

FERGUS DEVELOPMENT INC.

FERGUS GOLF CLUB REDEVELOPMENT – SERVICING STUDY

FEBRUARY 2022

REPORT PREPARED FOR

883890 Ontario Limited c/o Fergus Development Inc.
3190 Steeles Avenue East, Suit 300
Markham, ON L3R 1G9

REPORT PREPARED BY



**THE MUNICIPAL
INFRASTRUCTURE
GROUP LTD., A
T.Y. LIN
INTERNATIONAL
COMPANY**

8800 DUFFERIN STREET,
SUITE 200, VAUGHAN, ON
L4K 0C5
(905) 738-5700

TMIG PROJECT NUMBER 10402

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1 INTRODUCTION

1.1 Introduction

The Municipal Infrastructure Group (TMIG) has been retained by 883890 Ontario Limited c/o Fergus Development Inc. to prepare a servicing study technical memorandum (TM) to accompany a draft plan of subdivision filed for a redevelopment located in Township of Centre-Wellington, County of Wellington, Ontario. This document will identify the required water infrastructure and/or upgrades that would be needed to facilitate the new proposed redevelopment for Fergus Development Inc.

The existing golf course (the "Site"), shown on Figure 1, consists of two parcels; the northwest parcel, which is 42.35 ha, situated on the north side of Wellington Road 19, and the southeast parcel, which is 39.85 ha, situated on the south side of Wellington Road 19. The proposed residential redevelopment with 118 lots is located on the southeast parcel (the "SE Site") and the communal water and wastewater services are integrated into the existing Golf Course, which will remain, on the northwest parcel (the "NW Site"). The construction of the Water Treatment Plan (WTP) on the NW Site will serve the proposed 118 units, totaling a population of 365 people (at 3.094 people per unit). The new units will receive their drinking water via new wells and reservoir associated with the WTP. Average daily flow for this study has been assumed to be 350 Litres per Capita per Day (LPCD) as per the Township of Centre Wellington Engineering Guidelines.

1.2 Purpose

This Technical Memorandum focuses on the water servicing plan and has identified options for water servicing concepts for the Fergus golf course redevelopment. RJ Burnside and TMIG have been retained to identify preliminary servicing concepts for this development, based on the draft plan of the subdivision prepared by GSP (January 2022) which cover the lands under control by 883890 Ontario Limited.

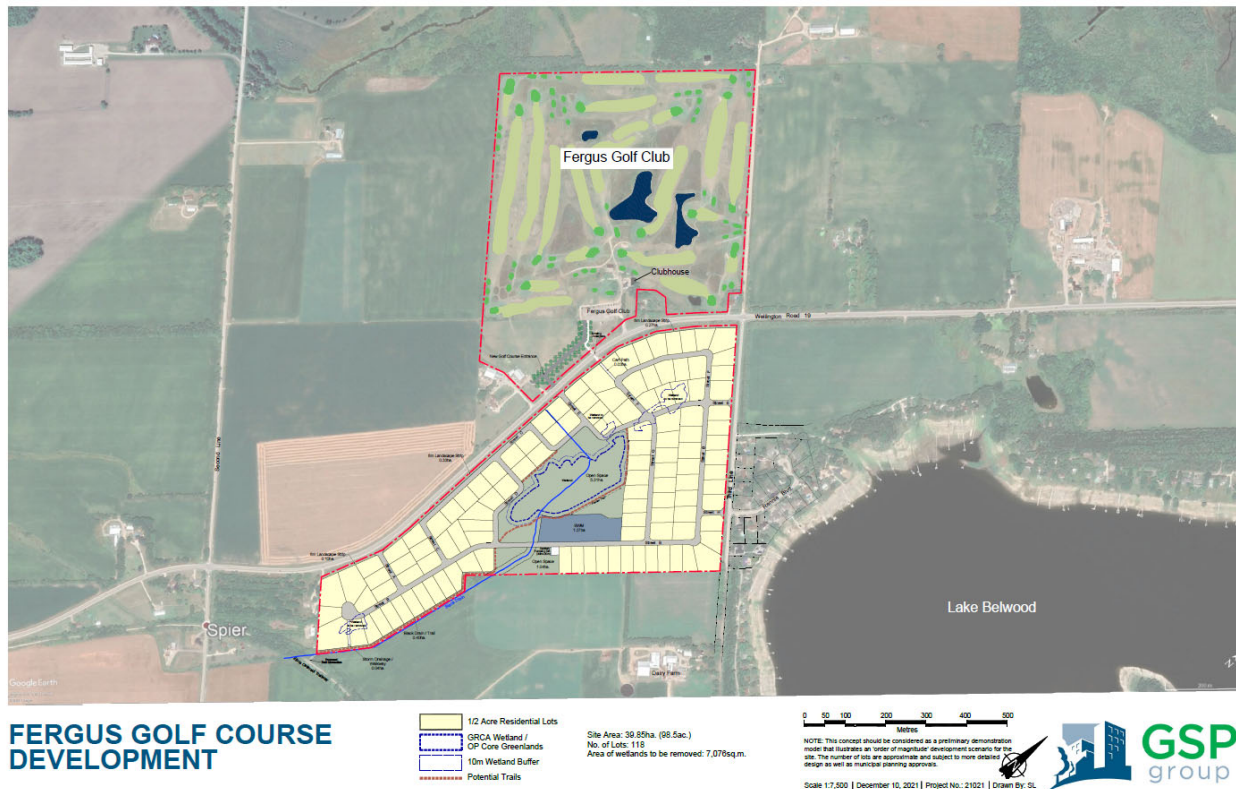


Figure 1 – Development Concept Plan

2 WATER TREATMENT PLANT

2.1 Projected Treated Water Demand

Projected maximum daily water demand that must be met by the new WTP at development build-out conditions is a Maximum Day Demand flow of 5.03 L/s, as summarized in Table 1.

	Total Units	Population ¹	Avg Water Demand		Max Day Factor	Max Day Flow, L/s	Peak Hour Factor	Peak Hour L/s	Peak Insta. Factor	Peak Insta. L/s
			M3/day ²	L/s						
Residential	118	365	128	1.48	3.40	5.03	5.00	7.39	7.5	11.09

¹ Based on average of 3.094 people per unit.

² Based on average per capita demand of 350 L/day.

Table 1 - Projected Water Demands at Development Build-Out

The average daily flow is calculated using the Township guideline of 350 L/day per person, and a density of 3.094 persons per dwelling unit. In addition, the maximum day, peak hour and peak instantaneous demands have been calculated using peaking factors specifically recommended by the Drinking Water System Design Guidelines (2008) for water systems serving fewer than 500 people.

2.2 Water Supply

The raw water supply required by the new water system will be derived from two wells located in the development area. Well supply systems must be designed to provide a firm capacity (largest well out of service) which is capable of meeting projected maximum day demand for communal

systems with storage. In order to meet this requirement, each well must be capable sustain a flow of 5.03 L/s.

2.3 Water Quality

Review of recent water quality data for observation wells and test wells at various locations near the site of the proposed new well supply, and for existing wells supplying the community suggests that the new source water will comply with all current Ontario Drinking Water Quality Standards, including aesthetic objectives. The water test results conducted by Golder Associates can be found in Appendix B. Based on the initial water quality data the wells are assumed to be non-GUDI.

2.4 Water Treatment Requirements

The well water data indicates that only primary and secondary disinfection will be required at the water treatment plant.

The design of the WTP to serve the redevelopment is therefore based on the following assumptions:

- The proposed wells are strictly groundwater, with no direct surface water influence.
- Provisions for disinfection to achieve a minimum 2-log (99 percent) inactivation of viruses will be included, in accordance with the requirements of Ontario Regulation 170/03 (rev. June 2006).
- Primary disinfection will be provided by UV with secondary disinfection by sodium hypochlorite. (Chlorine will be injected prior to the clearwells with top-up prior to discharge to the distribution system)
- Cartridge filters (rated a 5 microns nominal) will be placed in front of the UV system to reduce any potential particulates from entering the UV and reducing its effectiveness.

3 PRELIMINARY SITE FOOTPRINT

3.1 Water Treatment Facility

Based on projected maximum daily system demands at development build-out, required treatment plant production capacity is approximately 5.03 L/s. Well pumps will be designed with hydraulic head capabilities sufficient to convey the water from the wells to the WTP.

Filtered water would discharge to a 591 m³ below-grade finished water reservoir. The reservoir will be two cells with storage volumes for; Fire Flow (360 m³ – 50 L/s for 2 hours), Equalization (108.6 m³) and Emergency Storage (117.15 m³). The water entering the reservoir will be dosed with sodium hypochlorite to provide secondary chlorination. A chlorine residual analyser will monitor the dosage entering the clearwells. Four high-service pumps (three duty, one standby) would convey the finished water from the reservoir to the distribution system. Fire protection will include two fire flow pumps (one duty and one standby). The fire pumps will incorporate a constant backpressure valve to meter the pumps flow to the distribution system at a constant pressure regardless of fire flow demand.

The underground reservoir will be approximately 16m by 13m. Treatment, MCC, HVAC, chemical storage and pumping facilities would be housed within a 208 m² pre-engineered steel building. Control of the two well pumps and monitoring of flow rates from each well would be linked to the WTP control room. Influent flow rates at the WTP will be measured by an inline electromagnetic flow meter. Discharge to the distribution system will be monitored by a magnetic flow meter,

chlorine residual analyzer and pressure sensor. A 250-kW standby generator would be provided to ensure continued service in the event of an interruption in the electrical feed to the plant. The generator will be located outside the WTP building inside a sound attenuating enclosure. A site plan illustrating the location of the water treatment plant is shown on Figure 2.

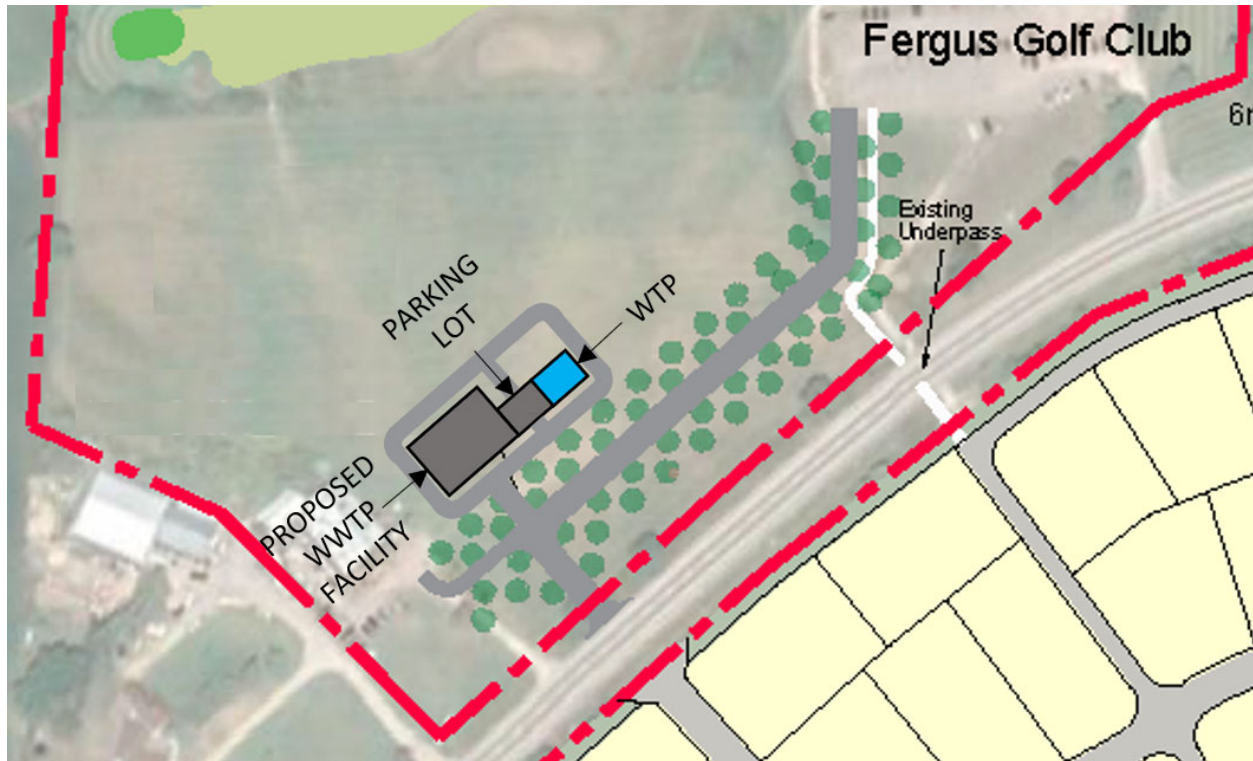


Figure 2 - Preliminary Water Treatment Plant Site Footprint

4 WATER DISTRIBUTION SYSTEM

4.1 Design Criteria

The design criteria utilized in the water model were obtained from RJ Burnside, Ministry of Environment, Conservation and Parks (MECP) and the Township of Centre Wellington. At this time, the elevations used in the model are as per the topographical survey (R-PE Surveying, 2021). The design criteria are shown in Table 2 below.

Criterion	Design Criteria	Source
People per unit	3.094	Assumed
Average Day Demand	350 Lpcd	Township
Maximum Day Factor	3.4	MECP
Peak Hour Day Factor	5.0	MECP
Fire Flow	Follow Fire Underwriter Survey	Township

Table 2 - Design Criteria

The fire flow demand for this area was calculated using Fire Underwriter Survey. The “short version” calculation provided a required fire flow of 50 L/s.

4.2 Level of Service

The water system evaluation involves assessing the system performance under various demand scenarios. The water distribution system is required to operate within pressures of 345 kPa (50 psi) to 552 kPa (80 psi) under normal operating conditions (average day and maximum day), and a slightly expanded pressure range (275 kPa (40 psi) to 700 kPa (100 psi) under peak hour conditions. A minimum of 140 kPa (20 psi) is required under the maximum day plus fire flow condition.

4.3 Watermain Network

The skeleton water network used in the water model was developed by TMIG using the hydraulic software InfoWater. Demands were assigned to five nodes in the system to force water through multiple watermains. The design hydraulic grade line for the water distribution system was set at 475.00 m. The skeleton water model network is illustrated in Figure 3 below.

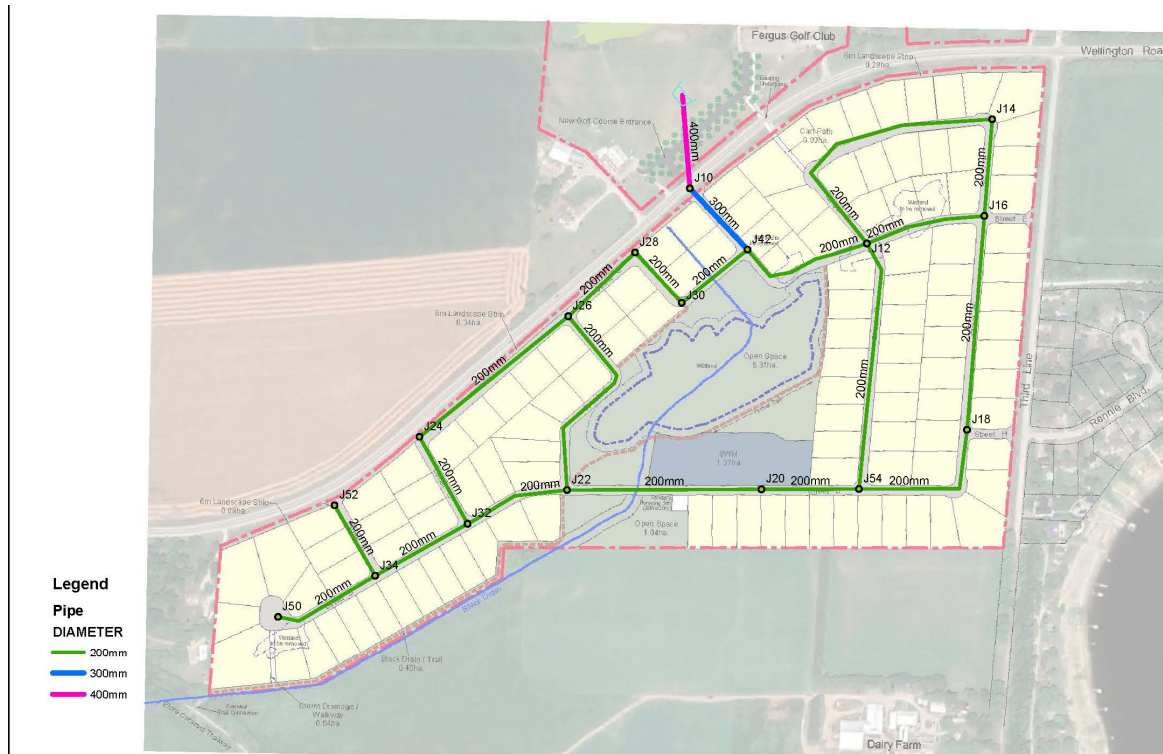


Figure 3 - Skeleton Watermain Network

4.4 Modelling Scenarios and Results

Four modelling scenarios were analyzed as part of this analysis to assess the system performance and conformance with the pressure level of service. These included - Average day demand, Maximum day demand, Peak hour demand and Maximum day demand plus fire flow.

The findings of the analysis are summarized in Table 3 below.

	Average Day		Maximum Day		Maximum Day Plus FF		Peak Hour	
Node ID	Demand (L/s)	Pressure (psi)	Demand (L/s)	Pressure (psi)	Demand (L/s)	Pressure (psi)	Demand (L/s)	Pressure (psi)
J14	0.30	67.17	1.01	67.15	1.01	65.94	1.48	67.13
J18	0.30	66.10	1.01	66.08	1.01	64.92	1.48	66.07
J22	0.30	68.59	1.01	68.57	1.01	65.58	1.48	68.55
J42	0.30	67.17	1.01	67.17	1.01	66.77	1.48	67.16
J50	0.30	68.23	1.01	68.21	51.01	59.02	1.48	68.19
Lowest Pressure	-	54.73	-	54.72	-	51.87	-	54.7
Highest Pressure	-	68.59	-	68.57	-	66.77	-	68.55

Table 3 - Modelling Analysis

As shown above, the level of service has reached under average day, maximum day, maximum day plus fire flow and peak hour. Under maximum day demand, all nodes in the system can satisfy the fire flow requirement of 50 L/s and still maintain a minimum of 20 psi. With a hydraulic grade line of 475 m at the reservoir site, the proposed Fergus Golf Course redevelopment can be serviced. For further reference, pressure maps for all scenarios are included in Appendix A.

5 SEWAGE PUMPING STATION

5.1 Design Flows

The pump station design flows are noted in Table 4 and will be used to size the pumps and forcemain for the redevelopment. TMIG has prepared preliminary design flow calculations for the proposed Fergus SPS which will be updated, as required during the detailed design phase of the project.

Criteria	Value	Unit
Average Daily Flow	128	m ³ /d
Harmon Peaking Factor	4.04	-
Peak Day Dry Weather Flow	518	m ³ /d
Infiltration Flowrate ¹	516	m ³ /d
Peak Hour Wet Weather Flow	1,034	m ³ /d
Peak Instantaneous Flow ²	1,292	m ³ /d
Peak Instantaneous Flow ²	15	L/s

¹Infiltration factor of 0.15 L/s/ha (Township Development Manual)
²Peak Instantaneous Flow is the criteria used to size pump station requirements.
³Design flows calculated assuming 118 units and serviced by the SPS

Table 4 - SPS Design Flows

5.2 SPS Design Guidelines

The design features for the pump station are not available within the Townships Development Manual and thus for the purpose of this servicing study, the SPS design features will be designed in accordance with MECP design guidelines.

As such, the following design features are proposed:

- A subgrade concrete wet well that will house a trash screen, pump, controls (floats/level transmitter) and discharge piping.

- A separate subgrade valve chamber that will house all the valving and instrumentation.
- An outdoor electrical panel that will house the electrical equipment and controls (i.e., motor control centers, automatic transfer switch, PLC, etc.)
- An outdoor emergency standby generator (fuel type to be confirmed based on availability).
- An odour control unit (OCU).

Other considerations that will require further discussion with the Township of Centre Wellington is the need for an emergency storage chamber.

5.3 Forcemain

5.3.1 Sizing

The forcemain (FM) pipe size in Table 5 is acceptable to comply with MECP design guidelines which recommends a flow velocity within a forcemain to range between 0.6 L/s to 2.0 L/s. The flow velocities are calculated using the peak instantaneous flow the corresponding pipe diameter.

Forcemain ID (mm)	Flow Velocity (m/s)
150	0.85

Table 5 - Calculated flow velocities

5.3.2 Horizontal Alignment

Figure 4 illustrates the proposed horizontal alignment to service the Fergus redevelopment.

- The proposed alignment will generally follow the right of way proposed by the GSP Site Plan from the SPS to the Fergus WWTF with the exception of a small section which will follow the proposed trail alignment. The FM alignment has an estimated length of 730 m.

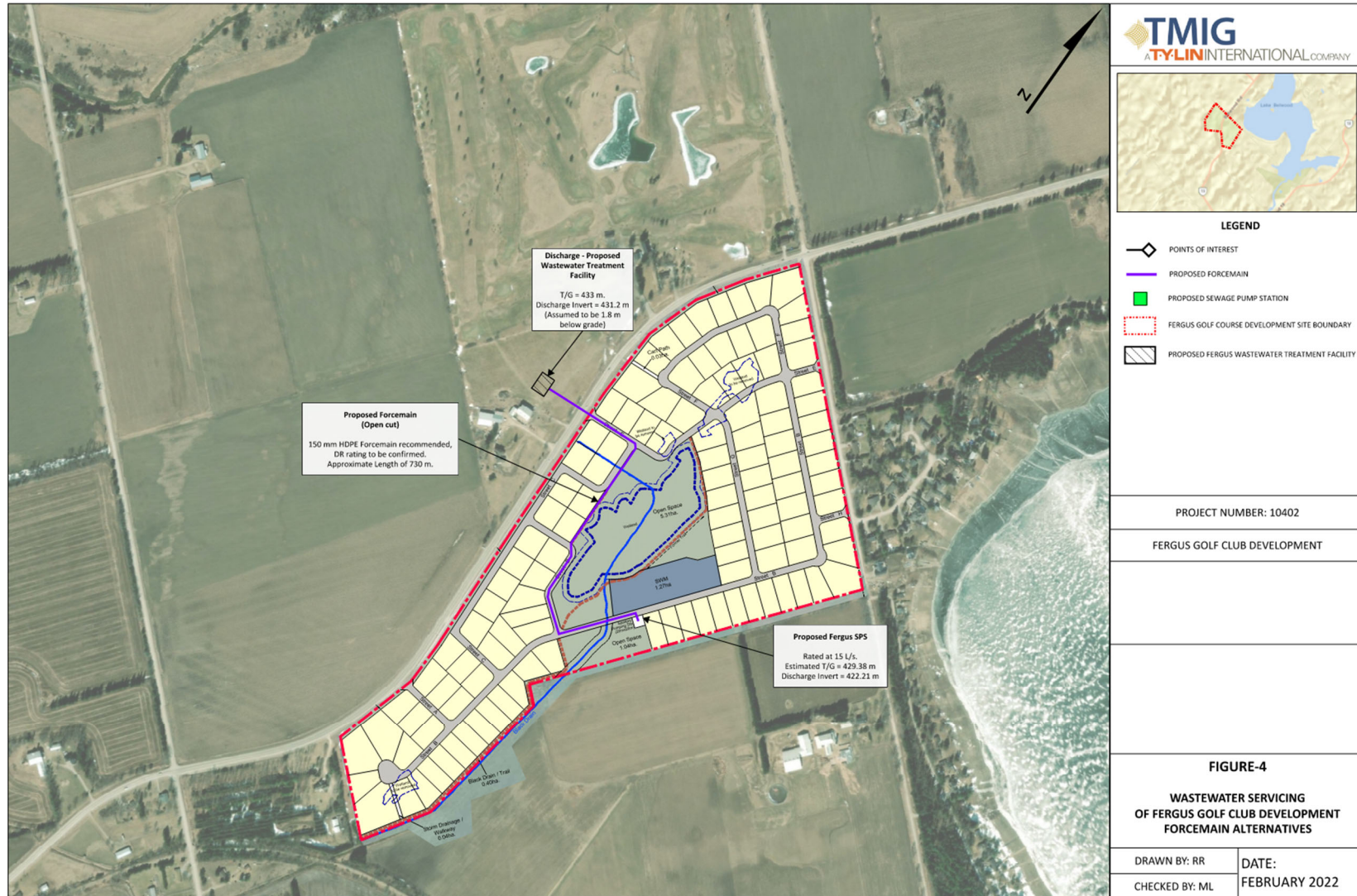


Figure 4 - Fergus Development Proposed Forcemain Horizontal Alignment

5.3.3 Vertical Alignment

The current forcemain alignment and general profile based on topographic information extracted from Google Earth has been identified in Figure 5.

The forcemain vertical alignment shall be designed to remain full during pump cycling. Keeping the forcemain full will reduce the impacts of hydraulic transients from occurring within the system.



6 REFERENCES

Golder Associates Ltd. (2022). *Water Quality Test Results*

Golder Associates Ltd. (2022). *Desktop Water Supply Investigation Report*

Golder Associates Ltd. (2022). *Preliminary Geotechnical Investigation*

Golder Associates Ltd. (2022). *Stage 1 Archaeological Assessment*

GSP. (2022). *Draft Subdivision Plan for Fergus Golf Course Development*

Ontario Ministry of the Environment. (2008). *Design Guidelines for Drinking Water Systems*

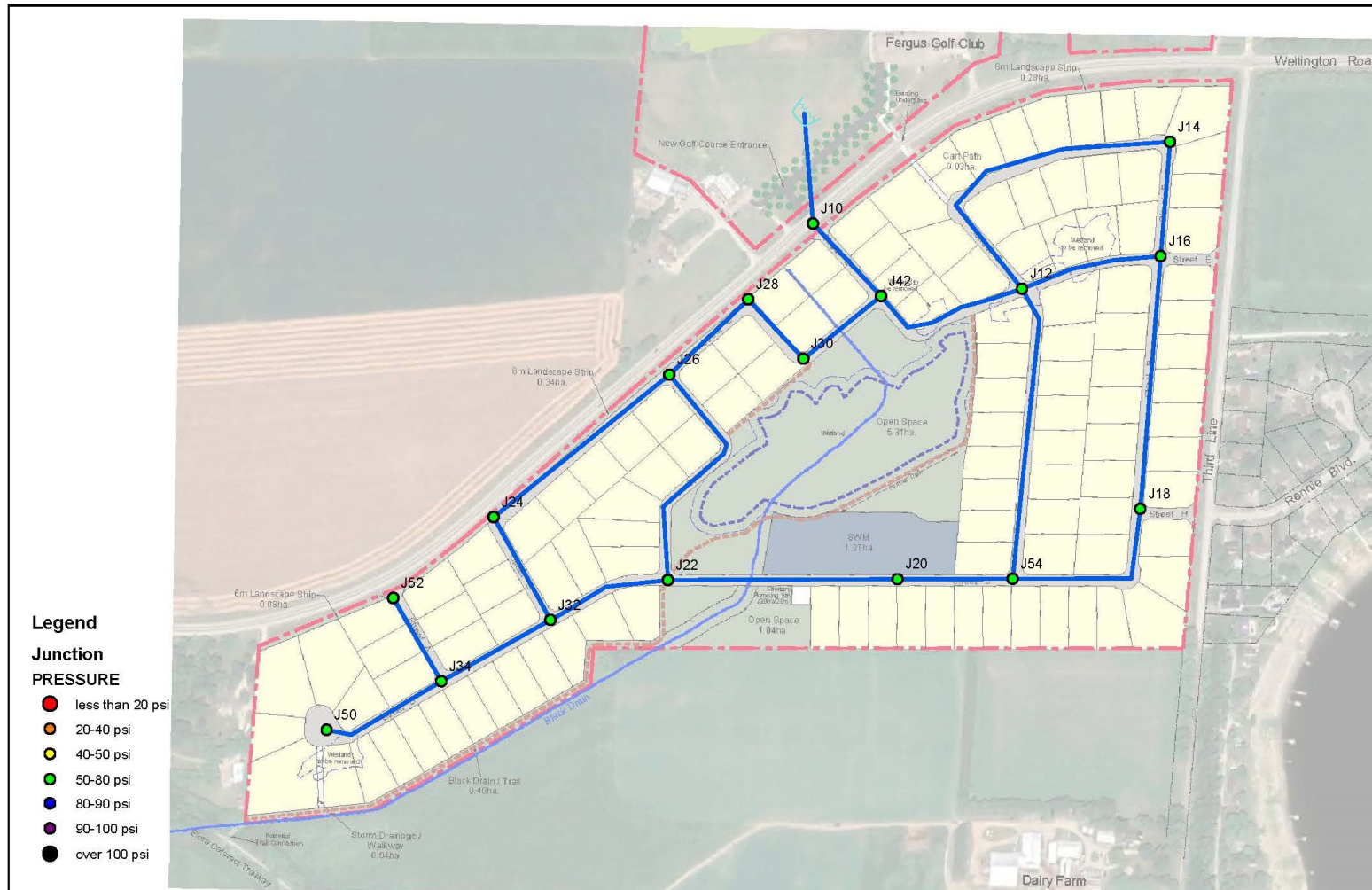
Ontario Ministry of the Environment. (2008). *Design Guidelines for Sewage Works*

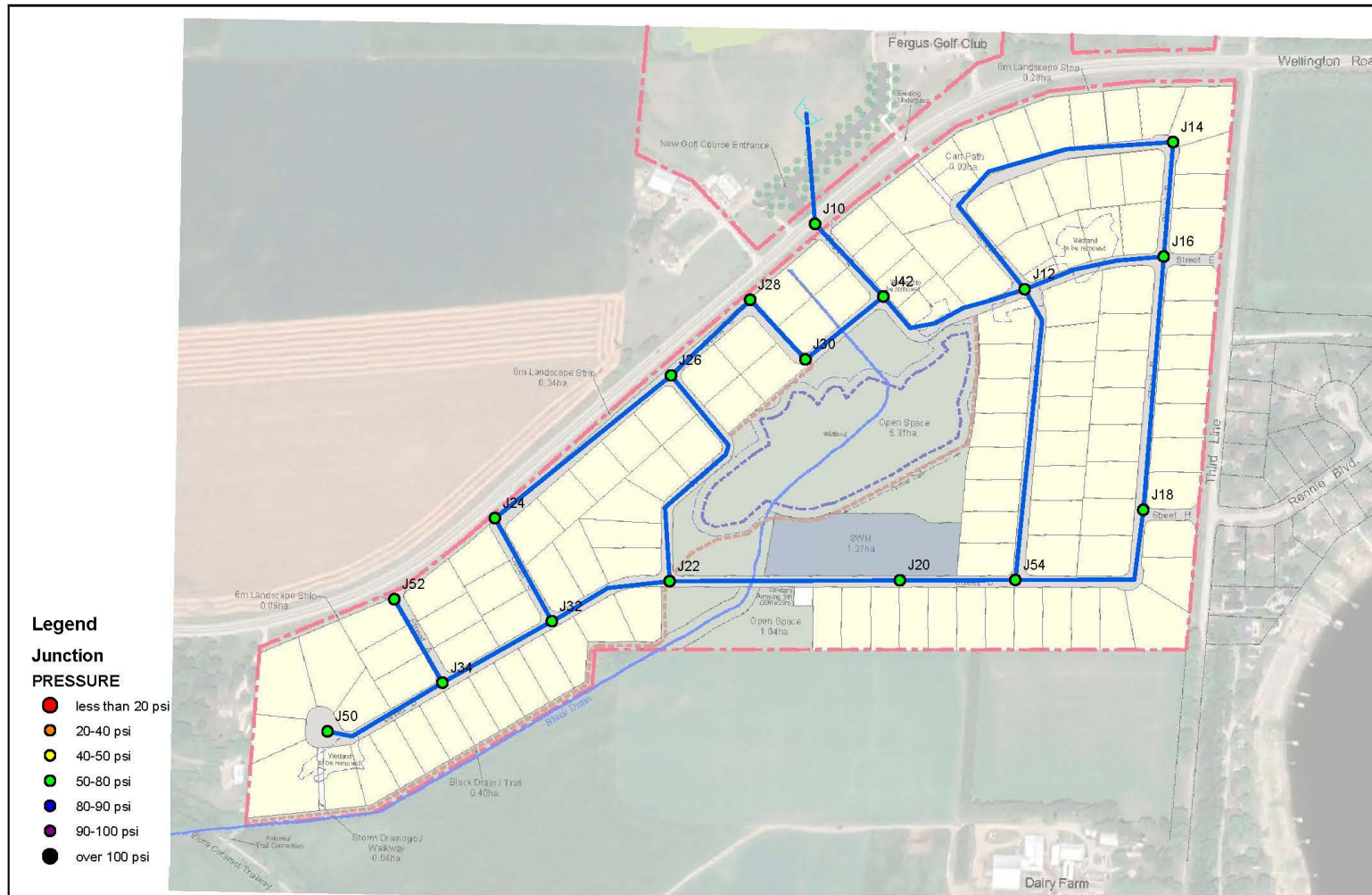
Stantec. (2016). *Township of Centre Wellington Growth Management Plan*

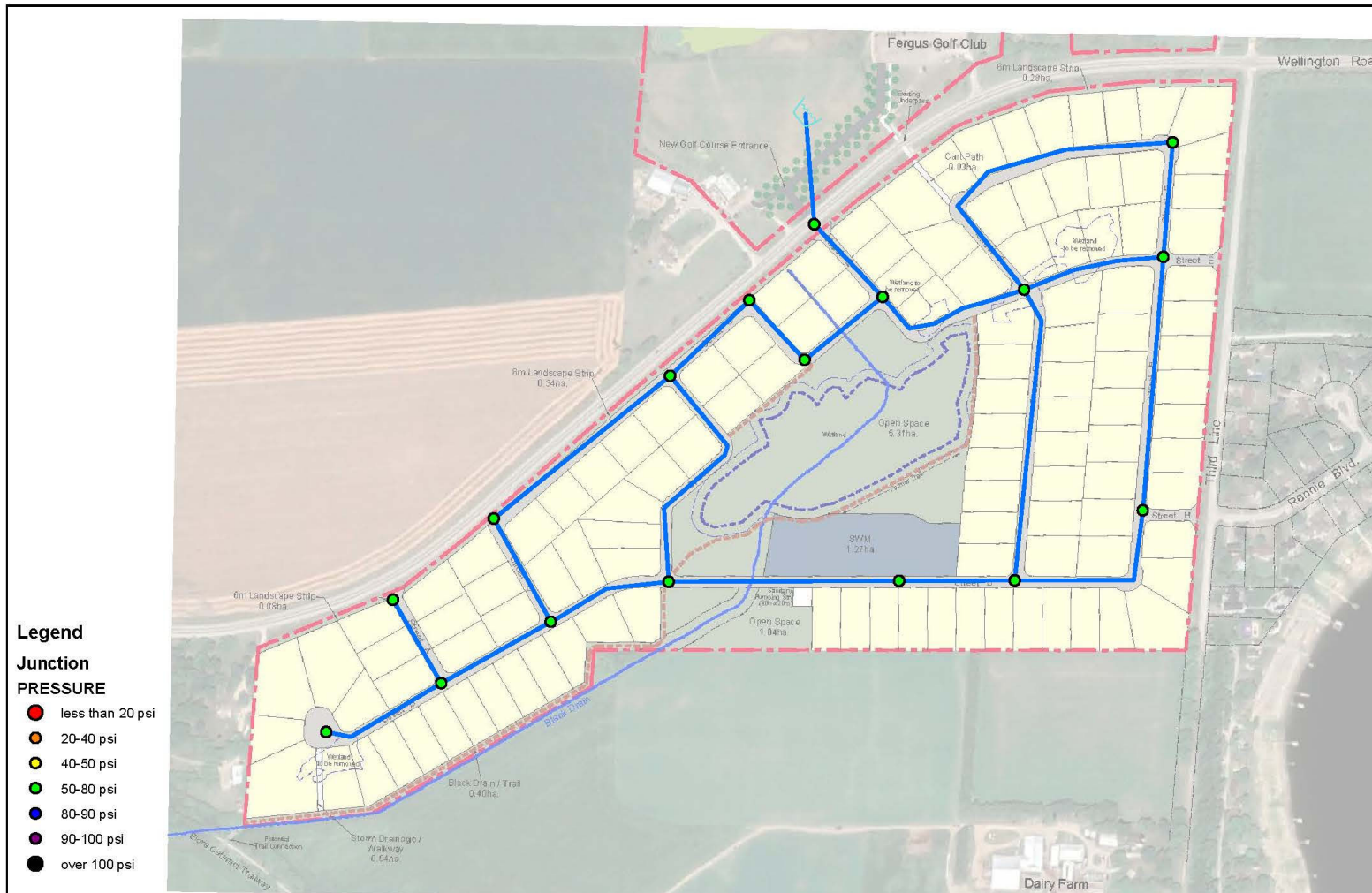
R-PE Surveying. (2021). *Topographical Survey*

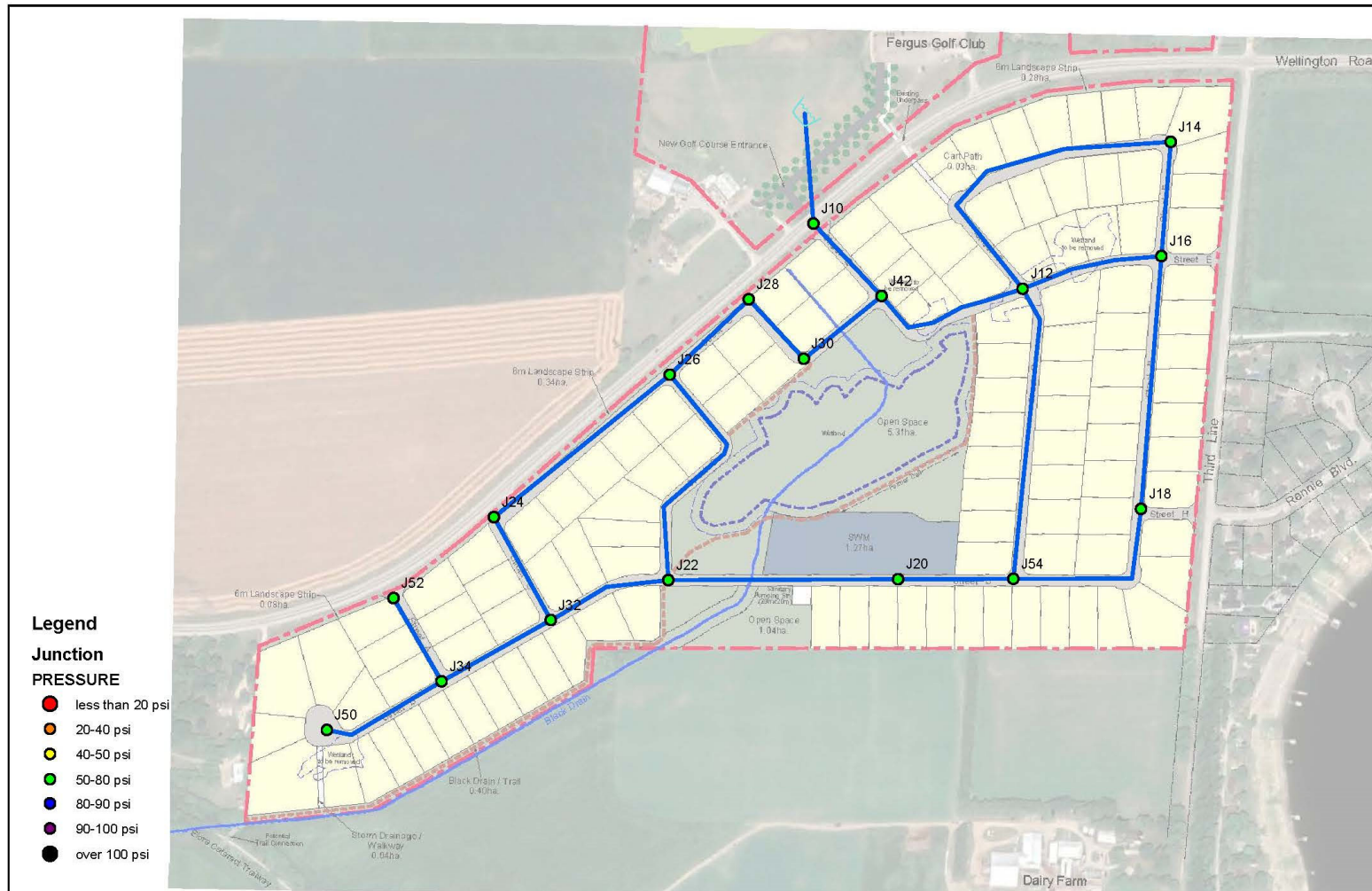
APPENDIX A

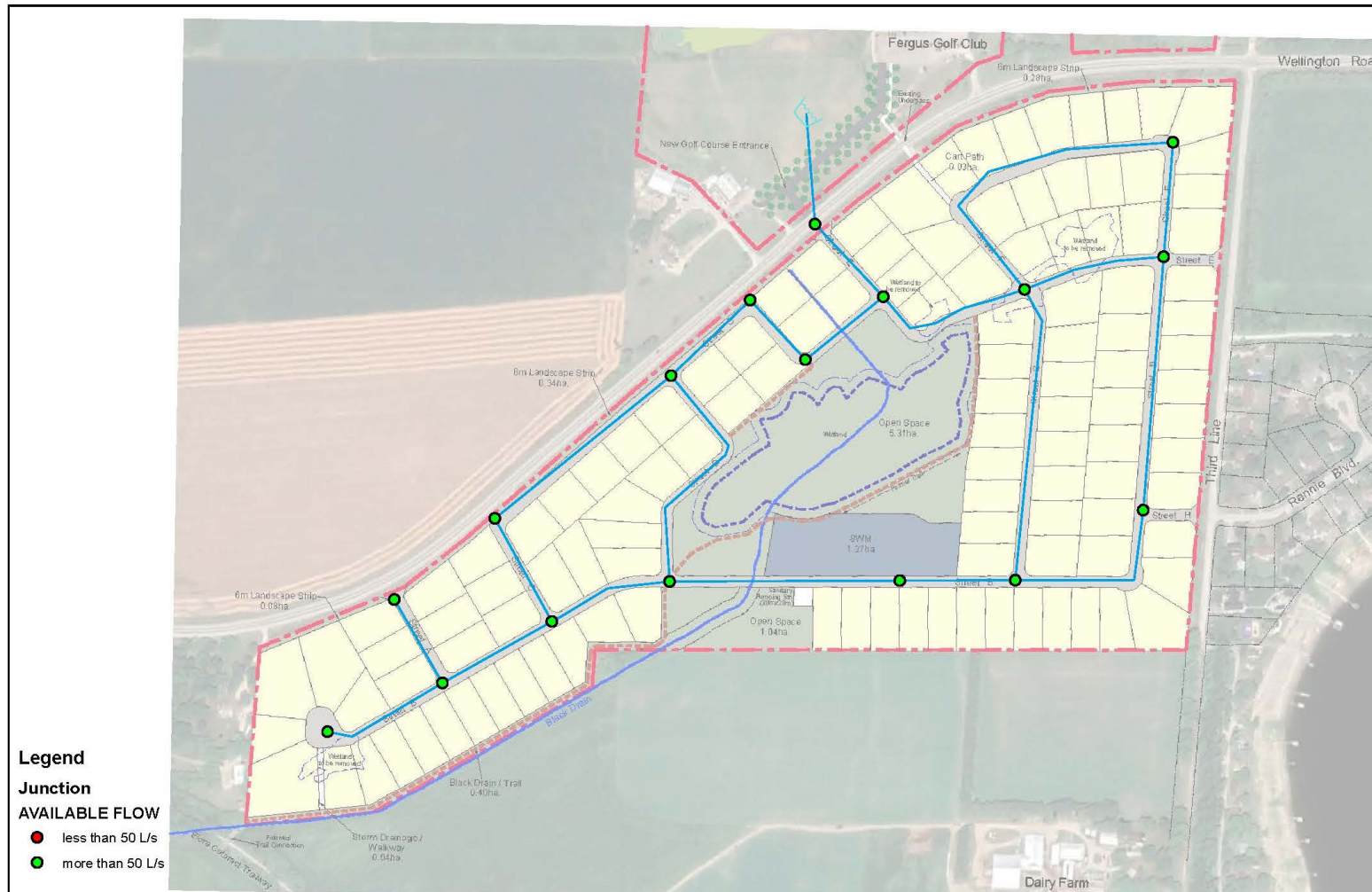
Pressure Maps











APPENDIX B

Water Quality Test Results

REPORT

Water Supply Investigation

Proposed Residential Development, Fergus Golf Club, 8243 and 8282 Wellington Road 19, Fergus, Ontario

Submitted to:

883890 Ontario Limited c/o Fergus Development Inc.

3190 Steeles Avenue East, Suite 300

Markham, Ontario

L3R 1G9

Attention: Ms. Farrah Ward

Submitted by:

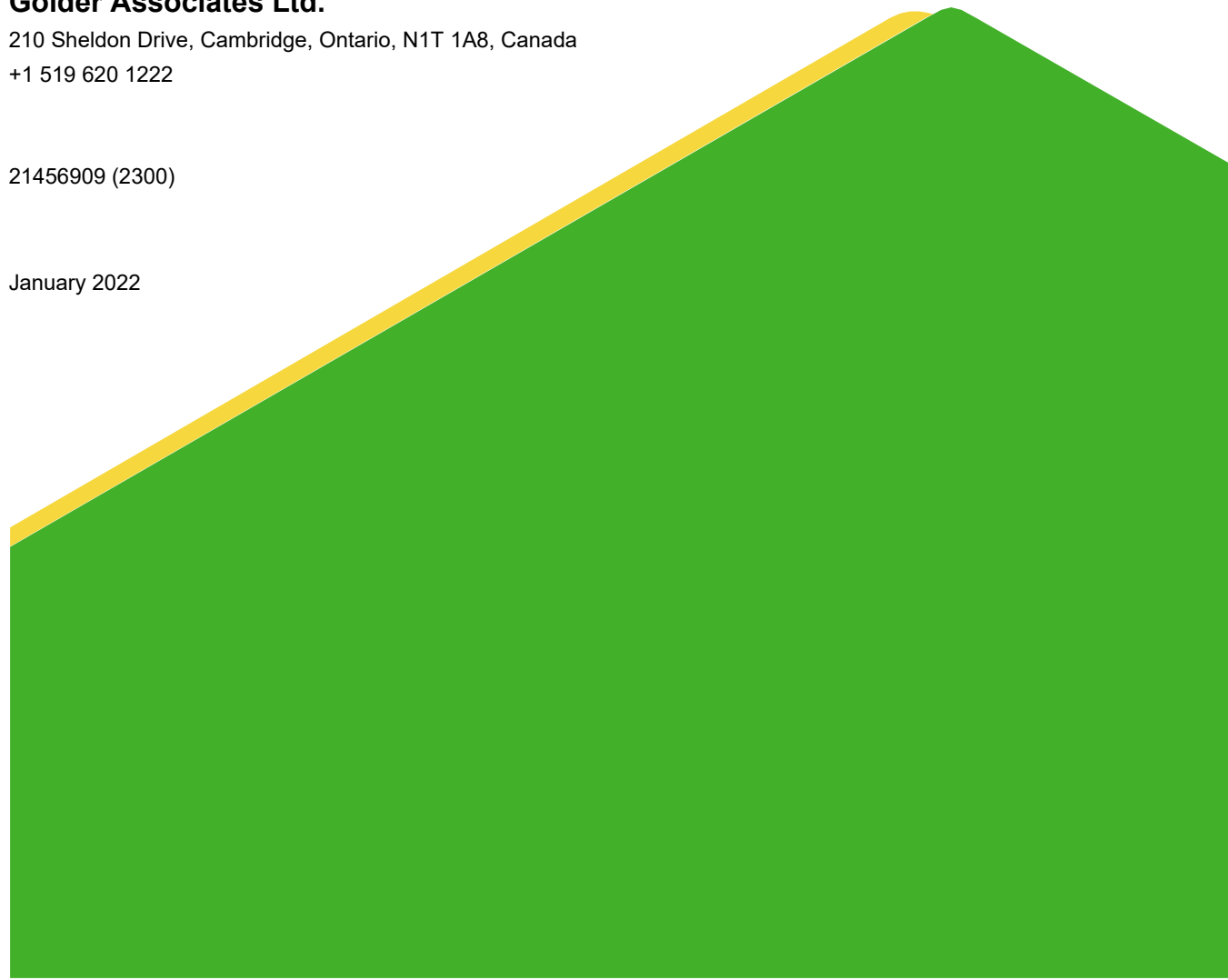
Golder Associates Ltd.

210 Sheldon Drive, Cambridge, Ontario, N1T 1A8, Canada

+1 519 620 1222

21456909 (2300)

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Stepped Rate Pumping Test Graphs

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Constant Rate Pumping Test Graphs

APPENDIX E

Water Quality Summary

1.0 INTRODUCTION

Golder Associates Ltd. (Golder) was retained by 883890 Ontario Limited c/o Fergus Development Inc. to carry out a water supply exploration investigation for a proposed residential development at 8243 and 8282 Wellington Road 19, the Township of Centre Wellington, Ontario (Figure 1). The purpose of this investigation is to assess the feasibility of a water supply for the proposed subdivision.

1.1 Scope of Work

The objective of the work was to evaluate a potential source of potable water supply for the proposed residential land development in Centre Wellington. This assessment includes a desktop study and field investigation. The scope of work included:

- Desktop background study;
- Identify locations for drilling;
- Conduct preliminary potential contaminant source identification;
- Conduct service locates;
- Drill and install monitoring wells (MW101, MW102 and MW103);
- Install mini-piezometers (MP-1, MP-2) and staff gauges (SG-1, SG-2);
- Construct a municipal grade test well (PW21-1);
- Conduct a variable rate step test and 72-hour constant rate pumping test;
- Conduct a water quality assessment at the test well;
- Prepare a hydrogeological assessment and feasibility assessment of the groundwater resource; and
- Delineate the zone of influence.

Key reports and data included in the study are listed as follows:

- Quaternary geology, bedrock geology, topography and physiography mapping;
- Ministry of the Environment, Conservation and Parks (MECP) Water Well Records;
- MECP Permits to Take Water (PTTW);
- Aerial photography;
- Source Water Protection Assessment Report;
- Source Protection Plan;
- Centre Wellington Tier 3 Water Budget Study and Risk Assessment;
- Fairview Golf Club Hydrogeological Investigation (Franklin Geotechnical Limited, 1990);

- Fairview Golf and Country Club Well Testing Program (Morrison Environmental Limited, 1999); and
- Fergus Golf Club Hydrogeological Report in Support of Permit to Take Water Application (R.J. Burnside & Associates Limited, 2011).

1.2 Water Supply Feasibility Assessment Approach

The feasibility of water servicing using a groundwater supply considers the following factors:

- **Aquifer Presence:** The likelihood of aquifer(s) being present across the entire proposed development area must be evaluated on the basis of on- and off-Site data. Provided that aquifer(s) are likely to be present, then the following must also be evaluated.
- **Water Quantity:** The probability of obtaining adequate quantities of potable water for a water supply must be evaluated based on existing water supplies in the area and field testing. In addition, consideration must be given to whether such a taking would cause adverse interference at other nearby wells or environmental features.
- **Water Quality:** As the water will be intended for human consumption it should not contain any disease-causing organisms or unacceptable concentrations of certain chemical parameters. Aesthetic considerations also provide a basis for drinking water objectives since the water should be pleasant to drink. Specifically, the water supply aquifer's ability to meet Ontario Drinking Water Quality Standards, Objectives and Guidelines (ODWQS) (either via raw water or through acceptable treatment technologies) must be considered. In addition, the water supply must be evaluated to determine if it is groundwater under the direct influence of surface water (GUDI), an assessment of whether pumping of the aquifer will induce the flow of water from a surface water body into the aquifer.
- **Source Water Protection:** Determine if the proposed water taking is located within existing wellhead protection areas (WHPA) delineated for municipal water supplies (i.e., Township of Centre Wellington) Under the Clean Water Act (2006) and whether or not this water supply would be identified as a threat.

1.3 Existing Land Use

The existing golf course (the "Site") consists of two parcels; the northwest parcel (the "NW Site") is situated on the northwest side of Wellington Road 19, and the southeast parcel (the "SE Site") is situated on the southeast side of Wellington Road 19, referred to as the Lake Belwood Golf Club (NW Site) and the Fairview Golf Club (SE Site), as shown on Figure 1. The NW Site is located on Part of Lots 10 and 11, Concession 3, Township of Centre Wellington (former Township of Garafraxa) and the SE Site is located on Part of Lots 9 and 10, Concession 3, Township of Centre Wellington (former Township of Garafraxa). The SE Site is being proposed for residential redevelopment while the NW Site will remain as a golf course and will incorporate the communal servicing infrastructure required to service both the golf course and proposed development.

The Site is located approximately 2 km northeast of the Town of Fergus and adjacent to Lake Belwood, a reservoir on the Grand River. The NW Site area totals approximately 42.35 ha and the SE Site area totals approximately 39.85 ha. Both sites are active golf courses (18 holes at NW Site and 9 holes at SE Site) with fairways, greens, wooded areas, wetlands and ponds, and the club house located on the NW Site. The surrounding land is mainly agricultural and rural residential. An existing residential development and seasonal cottages are present between the east side of the SE Site and Lake Belwood.

1.4 Proposed Development

Fergus Development Inc. has provided a proposed residential redevelopment layout consisting of 118 freehold lots (0.5+ acres) proposed for the SE Site. The redevelopment of the SE Site will also include open space, stormwater management pond, and natural features. Private communal water and wastewater will occur on the NW Site.

The Municipal Infrastructure Group Ltd. (TMIG) has estimated the required average day water taking to be approximately 128 m³/d (1.48 L/s) and the maximum day water taking to be 435 m³/d (5.03 L/s) for the proposed redevelopment (TMIG, 2022). A test well referred to as PW21-1 has been constructed on the NW Site that has the potential to provide the required water supply (as described in this report). Testing of the well is required to assess the water quantity, water quality and potential impacts to surrounding features (e.g., natural environment and private wells).

1.5 Site Selection

A summary of the findings from the background review is presented in Section 3.0. Based on that review it was determined that a well in the bedrock aquifer was the most feasible source for a water supply. The location selected for testing was chosen to maximize distance from private wells, maximize distance from Lake Belwood, be outside of existing WHPAs and be away from potential contaminant sources. To achieve these objectives, a site in the northwest corner of the NW Site was selected for drilling a test well (referred to as PW21-1). Details on the drilling and testing are included in the sections below.

2.0 FIELD PROGRAM OVERVIEW

2.1 Test Well Drilling and Monitoring Well Construction

The new supply test well (PW21-1) was constructed on the NW Site (Figure 2) in May 2021. The as-built log for PW21-1 is included in Appendix A. The well is completed to a depth of approximately 91.4 m within the bedrock aquifer. The bedrock is overlain by approximately 29.9 m of sandy to gravelly silt till. The well is completed with a 168 mm outside diameter (OD) steel casing set through the overburden to a depth of 32.9 m below ground surface (bgs) and an open 152 mm diameter hole through the bedrock. The bottom of the hole was sealed with bentonite and capped with cement to a depth of 84.1 m bgs to reduce the potential for poor water quality from the deeper bedrock, which was noted in some surrounding wells.

Three bedrock monitoring wells were also constructed on the NW Site to characterize the geology and allow for groundwater level monitoring. The monitoring well (MW101 through MW103) locations are shown on Figure 2 and as completed logs included in Appendix A. The monitoring wells were constructed with a nominal 152 mm diameter casing through the overburden (silt till) and a nominal 152 mm diameter open hole through the bedrock to a depth of 61.0 m.

All of the well drilling was completed by Well Initiatives using conventional rotary drilling equipment. The wells are constructed to Ontario Regulation 903 standards.

In addition, a number of shallow overburden monitoring wells have also been constructed on the NW Site as part of other investigations.

In August 2021, a mini-piezometer and staff gauge were installed in the pond east of PW21-1 (MP-1, SG-1) and the pond north of the North Irrigation Well (MP-2, SG-2), as shown on Figure 2.

2.2 Aquifer Testing

The aquifer testing at PW21-1 was conducted by Well Initiatives. Testing at PW21-1 consisted of a variable stepped rate pumping test completed on August 30, 2021 using three pumping steps of one hour each at 3.2 L/s, 6.3 L/s and 9.5 L/s. Following the step pumping test, a constant rate pumping test of 72 hours duration was completed from August 31, 2021 to September 3, 2021 at a rate of 8.8 L/s. The pumping rate was monitored by a flow meter on the discharge line. The pumping test was conducted at a higher rate than the required 5.03 L/s as an earlier development proposal contemplated more lots.

The pumping test was registered under the Environmental Activity and Sector Registry under Registration Number R-011-4136628634.

A notification letter was delivered to the private well owners within approximately 500 m to 1000 m of PW21-1 one week prior to the pumping test.

Pumped groundwater from PW21-1 was discharged to the on-Site pond beside the North Irrigation Well approximately 300 m southeast of PW21-1. The water was discharged using appropriate flow dissipation measures to prevent erosion or scouring. The water pumped into the pond was similar to the groundwater currently pumped into the pond from the North Irrigation Well.

Continuous groundwater level monitoring (i.e., monitoring by dataloggers, supplemented by manual water level readings) was carried out in a network of monitoring wells (as shown on Figure 2) prior to, during and following the test. Recovery was measured until one week post-test. The monitoring network included:

Bedrock Wells

- PW21-1 (pumping well);
- MW101, MW102 and MW103 (dedicated monitoring wells); and
- Clubhouse Well, South Irrigation Well and Old Clubhouse Well.

Overburden Wells

- BH21-10, BH21-13 and BH21-14.

Surface Water

- On-Site pond near PW21-1 (MP-1, SG-1); and
- On-Site pond near North Irrigation Well (MP-2, SG-2).

The North Irrigation Well was not accessible for monitoring and a pressure transducer datalogger could not be installed in the Clubhouse Well.

Additional monitoring included:

- Continuous monitoring of discharge quantity;
- Daily visual monitoring of the discharge for suspended sediment in the groundwater; and
- Daily visual monitoring of the discharge point to the on-Site pond for erosion.

The following mitigation measures were also in place during the testing, however they were not required.

- In the unlikely event that the aquifer test negatively impacts any nearby private wells, the pumping rate would be reduced or a temporary water supply would be provided to the impacted parties for the duration of the test; and
- In the event that erosion or scouring was observed at the discharge point, the flow dissipation system would be modified and the affected area rehabilitated.

2.3 Water Quality Testing

Water quality samples were obtained from PW21-1 periodically during the 72-hour test (at hours 1, 24 and 72) and analyzed for general chemistry parameters and bacteria. A sample was also collected at the end of the test to undergo a comprehensive analytical suite designed to assess the ODWQS parameters. The water samples were collected in laboratory prepared bottles and submitted to Bureau Veritas Laboratories.

Water quality samples were also collected for microscopic particulate analysis (MPA) from PW21-1 at the end of the constant rate test and submitted for analysis at Hyperion Research Limited to aid in the GUDI assessment.

3.0 SITE SETTING

3.1 Topography

The ground surface at the Site is gently undulating, with elevations ranging from approximately 424 metres above sea level (masl) to 437 masl (Figure 3) (Grand River Conservation Authority, 2021a). The ground surface at the NW Site generally slopes to the north from a high elevation of 433 masl near the southwestern part of the NW Site to a low elevation of 424 masl along a tributary to Irvine Creek at the north side of the NW Site. There is a high ground elevation of 437 masl in the southern part of the SE Site. The SE Site is like a trough with ground elevations around 430 masl on the east and west side of the SE Site and a low along the middle of the SE Site at 426 masl.

3.2 Drainage

The Site is located within the Grand River Watershed. The Grand River flows in a southwest direction in the area flowing through the Lake Belwood reservoir located approximately 1.2 km southeast of PW21-1.

Locally the NW Site and the majority of the SE Site is within the Irvine Creek Subwatershed. Irvine Creek and its tributaries generally flow in a southwest direction and discharge into the Grand River in Elora. At its closest point, Irvine Creek is located approximately 250 m from PW21-1 (Figure 3). The NW Site is drained by a tributary of Irvine Creek and the SE Site is drained by Black Drain. The Black Drain flows in a southwest direction through the low portion of the SE Site (Figure 3) and discharges into Irvine Creek approximately 2.5 km west of the SE Site.

3.3 Physiography

The Site is situated within the physiographic region described as the Guelph Drumlin Field (Chapman and Putnam, 1984). Chapman and Putnam (1984) describe the general landform pattern consisting of drumlins, or groups of drumlins, fringed by gravel terraces and separated by swampy valleys in which flow tributaries of the Grand River. Locally Irvine Creek and Black Drain are situated within spillways separated by a drumlinized till plain (Figure 3).

3.4 Geology

3.4.1 Overburden Geology

The surficial soils mapped in the area by the Ontario Geological Survey (OGS-GSC, 2020) are shown on Figure 4. The surficial soils in the area of PW21-1 consist of ablation till with surrounding surficial soils including fine-grained till, outwash sand and gravel and glaciofluvial outwash sand. The ablation till is a sandy silt till referred to as the Port Stanley Till and the fine-grained till is a silt till to clayey silt till referred to as the Tavistock Till, which likely form an aquitard in the area.

Three hydrostratigraphic cross-sections are provided on Figures 6, 7 and 8, with the alignments of the sections shown on Figure 5. The overburden is approximately 23 m to 33 m thick at the Site and surrounding area and is predominately characterized by a mix of fine-grained till with occasional discontinuous layers of sand (usually found directly above bedrock surface). Based on the MECP water well records, a bedrock valley is interpreted to exist across the SE Site. The valley is estimated to trend in a northeast-southwest direction. Based on water well record 6706408 the valley is at least 79 m deep and appears to be filled with till.

3.4.2 Bedrock Geology

The bedrock surface elevation is generally around 400 masl and consists of limestone, dolostone and shale. The bedrock that subcrops beneath the overburden does not outcrop at the Site. The bedrock formations underlying the Site comprise one of the most extensive bedrock aquifers in Ontario and are the main source of drinking water supplies for a number of nearby municipalities. The Ontario Geological Survey (OGS) has mapped the Silurian carbonate strata along the Niagara Escarpment region and has revised the framework for stratigraphy of this area. Based on the revised stratigraphic framework described by the OGS (Brunton, 2008, 2009), a brief description of the bedrock formations estimated to be present is provided below (from oldest to youngest).

- **Gasport Formation:** The Gasport Formation is a cross-bedded crinoidal grainstone-packstone with sequences of reef mound and coquina (shell bed) lithofacies (Brunton, 2008, 2009). This unit has commonly been referred to as the Amabel Formation in previous studies in the area;
- **Goat Island Formation:** The Goat Island Formation consists of two members; the lower Niagara Falls Member and the upper Ancaster Member. The Niagara Falls Member is a finely crystalline and cross laminated crinoidal grainstone with small reef mounds while the Ancaster Member is a chert rich, finely crystalline dolostone that is medium to ash grey in colour;
- **Eramosa Formation:** The Eramosa Formation consists of three members including, from oldest to youngest, the Vinemount Member, the Reformatory Quarry Member and the Stone Road Member. It is unknown whether all of the members of the Eramosa Formation are present at the Site; and
- **Guelph Formation:** The Guelph Formation consists of medium to thickly bedded crinoidal grainstones and wackestones and reefal complexes (Brunton, 2008, 2009). The Guelph Formation is cream coloured and is the uppermost bedrock unit.

3.5 Hydrostratigraphy

The conceptual model for the Site includes an approximately 30 m thick overburden (till) aquitard overlying a bedrock aquifer. Within the upper overburden aquitard there are confined and laterally discontinuous layers of sand or water bearing horizons that exist locally. Overlying the till are unconfined and laterally discontinuous outwash deposits north of the NW Site and within the SE Site. There are also some more permeable layers near

the bedrock contact throughout the area. These shallow and deep overburden units are sometimes used for individual private water supplies.

The bedrock is considered an aquifer (formerly referred to as the Guelph-Amabel Aquifer) with zones of varying permeability depending on the rock properties and rock features. Bedrock aquifers typically yield water from water producing features such as fractures and fissures within the bedrock. The production of water depends on the number of fractures, size of the fractures and interconnectivity of the fractures.

Groundwater flow in the bedrock aquifer is interpreted to be in a southerly to southwesterly direction toward the Grand River.

There is an existing pumping well on the NW Site that is used for golf course irrigation purposes (Figure 1). Testing of the well by others in 1999 indicated a bedrock transmissivity of 38 m²/d and a storage coefficient ranging from 0.00015 to 0.00004 (Morrison, 1999).

3.6 Local Water Users

A review of the MECP Water Well Records database indicates that there are 30 well records nominally within 1 km of PW21-1 (as shown on Figure 5). A table summarizing the water well records is included in Appendix B. Of the 30 well records, 29 have water supply (e.g., domestic or stock watering) as their designated use. The remaining well has an unknown use listed. Of the 29 water supply wells, 28 (97%) are completed in the bedrock and 1 (3%) is completed in the deep overburden.

Analysis of the well records indicates that bedrock well use dominates around the Site with most well completions occurring between elevations 375 masl and 400 masl as shown on Figures 6, 7 and 8.

Based on the recorded information, private water wells generally utilize three zones around the Site as follows:

- i) shallow overburden water wells (dug wells not included in MECP Well Record database) – shallow overburden wells are inferred to utilize various shallow, thin coarse-textured units or the glacial till unit for water supply. The coarse-textured units are inferred to be laterally discontinuous;
- ii) upper bedrock aquifer – most of the private water supply wells are completed in the upper bedrock with well completions occurring between elevations 375 masl and 400 masl as shown on Figures 6, 7 and 8; and
- iii) lower bedrock aquifer – some private wells are completed in the bedrock below elevation 375 masl. Most of the wells completed in this aquifer are open across both the upper and lower aquifers.

The presence of fresh water was reported on the well records.

There are four existing bedrock wells on the NW Site and SE Site that are used by Fergus Golf Club as shown on Figure 1. The North Irrigation Well (MOE#6712549) and Clubhouse Well (MOE#6714026) are located on the NW Site and completed in the bedrock to depths of 86.0 m and 74.7 m, respectively. The South Irrigation Well (MOE#6713016) and Old Clubhouse Well (possibly MOE#6706408) are located on the SE Site and completed in the bedrock to depths of 94.5 m and 108.5 m, respectively

3.7 Permitted Water Users

A PTTW is required for water takings greater than 50,000 L/d. A review of the MECP PTTW database identified the following PTTWs within 3 km of the Site (including two permits issued to Fergus Golf Club). A summary of the permits is included in Table 1, below. PTTW 4856-9KBH5A was issued to the Township of Centre Wellington for

municipal water supply in Elora and Fergus. The permit allows for a groundwater taking from nine wells. The closest municipal wells to the Site are F4 and F6 which are located approximately 2.8 km southwest of the Site. A PTTW was also issued to Highland Pines Campground to allow for a groundwater taking from six wells. The Highland Pines Campground is located approximately 2 km northeast of the Site.

Table 1: Permits To Take Water

Permit Number	Permit Owner	Source	Use
5817-8JQN3B	Fergus Golf Club	Groundwater (1 well) and Surface Water (1 pond)	Golf Course Irrigation
2633-9XARF2	Fergus Golf Club	Groundwater (1 well) and Surface Water (1 pond)	Golf course Irrigation
4856-9KBH5A	The Corporation of the Township of Centre Wellington	Groundwater (9 wells)	Municipal (closest wells are F4 and F6)
3657-BSEJSA	Highland Pines Campground Limited	Groundwater (6 wells)	Campground

4.0 WATER SUPPLY POTENTIAL

The water supply potential has been assessed with test well construction, monitoring well construction and aquifer testing at the Site. The drilling at PW21-1 identified fractured dolostone capable of producing high well yields. Preliminary estimates of flow during drilling indicated the well could pump at a rate of approximately 7.5 L/s or more.

4.1 Stepped Rate Pumping Test

The results of the stepped rate pumping test are shown in Table 2 and presented graphically in Appendix C. Prior to the testing the static water level in the well was measured at 9.5 m bgs. The specific capacity ranged from 0.8 L/s/m to 1.3 L/s/m and declined as the pumping rate increased due to well losses.

Table 2: Stepped Rate Pumping Test Summary

Pumping Rate (L/s)	Drawdown at PW21-1 (m)	Specific Capacity (L/s/m)
3.2	2.40	1.3
6.3	5.65	1.1
9.5	11.57	0.8

4.2 Constant Rate Pumping Test

The pumping test was carried out to pump the well at a rate with the pumping water level remaining above the overburden/bedrock contact at 29.9 m bgs. Based on the results of the step pumping test, a pumping rate greater than 9.5 L/s was possible, however, it was found that the well was pumping some sand at 9.5 L/s. This could potentially be from within fractures connected to the overburden. The test at PW21-1 was therefore conducted at a rate of 8.8 L/s for 72 hours to avoid pumping sand, to estimate the long-term potential production rate from the

well and to investigate potential environmental impacts. This testing rate is higher than the estimated rate of 5.03 L/s required for the proposed redevelopment.

Hydrographs for the monitoring wells screened in the bedrock, the overburden and surface water are shown on Figures D1, D2 and D3 in Appendix D, respectively and a table of observed drawdown is included in Table 3. The hydrographs show the water level measured in the well along with the pumping rate at PW21-1 and daily precipitation. Figure D4 presents the drawdown versus elapsed time for these same key bedrock wells and a graph of observed drawdown versus distance from the pumping well is included on Figure D5.

Table 3: Drawdown Observed at the End of the Pumping Test

Monitoring Location	Distance from PW21-1 (m)	Open Interval (m below ground surface)	Drawdown (m)
PW21-1	0	32.9 – 84.1	12.8
MW101	640	33.8 – 61.0	1.9
MW102	562	30.6 – 61.0	2.5
MW103	413	30.8 -61.0	2.8
Clubhouse Well	487	32.9 – 74.7	1.3
South Irrigation Well	821	28.0 – 94.5	0.4
Old Clubhouse Well	1,095	79.2 – 108.5	0.3
BH21-10	497	3.0 – 6.1	less than 0.1
BH21-13	261	5.8 – 7.3	0.2 (may be natural fluctuation)
BH21-14	257	1.5 – 3.0	less than 0.1
MP-1	144	0.1 – 0.8	less than 0.1
SG-1	143	N/A	less than 0.1
MP-2	319	0.6 – 1.2	less than 0.1
SG-2	321	N/A	less than 0.1

The following summarizes the observed water level responses from the 72-hour pumping test:

PW21-1 Response

- Drawdown occurred rapidly at the start of the test;
- The total drawdown at the end of the test was 12.8 m; and
- At the end of the test, the water level was declining approximately 2.2 m per log cycle.

Bedrock Aquifer Response

- A definitive response to pumping was observed in the monitoring wells within 700 m of PW21-1;
- Drawdown in the bedrock monitoring wells ranged from 0.3 m (Old Clubhouse Well) to 2.8 m (MW103); and

- The drawdown cone in the bedrock is estimated to extend approximately 1 km from PW21-1 with approximately 0.4 m of drawdown estimated at that distance (Figure D5 and Figure 9).

Overburden Response

- A clear response to pumping was not observed in the overburden monitoring wells; and
- The water level in BH21-13 declined approximately 0.2 m during the test but did not recover at the end of the test. The changes in water level may be due to natural fluctuation within the till.

Surface Water Response

- Water levels at MP-1 and SG-1 remained constant during the test and were not influenced by pumping at PW21-1;
- Water levels at MP-2 and SG-2 increased during the test due to the discharge into the pond from PW21-1; and
- The vertical gradients at both locations did not change during the test.

4.2.1 Estimate of Aquifer Parameters

As shown on Figure D6 in Appendix D, the hydrographs of most monitoring wells and the pumping well located within the bedrock aquifer plot along a similar slope on the semi-log plot. Based on the slope of this line (approximately of 2.22 m per log cycle t/r^2), the bulk transmissivity of the bedrock aquifer can be estimated using the Cooper-Jacob (1946) approximation as follows:

$$T = \left(\frac{2.303}{4\pi} \right) \times \left(\frac{Q}{\Delta S} \right)$$

Where: Q = pumping rate (m^3/day)

ΔS = slope of the observed drawdown hydrograph per log cycle

Using an average pumping rate of $763 \text{ m}^3/\text{day}$ (8.8 L/s) based on a fit to the drawdown data while PW21-1 was pumping at this rate, the average bulk transmissivity of the bedrock aquifer is interpreted to be approximately $63 \text{ m}^2/\text{day}$.

Based on the slope of the hydrographs in the composite plot, the storativity (S) of the bedrock aquifer can be estimated as follows:

$$S = 2.2459T \left(\frac{t}{r^2} \right)$$

Where T = transmissivity

t/r^2 = time/radius² value when observed drawdown = 0 m

Based on this calculation, the storativity of the bedrock aquifer is estimated to be approximately 9×10^{-3} .

4.3 Water Quality

4.3.1 General Chemistry Trends During Pumping Test

During the pumping test, water samples were collected for general chemistry analysis after 1 hour, 24 hours and 72 hours of pumping to analyze for water quality trends with extended pumping. A summary of the water quality results is included in Table E1 of Appendix E. Laboratory certificates of analysis are included in Appendix E. For the parameters tested, aluminum, iron and manganese exceeded the ODWQS in the sample collected after 1 hour of pumping and the total dissolved solids (TDS) exceeded the ODWQS in the samples collected after 24 and 72 hours of pumping. Hardness exceeded the ODWQS in all three samples.

Chloride and nitrate concentrations were either low or not detected. These parameters are indicators of potential surface contamination (road salt or agricultural operations). The low concentrations indicate a low potential for surface contamination entering the bedrock aquifer. There were also no detections of total coliforms or *Escherichia coli*, which are also indicators of potential surface contamination.

Conductivity, TDS and some inorganics (sulphate, chloride) concentrations increased with pumping duration while some metals (aluminum, copper, iron, lead, manganese, nickel, silicon, sodium, titanium, vanadium, zinc) concentrations decreased with pumping duration.

4.3.2 Ontario Drinking Water Quality Standards

A sample collected at the end of the test underwent a comprehensive analytical suite designed to assess the ODWQS parameters. A summary of the water quality results for the ODWQS is included in Table E2 of Appendix E. Laboratory certificates of analysis are included in Appendix E. With the exception of TDS and hardness, all of the concentrations of the parameters were below the ODWQS limits. TDS was measured at 550 mg/L (aesthetic objective is 500 mg/L) and hardness was measured at 380 mg/L (operational guideline is 80-100 mg/L). The Technical Support Document (MOE, 2006) indicates that total dissolved solids refers to the inorganic substances dissolved in water (principal constituents include chloride, sulphates, calcium, magnesium and bicarbonates). Elevated TDS can create highly mineralized water with excessive hardness, taste and mineral deposition. Water supplies with a hardness greater than 200 mg/L are considered poor but tolerable and hardness in excess of 500 mg/L is unacceptable for most domestic purposes.

4.3.3 Micro Particulate Analysis

The results of the microscopic particulate analysis (MPA) from PW21-1 at the end of the test are included in Appendix E. There were no detections of diatoms, algae, insect/larvae, rotifers, plant debris, nematodes, pollen, crustacea, spores, giardia or cryptosporidium in the groundwater sampled from PW21-1. For comparison, analysis of a sample from the nearby pond indicates the detection of spores (2,700 CFU/100 mL), rotifers, diatoms, blue green algae and other photosynthetic pigment bearing organisms. Based on this sample, the risk of surface water contamination is low.

5.0 WATER SUPPLY POTENTIAL

5.1 Aquifer Presence

The overburden is mainly glacial till, which is not suitable for a municipal water supply. Any coarse-grained layers within the overburden may be suitable for individual water supplies but do not appear to be laterally continuous and are not suitable for a municipal water supply. The buried bedrock valley at the Site appears to be infilled with glacial till and as such is not considered to be a viable water supply target.

The majority of private wells in the area are completed in the bedrock. It is inferred that the bedrock underlying the Site is part of a regional bedrock aquifer that should be considered the target aquifer for a large capacity water supply well. The drilling and testing at the Site has confirmed that the bedrock aquifer is suitable for a water supply well.

5.2 Water Quantity

Water quantity from a well in a bedrock aquifer is often dependant on the number and size of fractures intercepted by the well. PW21-1 has demonstrated the ability to yield 8.8 L/s for a period of 72 hours while recording drawdown within the well of 12.8 m. The available drawdown (to the top of the bedrock) is approximately 20.4 m.

At the proposed rate of 5.03 L/s, it is estimated that the drawdown in PW21-1 would decrease to approximately 7.3 m or 36% of the available drawdown after 72 hours of pumping. Extrapolation of the drawdown versus time for PW21-1 indicates that there is a suitable water supply at this location considering the proposed rate will be 5.03 L/s.

At the anticipated 5.03 L/s, the drawdown at the private wells would be minor (<1 m).

There are no anticipated impacts to surface water features from the use of PW21-1 due to the thick low-permeability overburden (glacial till).

5.3 Water Quality

Water quality testing indicates that with the exception of TDS and hardness, all of the parameters meet the ODWQS. If required, water treatment will be designed by another consultant.

5.4 GUDI Assessment

The following provide an assessment to determine the GUDI status of the well.

Under the MOE 2001 Terms of Reference, communal wells are “flagged” as potentially GUDI if a number of conditions are met. The following table summarizes the status of PW21-1 in relation to these conditions.

Table 4: GUDI Assessment Based on MOE 2001 Terms of Reference

Condition	Summary of Condition	PW21-1 Status
<i>i</i>	<i>Regularly contain Total Coliforms and/or periodically contain E. coli; or</i>	Four samples were collected during a 72-hour pumping test at PW21-1; neither total coliforms nor E. coli were detected during sampling.
<i>ii</i>	<i>are located within approximately 50 days horizontal saturated travel time from surface water or are within 100 m (overburden wells) or 500 m (bedrock wells) of surface water (whichever is greater) and meet one or more of the following criteria:</i>	On-Site ponds and Irvine Creek are located within 500 m of PW21-1 (Figure 1).

Condition	Summary of Condition	PW21-1 Status
ii a)	<i>Wells may be drawing water from an unconfined aquifer;</i>	The regional hydrogeologic system consists of a bedrock aquifer overlain by a silt till aquitard. PW21-1 draws water from the bedrock aquifer. In the vicinity of the PW21-1, the bedrock aquifer is encountered at a depth of approximately 30 m. PW21-1 does not draw water from an unconfined aquifer.
ii b)	<i>Wells may be drawing water from formations within approximately 15 m of surface;</i>	The well casing of PW21-1 extends to a depth of 32.9 m below ground surface. Water from this well is therefore drawn from formations deeper than 15 m of surface.
ii c)	<i>Wells are part of an enhanced recharge/infiltration project;</i>	No recharge/infiltration project exists at the site.
ii d)	<i>When the well is pumped, water levels in surface water rapidly change or hydraulic gradients beside the surface water significantly increase in a downward direction;</i>	Gradients beside surface water did not change during the pumping test at PW21-1.
ii e)	<i>Chemical water quality parameters (such as temperature, conductivity, turbidity, total dissolved solids, pH, colour, oxygen) are more consistent with nearby surface water than local groundwater and/or if they fluctuate significantly and rapidly in response to climatological or surface water conditions.</i>	The samples analyzed for water quality during the 72-hour pumping test at PW21-1 are consistent with groundwater from a bedrock aquifer.

In summary, based on the above conditions, PW21-1 should not be “flagged” as potentially GUDI under the MOE 2001 Terms of Reference.

Under the Draft Terms of Reference for Determination of Minimum Treatment for Municipal Residential Drinking Water Systems Using Subsurface Raw Water Supplies (MOE, 2019) the need for disinfection of protozoan pathogens is based on the presence of *Giardia*, *Cryptosporidium* and fecal contamination. There were no detections of *Giardia*, *Cryptosporidium*, *E. coli* or total coliforms in samples collected during the pumping test.

5.5 Source Water Protection

Under the Clean Water Act (2006) WHPAs were developed and included in the Assessment Reports to identify the time-of-travel capture zones for municipal water supplies. These WHPAs form part of the Source Protection Plans that are used to protect sources of municipal drinking water. The Site is within the Grand River Source Protection Area within the Lake Erie Source Protection Region (LESPR). To support the development of these plans, the horizontal movement of groundwater to the municipal wells is categorized into groundwater time-of-travel zones delineated around each well or group of wells including WHPA-A (100 m radius), WHPA-B (2 year time-of-travel), WHPA-C (5 year time-of-travel) and WHPA-D (25 year time-of-travel).

The WHPA for the Fergus municipal wells (Lake Erie Region Source Protection Committee, 2021a) extends through the Site as shown on Figure 9. PW21-1 lies within WHPA-D (25-year time-of-travel) of the capture zone.

In addition to the delineation of the WHPAs, the vulnerability of municipal wells and intakes to contamination from surrounding land-use activities is also assessed. This is assessed using the intrinsic vulnerability, which is based on an evaluation of the geologic and hydrogeological characteristics of the sediments overlying the aquifer of interest. The intrinsic vulnerability is ranked as high, medium or low, with low providing the most protection to an aquifer. PW21-1 lies within a low vulnerability zone (see Figure 9). There is some medium vulnerability by Lake Belwood, which is due to the higher permeable sediments at surface and thinning of the overburden toward Lake Belwood.

The WHPAs are combined with the intrinsic vulnerability to determine a WHPA vulnerability, which is the basis for the threat analysis. WHPA vulnerability ranges from 2 to 10 with 10 being the most vulnerable. Where the WHPAs are present at the Site, the WHPA vulnerability is 2 with the exception of the small portion by Lake Belwood where the WHPA vulnerability is 4 (i.e., the area where the intrinsic vulnerability is shown as medium on Figure 9). Significant groundwater recharge areas (SGRA) are also evaluated and, in the area of the Site, the vulnerability is 2 (for the SE Site and part of the NW Site). Based on the Source Protection Plan (Lake Erie Region Source Protection Committee, 2021b) there are no significant threats identified at the Site.

The Site does not fall within an Issue Contributing Area and therefore there are no threats related to specific issues.

To protect sources of municipal drinking water with respect to water quantity, draft Wellhead Protection Area Quantity zones (WHPA-Q) were delineated by Matrix Solutions for the Lake Erie Source Protection Region (Grand River Conservation Authority, 2021b) for Elora and Fergus. The WHPA-Q zone is included on the GRCA Grand River Information Network (GRIN) mapping but is considered draft. The WHPA-Q in the area of the Site is shown on Figure 9 and extends through a small portion of the western edge of the NW Site and the SE Site. PW21-1 is located outside of the WHPA-Q zone.

6.0 CONCLUSIONS AND RECOMMENDATIONS

The hydrogeological assessment provided herein concludes that a water supply is considered to be feasible at the Site. The following conclusions are provided:

- The bedrock aquifer is the primary target for water supply development;
- PW21-1 was constructed in the bedrock aquifer for testing as potential water supply;
- PW21-1 had a tested yield of 8.8 L/s and can meet the maximum day demand of 5.03 L/s;
- Groundwater quality at PW21-1 met the ODWQS with the exceptions of hardness and TDS; and
- PW21-1 is not considered a GUDI well.

The following recommendation is provided.

- A second well should be constructed to provide a back-up water supply. The back-up water supply should be situated at least 100 m away from agricultural land and dispersal beds, and approximately 200 m away from private water supplies. One such location is shown on Figure 9 northeast of PW21-1.

7.0 REPORT LIMITATIONS

7.1 General Limitations

This hydrogeological assessment was prepared for 883890 Ontario Limited c/o Fergus Development Inc., and their agents to confirm a water supply feasibility for the proposed redevelopment at the existing Fergus Golf Club. The factual information, descriptions, interpretations, comments, recommendations and electronic files contained herein are specific to the project described in this report and do not apply to any other project or site. This report is based on borehole drilling, pumping tests and water quality analyses collected during this investigation. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the sole responsibilities of such third parties. Under no circumstances may this information be used for any other purposes than those specified in the scope of work unless explicitly stipulated in the text of this report or formally authorized by Golder. This report must be read in its entirety as some sections could be falsely interpreted when taken individually or out-of-context. As well, the final version of this report and its content supersedes any other text, opinion or preliminary version produced by Golder.

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8.0 CLOSURE

We trust this report meets your current requirements. Should you have any questions please do not hesitate to contact the undersigned.

9.0 REFERENCES

- Brunton, F.R., 2009. Update of Revisions to the Early Silurian Stratigraphy of the Niagara Escarpment: Integration of Sequence Stratigraphy, Sedimentology and Hydrogeology to Delineate Hydrogeologic Units. In Summary of Field Work and Other Activities 2009, Ontario Geological Survey, Open File Report 6240, p.25-1 to 25-20.
- Brunton, F.R., 2008. Preliminary Revisions to the Early Silurian Stratigraphy of Niagara Escarpment: Integration of Sequence Stratigraphy, Sedimentology and Hydrogeology to Delineate Hydrogeologic Units. In Summary of Field Work and Other Activities 2008, Ontario Geological Survey, Open File Report 6226, p. 31-1 to 31-18.
- Chapman, L.J. and Putnam, D.F., 1984. The Physiography of Southern Ontario; Ontario Geological Survey, Special Volume 2, 270 p. Accompanied by Map P.2715 (coloured), scale 1:600,000.
- Franklin Geotechnical Ltd., 1990. Hydrogeological Investigation Report on Fairview Golf Club. Prepared for R.J. Burnside and Associated Limited.
- Grand River Conservation Authority, 2021a. Terrain Contours obtained from Grand River Information Network.
- Grand River Conservation Authority, 2021b. Wellhead Water Quantity Zone obtained from Grand River Information Network.
- Lake Erie Region Source Protection Committee, 2021a. Grand River Source Protection Area Approved Assessment Report. Updated February 2, 2021.
- Lake Erie Region Source Protection Committee, 2021b. Grand River Source Protection Area Approved Source Protection Plan. Updated February 2, 2021.
- Ministry of the Environment, 2006. Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines.
- Ministry of the Environment, 2019. Draft Terms of Reference for Determination of Minimum Treatment for Municipal Residential Drinking Water Systems Using Subsurface Raw Water Supplies.
- Ministry of the Environment, 2001. Terms of Reference Hydrogeological Study to Examine Groundwater Sources Potentially Under Direct Influence of Surface Water.
- Morrison Environmental Limited, 1999. Well Testing Program at the Proposed 18 Hole Golf Course Expansion. Prepared for Fairview Golf and Country Club.
- R.J. Burnside & Associates Limited, 2022. Functional Servicing Report – Fergus Golf Course.
- R.J. Burnside & Associates Limited, 2011. Hydrogeological Report in Support of Permit to Take Water Application. Prepared for Fergus Golf Club.
- R.J. Burnside & Associates Limited, 2000. Long Term Test of PW1 Fairview Golf Course Expansion. Submitted to Township of Centre Wellington.
- The Municipal Infrastructure Group Ltd., 2022. Fergus Golf Club Redevelopment – Water Servicing Study.

Signature Page

Yours truly,

Golder Associates Ltd.



Greg Padusenko, M.Sc., P.Eng., P.Geo.
Sr. Hydrogeologist



John Piersol, M.Sc., P.Geo.
Associate, Sr. Hydrogeologist

GRP/JAP/sv/II

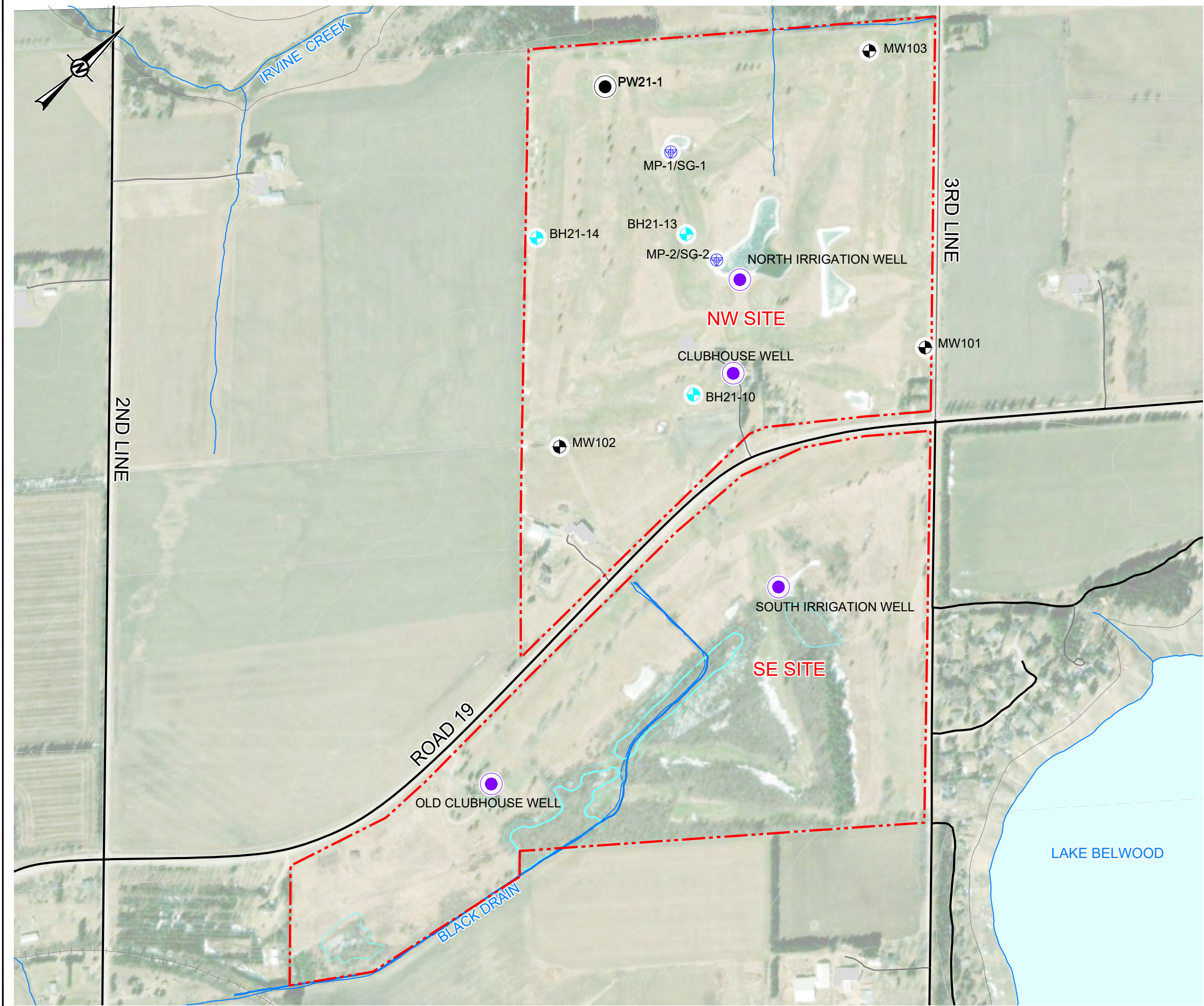
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[https://golderassociates.sharepoint.com/sites/142682/project files/6 deliverables/water supply/03 water supply investigation/final/superseded/21456909 \(2300\) rep 2021'12'16 water supply investigation - fergus golf club \(rev0\).docx](https://golderassociates.sharepoint.com/sites/142682/project%20files/6%20deliverables/water%20supply/03%20water%20supply%20investigation/final/superseded/21456909%20(2300)%20rep%202021'12'16%20water%20supply%20investigation%20-%20fergus%20golf%20club%20(rev0).docx)

FIGURES

- Figure 1 – Site Location Plan
- Figure 2 – Monitoring Locations
- Figure 3 – Physiography and Drainage
- Figure 4 – Quaternary Geology
- Figure 5 – Ministry Recorded Wells
- Figure 6 – Area Section A-A'
- Figure 7 – Area Section B-B'
- Figure 8 – Area Section C-C'
- Figure 9 – Wellhead Protection Areas

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REGIONAL KEY PLAN 1:100,000

PLAN LEGEND

- PROPERTY BOUNDARY
- EXISTING PRODUCTION WELL
- BEDROCK TEST WELL
- BEDROCK MONITORING WELL
- OVERBURDEN MONITORING WELL
- MINI-PIEZOMETER / STAFF GAUGE

REFERENCES & DISCLAIMERS

BASE IMAGERY - SOURCE: ESRI, MAXAR, GEOEYE; GIS USER COMMUNITY.

ALIGNMENT OF ORTHOGRAPHIC IMAGERY IS APPROXIMATED TO SELECT FEATURES ON DATUM. AWAY FROM POINTS OF ALIGNMENT THE ORTHOGRAPHIC IMAGE MAY BE DIMENSIONALLY SKEWED OR PROJECTED OFF THE MAP DATUM PLANE.

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PLOTTED 11X17" TABLOID

PROJECTION IS UTM NAD 83 ZONE 17

CLIENT

883890 ONTARIO LIMITED
C/O FERGUS DEVELOPMENT INC.

PROJECT

FERGUS GOLF CLUB
WATER SUPPLY INVESTIGATION

TITLE

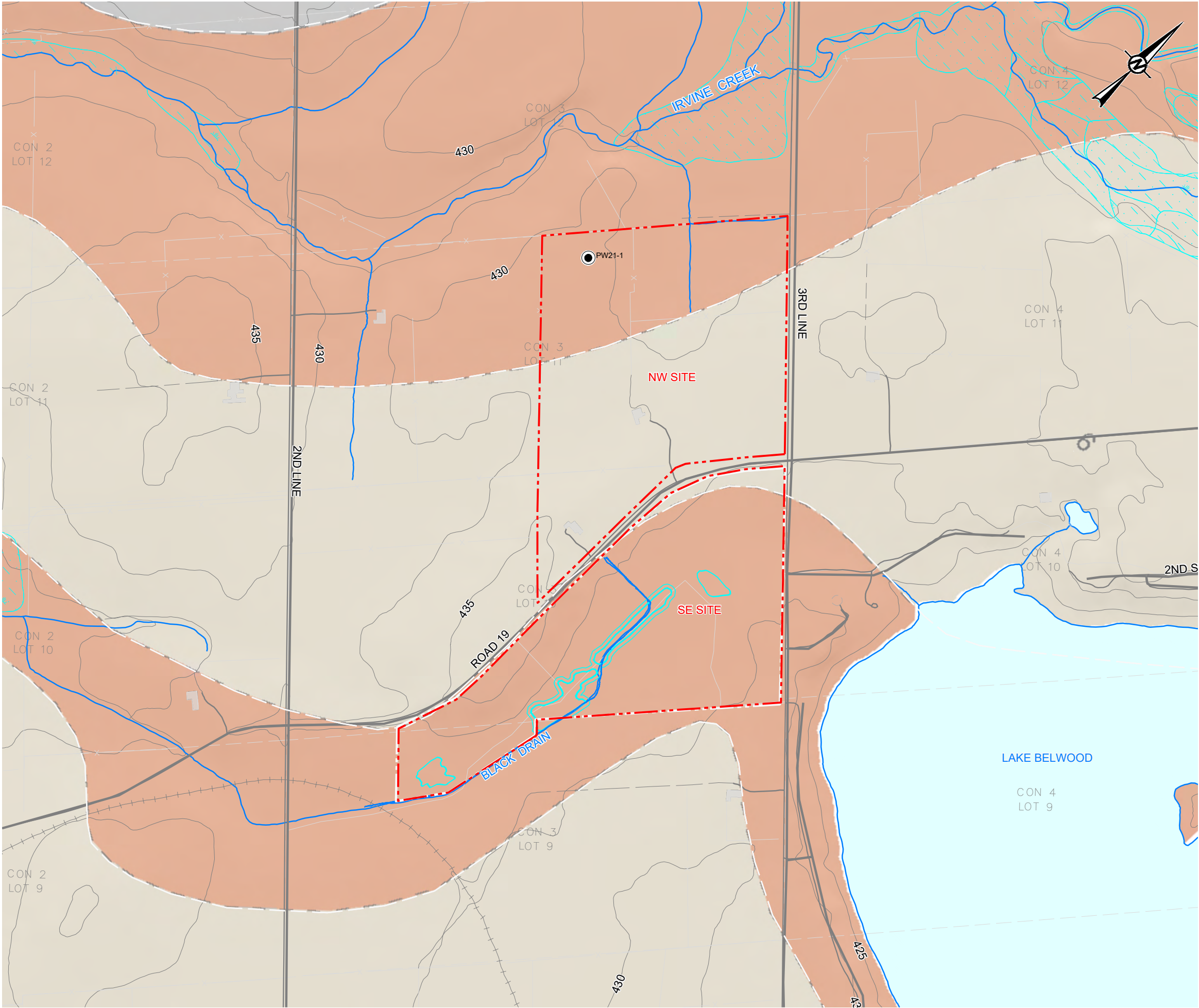
MONITORING LOCATIONS

CONSULTANT	YYYY-MM-DD	2022-01-13
DESIGNED		
PREPARED	JPR	
REVIEWED	GP	
APPROVED	JAP	

PROJECT NO.	CONTROL	REV.	FIGURE
21456909	0010	----	2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM A4S/B 25 mm

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- SPILLWAY
- DRUMLINIZED TILL PLAIN
- WETLAND
- MNR MAPPED WETLAND

PLAN LEGEND

- PROPERTY BOUNDARY
- BEDROCK TEST WELL

REFERENCES & DISCLAIMERS

QUATERNARY MAPPING ONTARIO GEOLOGICAL SURVEY, QUEEN'S PRINTER 2006

ALIGNMENT OF ORTHOGRAPHIC IMAGERY IS APPROXIMATED TO SELECT FEATURES ON DATUM. AWAY FROM POINTS OF ALIGNMENT THE ORTHOGRAPHIC IMAGE MAY BE DIMENSIONALLY SKEWED OR PROJECTED OFF THE MAP DATUM PLANE.



1:10000
PLOTTED 11X17" TABLOID
PROJECTION IS UTM NAD 83 ZONE 17

CLIENT
883890 ONTARIO LIMITED
C/O FERGUS DEVELOPMENT INC.

PROJECT
FERGUS GOLF CLUB
WATER SUPPLY INVESTIGATION

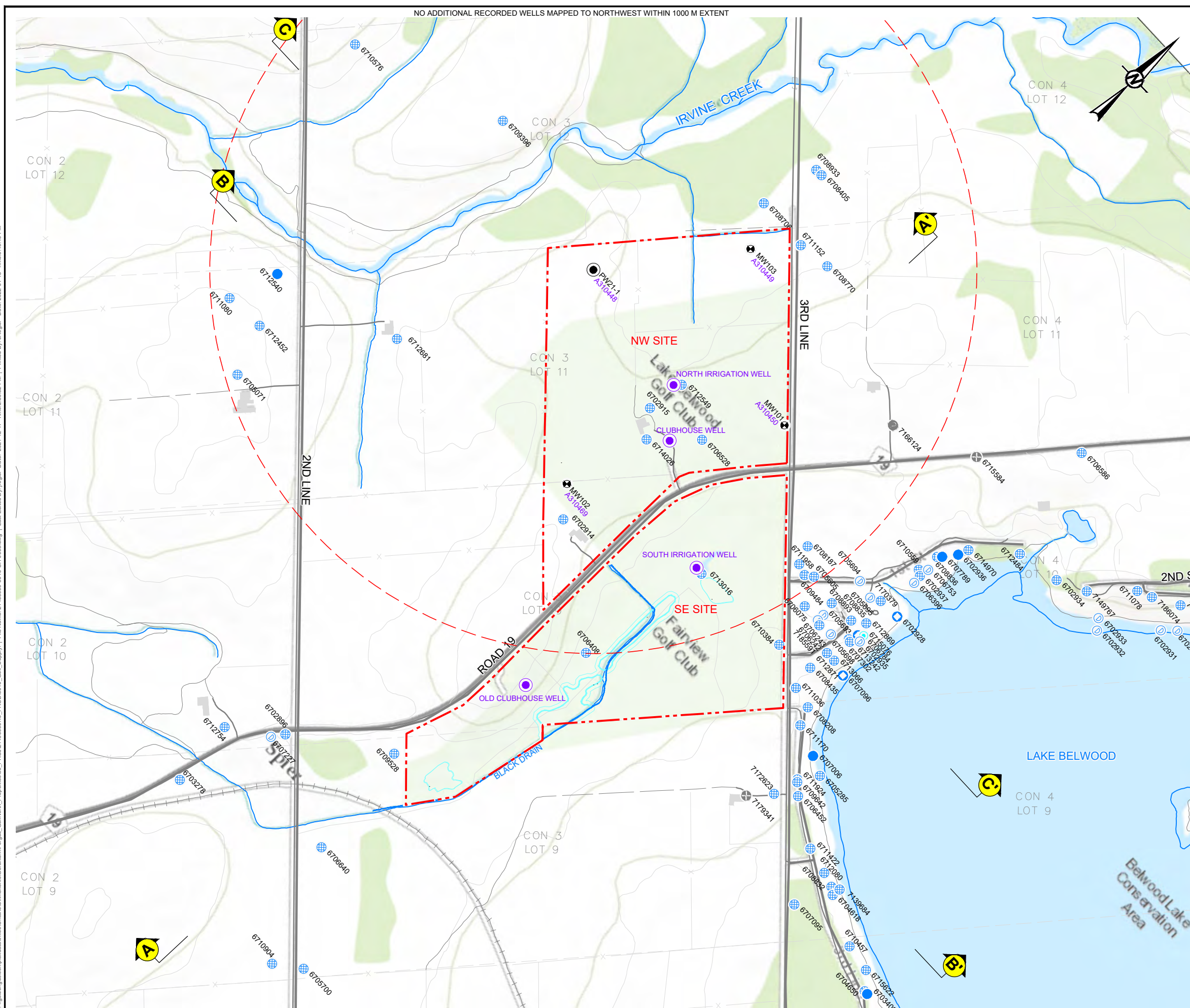
TITLE
PHYSIOGRAPHY AND DRAINAGE

CONSULTANT	YYYY-MM-DD	2022-01-13
	DESIGNED	
	PREPARED	JPR
	REVIEWED	GP
	APPROVED	JAP

PROJECT NO. 21456909	CONTROL 0010	REV. ----	FIGURE 3
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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM A3S/B



PLAN LEGEND

-
-  PROPERTY BOUNDARY
 EXISTING PRODUCTION WELL
 BEDROCK TEST WELL WITH 1000 M OFFSET
 BEDROCK MONITORING WELL
 WETLAND
 MNR MAPPED WETLAND
 LINE OF SECTION

RECORDED MINISTRY WATER WELL WITH RECORD ID / TAG NUMBER

- | | |
|---|----------------------------|
|  | SHALLOW DUG OR BORED <10 M |
|  | DEEP BORED WELL >10 M |
|  | DRILLED OVERBURDEN WELL |
|  | TEST OR OBSERVATION WELL |
|  | DRILLED BEDROCK WELL |
|  | RECORD OF ABANDONMENT |
|  | INFORMATION UNRECORDED |
|  | TEMPORARY DEWATERING WELL |

REFERENCES & DISCLAIMERS

MINISTRY OF ENVIRONMENT WATER WELL INFORMATION SYSTEM, QUEEN'S PRINTER.
LOCATION AND ELEVATIONS OF MAPPED WELLS ARE SUBJECT TO REVISION BASED ON DRILL
RECORD OR FIELD VERIFICATION.

ALIGNMENT OF ORTHOGRAPHIC IMAGERY IS APPROXIMATED TO SELECT FEATURES ON DATUM. AWAY FROM POINTS OF ALIGNMENT THE ORTHOGRAPHIC IMAGE MAY BE DIMENSIONALLY SKEWED OR PROJECTED OFF THE MAP DATUM PLANE.



1:10000

PLOTTED 11X17" TABLOID

PROJECTION IS UTM NAD 83 ZONE 17

CLIENT

883890 ONTARIO LIMITED
C/O FERGUS DEVELOPMENT INC.

PROJECT

FERGUS GOLF CLUB
WATER SUPPLY INVESTIGATION

TITLE

MINISTRY RECORDED WELLS

CONSULTANT

YYYY-MM-DD 2022-01-13

DESIGNED

PREPARED	JPR
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REVIEWED	GP
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APPROVED JAP

PROJECT NO.
21456909

CONTROL
0010

REV.

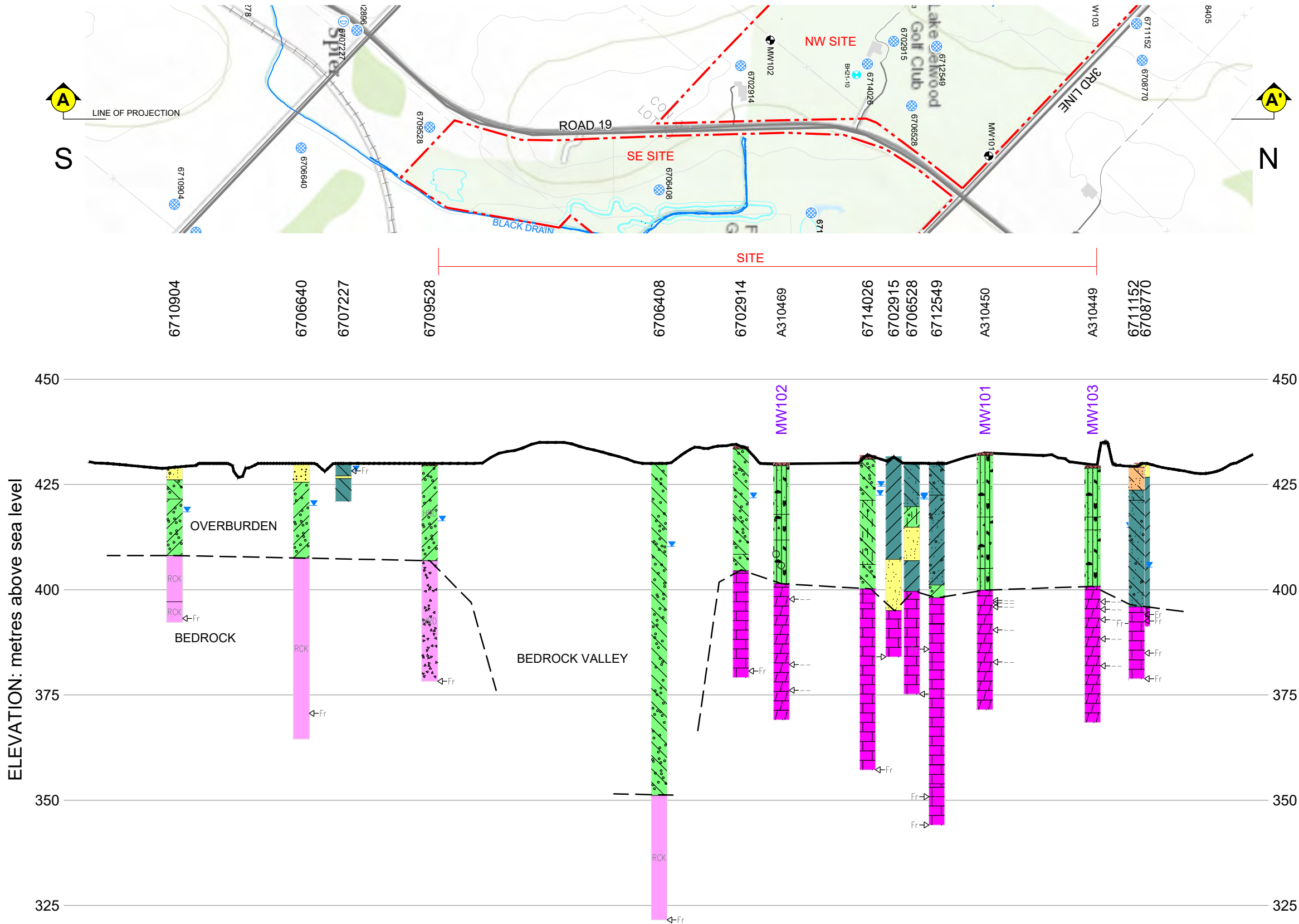
FIGURE

5

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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B 5 mm

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PLAN LEGEND

- SHALLOW DUG OR BORED <10 M
- DEEP BORED WELL >10 M
- DRILLED OVERBURDEN WELL
- TEST OR OBSERVATION WELL
- DRILLED BEDROCK WELL
- BEDROCK TEST WELL
- EXISTING PRODUCTION WELL
- BEDROCK 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
LIMESTONE	LIMESTONES
SHALE	SHALES
	UNDIFFERENTIATED

WELL SYMBOLS

- MOE RECORDED PRIVATE WELL
- RECORDED STATIC WATER LEVEL
- WATER PRODUCING ZONE
- SCREEN

NOTES

MINISTRY OF ENVIRONMENT WATER WELL INFORMATION SYSTEM, 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 EVIDENCE.

0 200 400 600 m

1:10000

CLIENT
883890 ONTARIO LIMITED
C/O FERGUS DEVELOPMENT INC.

PROJECT
FERGUS GOLF CLUB
325 WATER SUPPLY INVESTIGATION

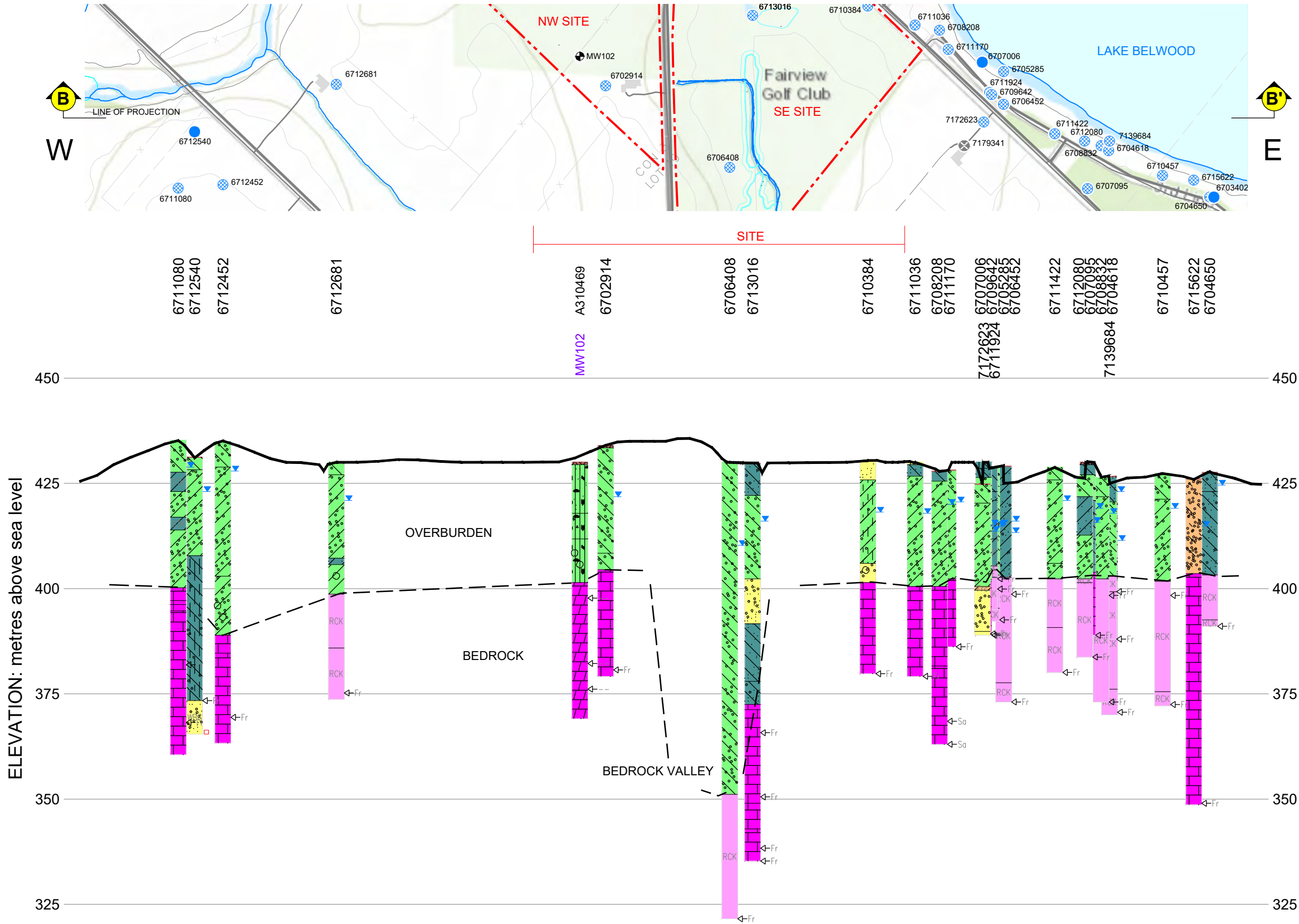
TITLE
AREA SECTION A - A'

CONSULTANT	YYYY-MM-DD	2022-01-13
DESIGNED		
PREPARED	JPR	
REVIEWED	GP	
APPROVED	JAP	

PROJECT NO.	CONTROL	REV.	FIGURE
21456909	0010	----	6

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM A3/B

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PLAN LEGEND

- SHALLOW DUG OR BORED <10 M
- DEEP BORED WELL >10 M
- DRILLED OVERBURDEN WELL
- TEST OR OBSERVATION WELL
- DRILLED BEDROCK WELL
- BEDROCK TEST WELL
- EXISTING PRODUCTION WELL
- BEDROCK 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
LIMESTONE	LIMESTONES
SHALE	SHALES
	UNDIFFERENTIATED

WELL SYMBOLS

- MOE RECORDED PRIVATE WELL
- RECORDED STATIC WATER LEVEL
- WATER PRODUCING ZONE
- SCREEN

NOTES

MINISTRY OF ENVIRONMENT WATER WELL INFORMATION SYSTEM, 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 EVIDENCE.

0 200 400 600 m

1:10000

CLIENT
883890 ONTARIO LIMITED
C/O FERGUS DEVELOPMENT INC.

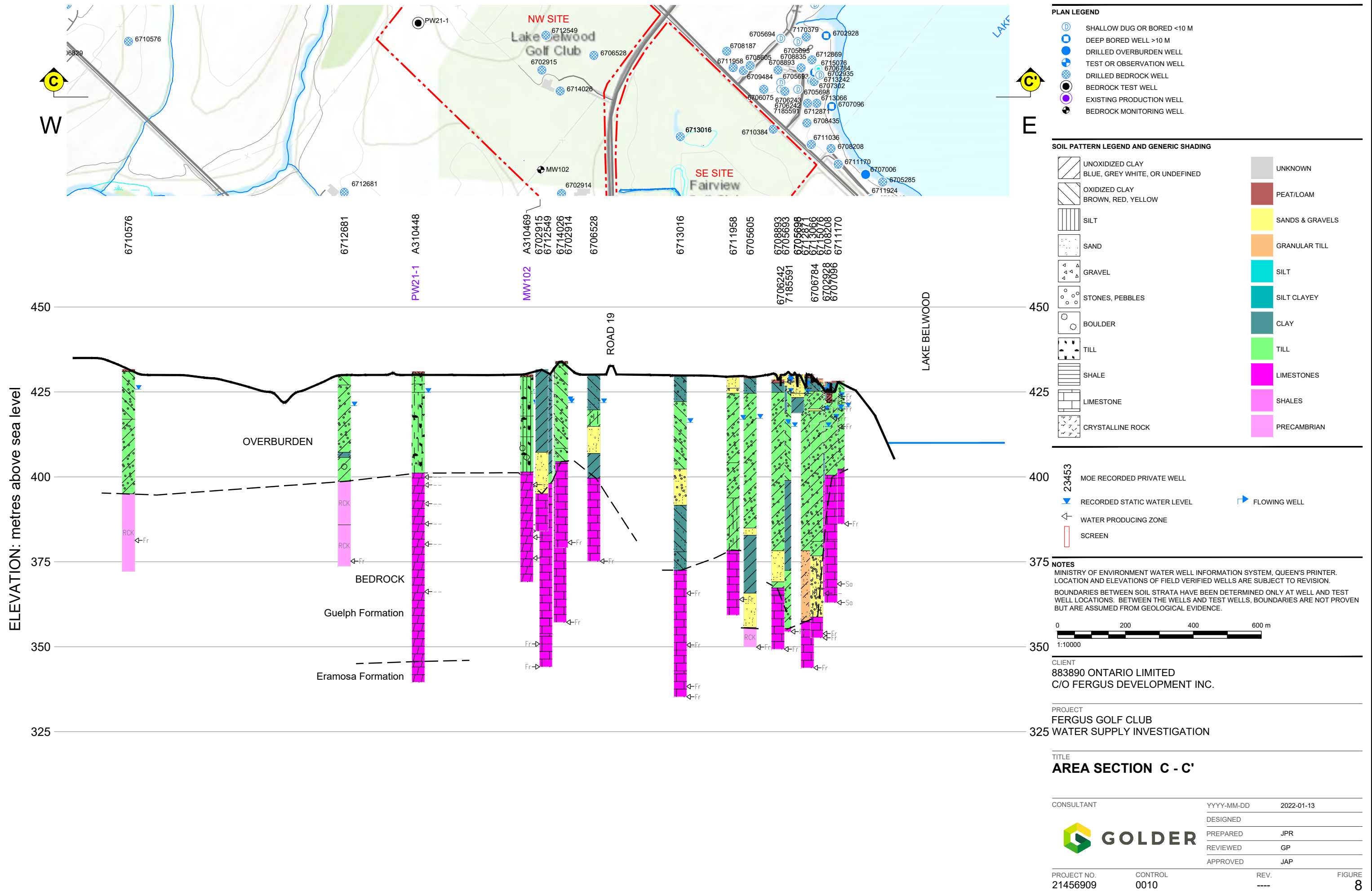
PROJECT
FERGUS GOLF CLUB
325 WATER SUPPLY INVESTIGATION

TITLE
AREA SECTION B - B

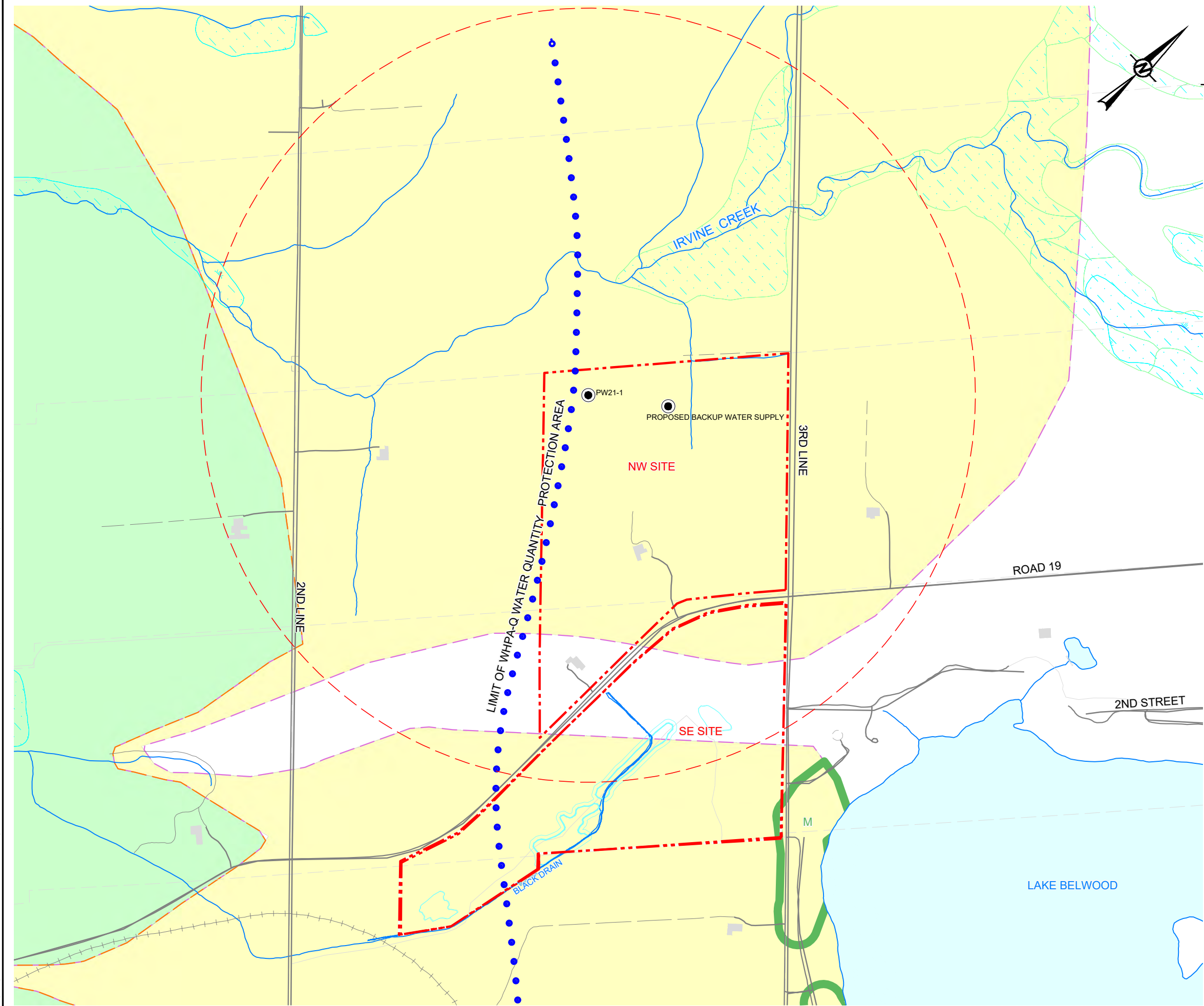
CONSULTANT	YYYY-MM-DD	2022-01-13
DESIGNED		
PREPARED	JPR	
REVIEWED	GP	
APPROVED	JAP	

PROJECT NO.	CONTROL	REV.	FIGURE
21456909	0010	----	7

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM A4 (ANSI B) TO A3 (ANSI B)



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REGIONAL PLAN 1:100,000

PLAN LEGEND

- PROPERTY BOUNDARY WITH 500 m OFFSET
- APPROXIMATE ZONE OF INFLUENCE (PUMPING AT 8.8 l/s)
- WELLHEAD PROTECTION AREA A / MUNICIPAL WELL SITE
- WELLHEAD PROTECTION AREA B
- WELLHEAD PROTECTION AREA C
- WELLHEAD PROTECTION AREA D
- WATER QUANTITY PROECTION LIMIT
- AREA OF MEDIUM AQUIFER INTRINSIC VULNERABILITY (GRCA)

REFERENCES & DISCLAIMERS

WELLHEAD PROTECTION AREAS, GRAND VALLEY CONSERVATION AUTHORITY (GRCA); 2009

AQUIFER INTRINSIC SUSCEPTIBILITY, GRCA. AREAS OUTSIDE MAPPED MEDIUM VULNERABILITY LOCAL TO THE SITE PLAN AREA EXTENT ARE MAPPED LOW ISI OTHERWISE.

MAPPED FEATURES ARE APPROXIMATE AND NOT TO SCALE.

0 200 400 600 m

1:10000

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PROJECTION IS UTM NAD 83 ZONE 17

CLIENT

883890 ONTARIO LIMITED
C/O FERGUS DEVELOPMENT INC.

PROJECT

FERGUS GOLF CLUB
WATER SUPPLY INVESTIGATION

TITLE

WELLHEAD PROTECTION AREAS

CONSULTANT	YYYY-MM-DD	2022-01-13
DESIGNED		
PREPARED	JPR	
REVIEWED	GP	
APPROVED	JAP	

PROJECT NO.	CONTROL	REV.	FIGURE
21456909	0010	----	9

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

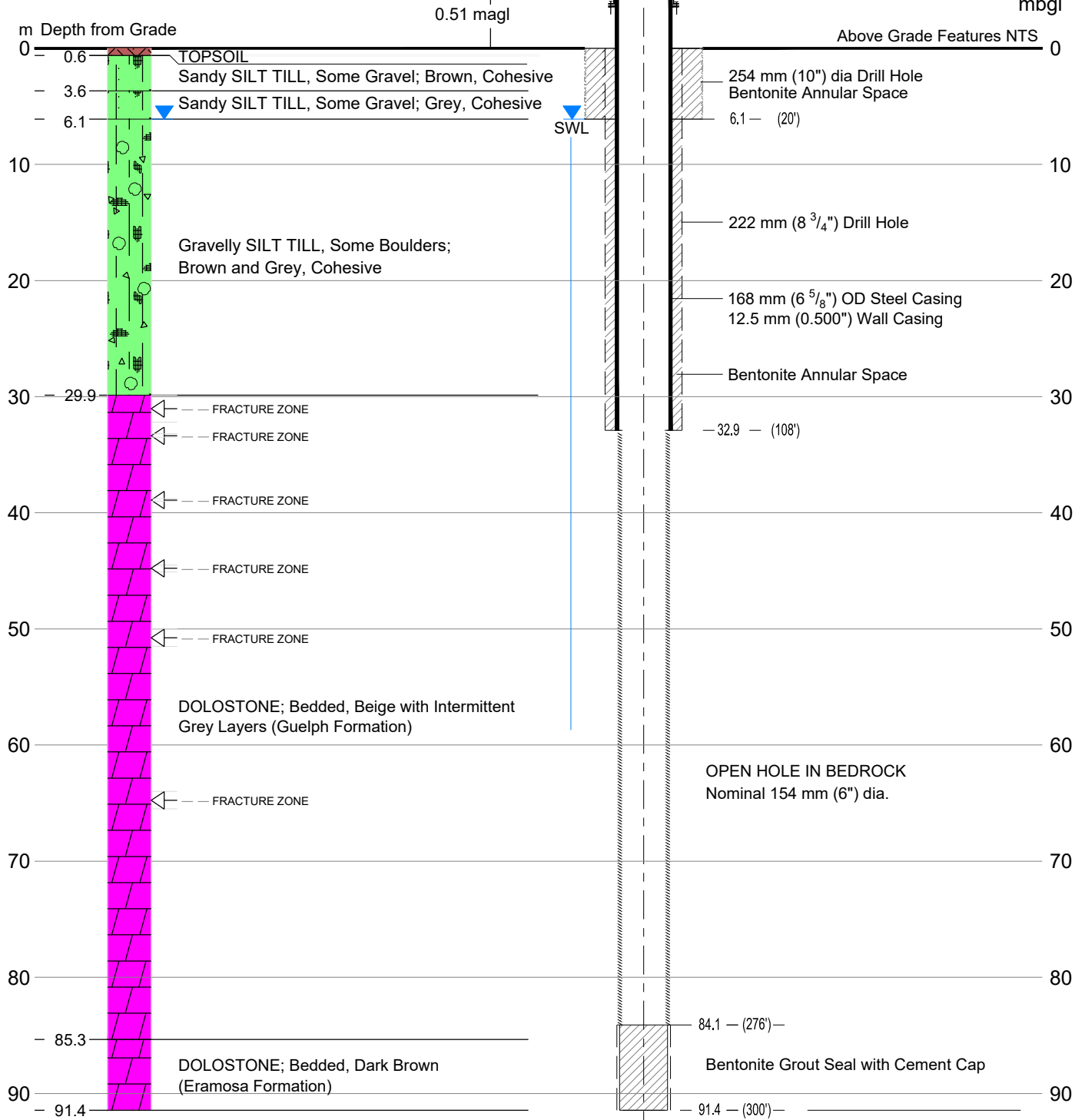
APPENDIX A

As-Built Drawings

Drill Hole
TAG A310448
PW21-1

Well Design

Depth
mbgl



***Note:**

Converted depths to feet nominal 1 foot integrals
Drilled by Well Initiatives Limited
Constructed 6th-12th May 2021
Constructed by Rotary Drill Methods

CLIENT
883890 ONTARIO LIMITED
C/O FERGUS DEVELOPMENT INC.

PROJECT
FERGUS GOLF CLUB
WATER SUPPLY INVESTIGATION

CONSULTANT

YYYY-MM-DD 2022-01-13

DESIGNED

PREPARED JPR

REVIEWED GP

APPROVED JAP

TITLE

PW21-1 AS-BUILT

PROJECT NO.
21456909

CONTROL
0010

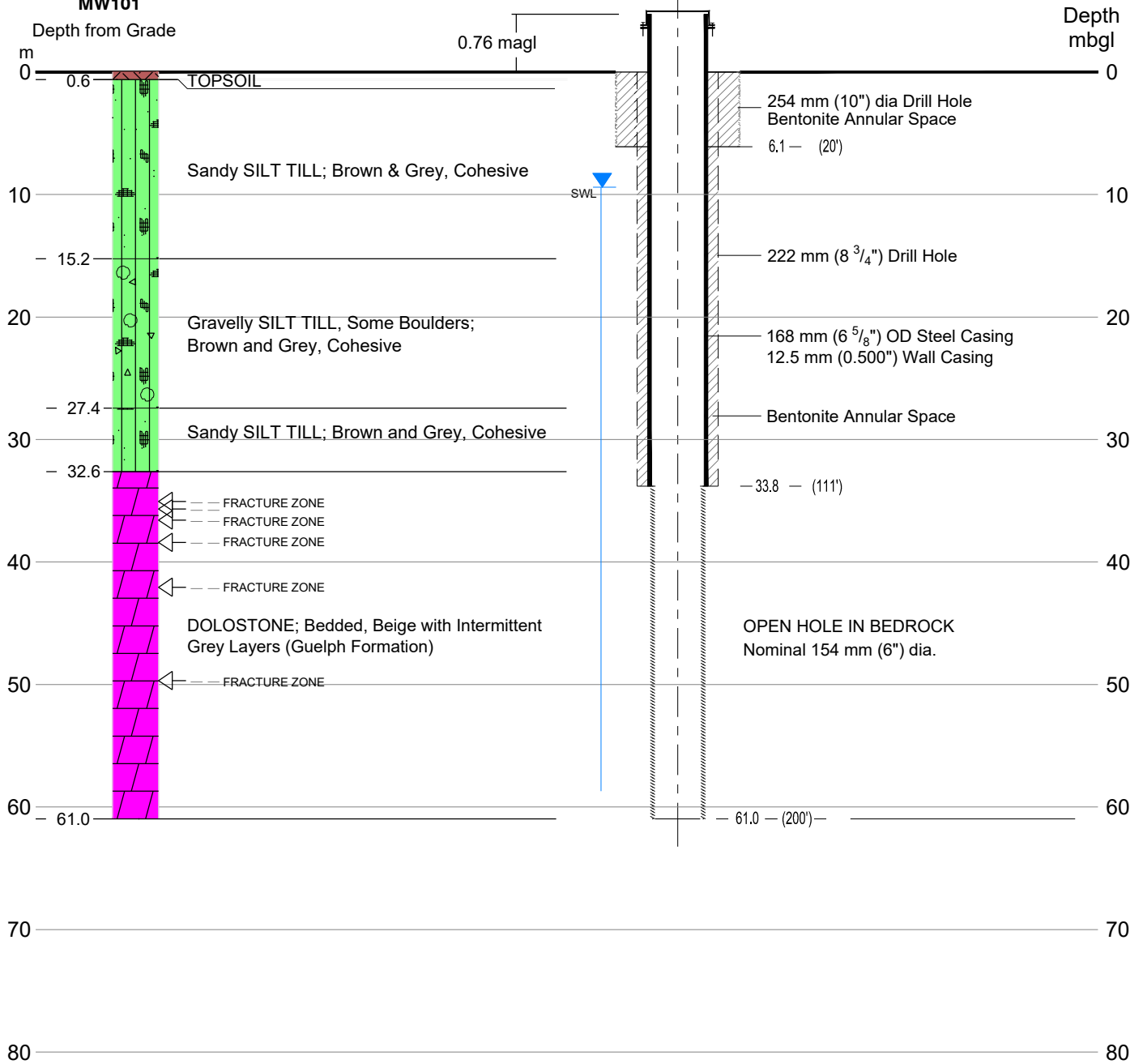
REV.

FIGURE
A1



Drill Hole TAG A310450 MW101

Well Design



*Note:

Converted depths to feet nominal 1 foot integrals
Drilled by Well Initiatives Limited
Constructed 17th-18th May 2021
Constructed by Rotary Drill Methods

CLIENT
883890 ONTARIO LIMITED
C/O FERGUS DEVELOPMENT INC.

PROJECT
FERGUS GOLF CLUB
WATER SUPPLY INVESTIGATION

CONSULTANT

YYYY-MM-DD 2022-01-13

DESIGNED

PREPARED JPR

REVIEWED GP

APPROVED JAP



TITLE

MW101 AS-BUILT

PROJECT NO.
21456909

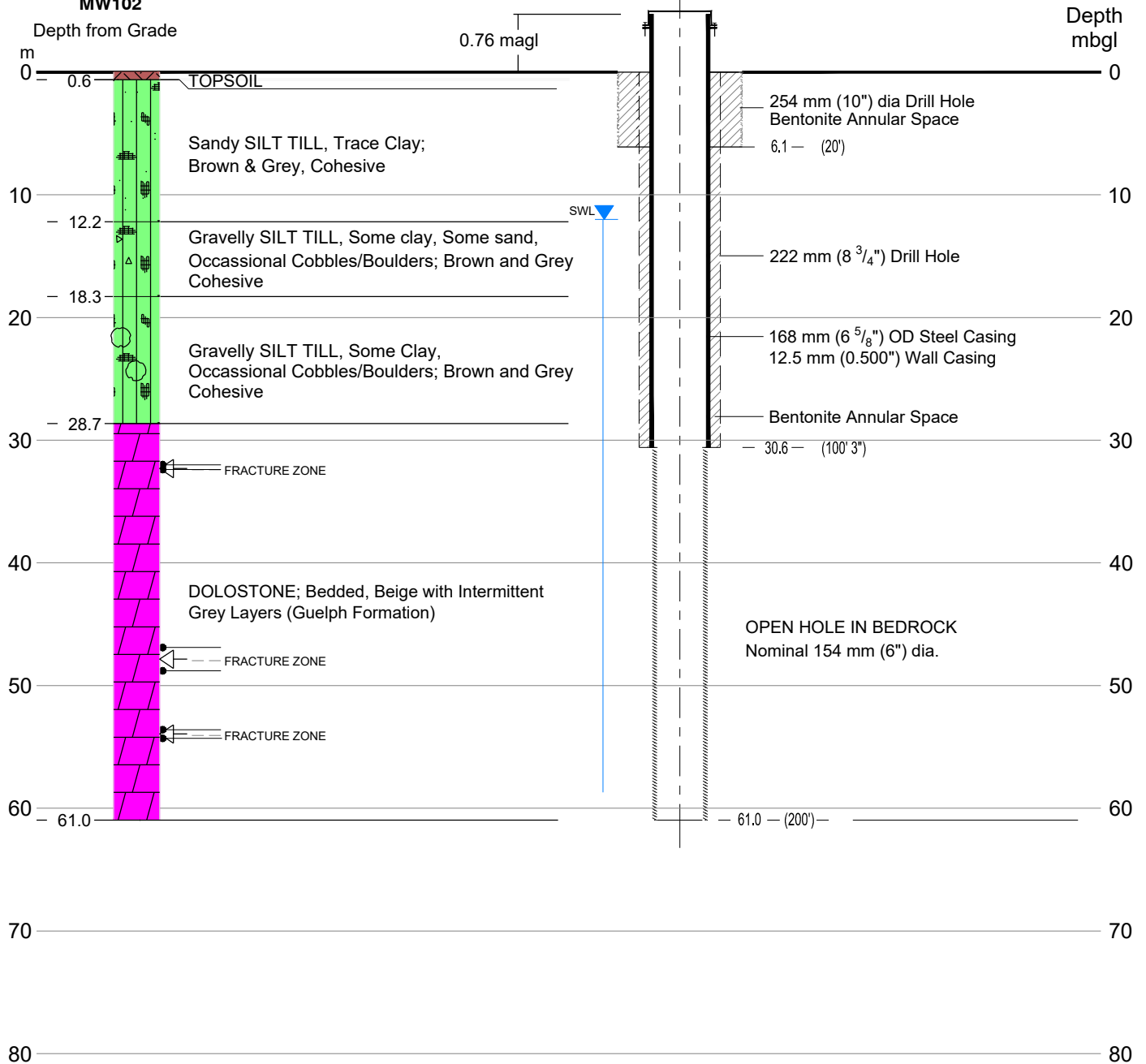
CONTROL
0010

REV.

FIGURE
A2

Drill Hole TAG A310469 MW102

Well Design



*Note:

Converted depths to feet nominal 1 foot integrals
Drilled by Well Initiatives Limited
Constructed 25th-26th May 2021
Constructed by Rotary Drill Methods

CLIENT
883890 ONTARIO LIMITED
C/O FERGUS DEVELOPMENT INC.

PROJECT
FERGUS GOLF CLUB
WATER SUPPLY INVESTIGATION

CONSULTANT

YYYY-MM-DD 2022-01-13

DESIGNED

PREPARED JPR

REVIEWED GP

APPROVED JAP



TITLE

MW102 AS-BUILT

PROJECT NO.
21456909

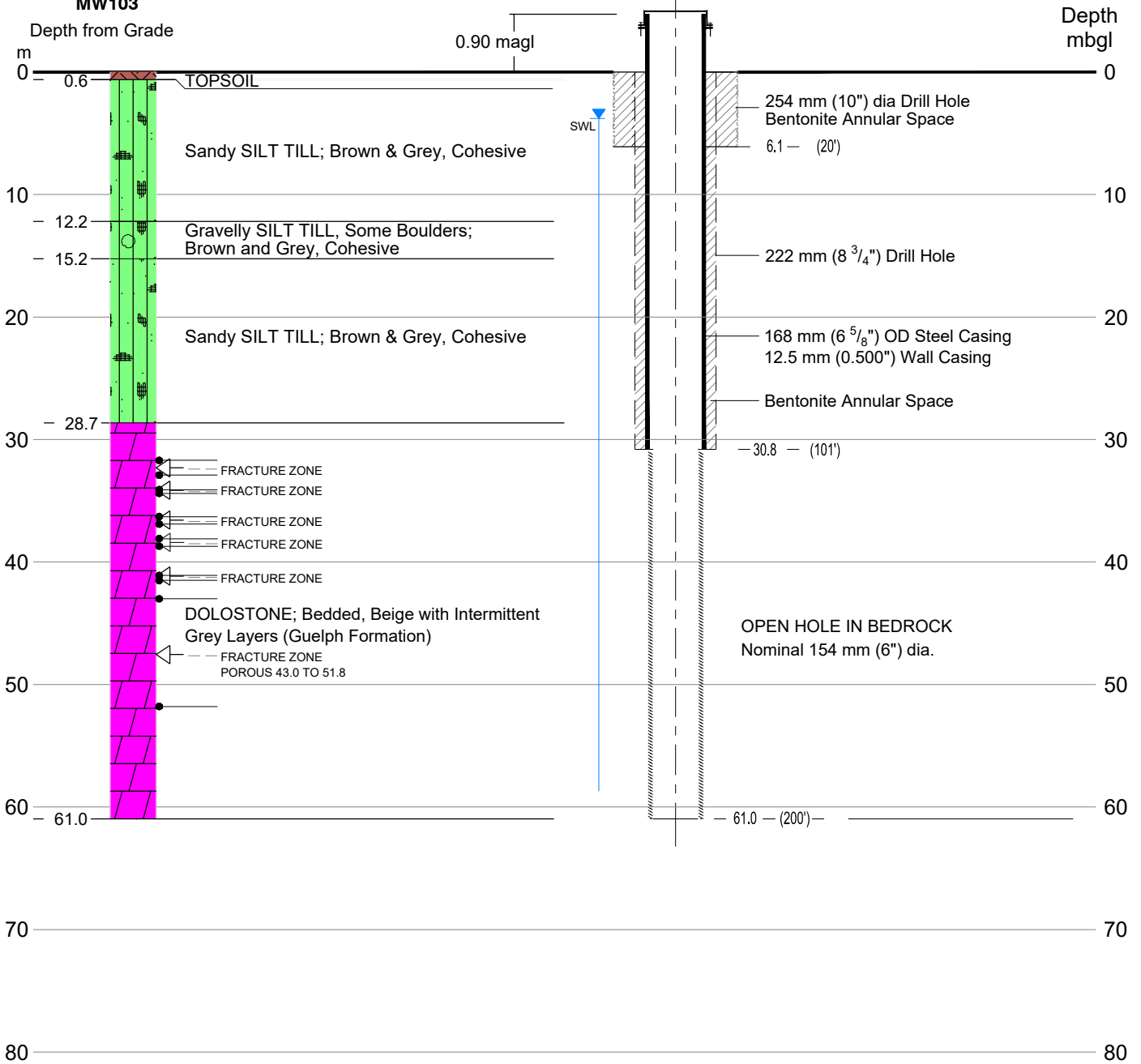
CONTROL
0010

REV.

FIGURE
A3

Drill Hole TAG A310449 MW103

Well Design



*Note:

Converted depths to feet nominal 1 foot integrals
Drilled by Well Initiatives Limited
Constructed 12th - 15th May 2021
Constructed by Rotary Drill Methods

CLIENT
883890 ONTARIO LIMITED
C/O FERGUS DEVELOPMENT INC.

PROJECT
FERGUS GOLF CLUB
WATER SUPPLY INVESTIGATION

CONSULTANT

YYYY-MM-DD 2022-01-13

DESIGNED

PREPARED JPR

REVIEWED GP

APPROVED JAP



TITLE

MW103 AS-BUILT

PROJECT NO.
21456909

CONTROL
0010

REV.

FIGURE
A4

APPENDIX B

Water Well Records

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR FND mbgl Qu	ICR TOP LEN mbgl m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
6702914	3 10	Dec-67	551217 4844015	433.7	53.3 Fr		12.2	45	90	18.3	2406 CT	WS ST	MOE# 6702914 0.0 TPSSL 0.6 BRWN CLAY STNS 25.6 BRWN CLAY GRVL 29.6 BRWN LMSN 54.9
6702915	3 11	Dec-51	551159 4844378	429.8	47.5 Fr		7.0	45	30	9.1	2521 CT	WS ST	MOE# 6702915 0.0 CLAY 24.4 MSND 36.6 LMSN 47.5
6702916	3 13	Apr-64	549770 4844615	431.6	53.0 Fr		11.6	36	240	18.3	1659 CT	WS DO	MOE# 6702916 0.0 CLAY MSND 6.1 CLAY STNS 39.6 GREY LMSN 53.3
6705071	2 11	Oct-74	550362 4843651	434.3	65.5 Fr		9.1	91	60	18.3	2336 RC	WS DO	MOE# 6705071 0.0 TPSSL 0.3 BRWN CLAY STNS 3.0 GREY CLAY STNS 36.3 GREY ROCK 45.1 BRWN ROCK 65.5
6705605	4 10	Jul-75	551772 4844391	428.2	79.2 Fr		11.9	45	60	19.8	2336 RC	WS DO	MOE# 6705605 0.0 TPSSL 0.3 BRWN CLAY SAND 4.6 GREY CLAY STNS 44.2 GREY SAND 46.3 GREY CLAY 63.4 BRWN SAND 73.5 BRWN ROCK 79.2
6706075	4 10	Jun-76	551812 4844321	428.2	57.9 Fr		10.7	45	60	22.9	2336 RC	WS DO	MOE# 6706075 0.0 BRWN SAND 3.7 GREY CLAY GRVL 29.6 GREY ROCK 38.7 BRWN ROCK 61.3
6706408	3 10	May-77	551512 4843821	429.8	108.5 Fr		19.8	68	300	25.9	1906 RC	WS DO	MOE# 6706408 0.0 BRWN CLAY STNS 78.9 GREY STNS 108.5
6706427	3 13	May-77	549762 4844571	432.5	40.2 Fr		7.0	36	60	21.3	5469 RC	WS DO	MOE# 6706427 0.0 BRWN CLAY 5.5 GREY CLAY 37.5 GREY LMSN 40.2
6706528	3 11	Jan-77	551312 4844421	429.8	54.9 Fr		8.2	41	60	22.9	3740 RA	WS DO	MOE# 6706528 0.0 BRWN CLAY SAND 10.4 GREY HPAN STNS 15.2 BRWN SAND 23.2 GREY CLAY 30.5 GREY LMSN 54.9
6708187	4 10	Jun-84	551703 4844433	426.1	38.1 Fr		7.0	36	120	19.8	5317 RC	WS DO	MOE# 6708187 0.0 CLAY STNS 28.7 LMSN 42.7
6708208	4 9	Aug-85	552010 4844147	427.0	64.9 Sa 59.4 Sa		7.9	41	90	25.9	3740 RC	WS DO	MOE# 6708208 0.0 BLCK TPSSL 0.3 BRWN CLAY 2.4 GREY CLAY STNS 27.4 GREY LMSN 46.3 BRWN LMSN 64.9
6708405	4 12	Mar-86	551020 4845119	427.9	50.3 Fr 47.9 Fr		12.8	45	60	17.7	3740 RC	WS DO	MOE# 6708405 0.0 BLCK TPSSL 0.3 BRWN CLAY SAND 3.7 GREY CLAY STNS 29.0 GREY LMSN SHLE 51.5
6708706	3 12	May-86	550971 4844959	427.0	50.3 Fr 45.7 Fr		2.1	91		6.1	2564 CT	WS DO	MOE# 6708706 0.0 GRVL 3.0 CLAY 30.5 SAND 33.5 LMSN 50.3
6708770	4 11	May-87	551204 4844968	428.9	38.1 Fr		15.2	23	60	30.5	4643 RC	WS DO	MOE# 6708770 0.0 BLCK TPSSL 0.3 BRWN SAND 3.4 BLUE CLAY 34.4 GREY LMSN 38.7
6708893	4 10	Jun-87	551854 4844378	428.9	79.2 Fr		12.8	41	60	20.7	3740 RC	WS DO	MOE# 6708893 0.0 BRWN FILL 0.9 BRWN CLAY 3.7 GREY CLAY STNS 50.3 GREY SAND 59.4 GREY CLAY STNS 61.3 BRWN SNDS SHLE 63.1 BRWN LMSN 79.2
6708933	4 12	Jan-87	551001 4845118	427.0	41.1 Fr		4.6	91	60	24.4	2336 RC	WS DO	MOE# 6708933 0.0 BRWN CLAY GRVL STNS 5.5 GREY CLAY 36.9 GREY ROCK 41.1
6709396	3 12	Jul-88	550350 4844608	431.9	56.1 Fr		5.2	45	180	29.0	1906 RC	WS DO	MOE# 6709396 0.0 BRWN CLAY STNS 36.0 BLUE ROCK 37.5 GREY ROCK 42.7 LMSN 56.4
6709484	4 10	Sep-88	551752 4844376	427.9	39.3 Fr		15.8	32	60	21.3	3740 RC	WS DO	MOE# 6709484 0.0 BLCK TPSSL 0.3 BRWN SAND CLAY 3.7 BRWN CLAY STNS 10.4 GREY CLAY STNS 30.5 GREY LMSN 39.3

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR FND mbgl Qu	ICR TOP LEN mbgl m	SWL mbgl	RATE L/min	TIME min	PL DRILLER mbgl METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
6710384	3 10	Jun-90	551840 4844204	431.0	50.6 Fr		12.2	68	60	2663 RA	WS DO	MOE# 6710384 0.0 TPSL 0.3 SAND 4.6 CLAY HPAN 24.4 BLDR GRVL 29.0 GREY LMSN 39.6 BRWN LMSN 50.6
6710576	3 12	Aug-90	549942 4844462	431.6	50.3 Fr		5.8	45	90	16.8 2332 RC	WS DO	MOE# 6710576 0.0 BLCK TPSL 0.6 BRWN CLAY STNS 14.6 GREY CLAY STNS 36.6 BRWN ROCK 59.4
6711080	2 11	Jun-92	550202 4843772	435.3	67.1 Fr 53.3 Fr		6.4	45	90	22.9 3317 RC	WS DO	MOE# 6711080 0.0 BRWN CLAY STNS 7.6 GREY CLAY STKY 12.2 GREY CLAY STNS 18.3 GREY CLAY STKY 21.3 GREY CLAY STNS 35.1 GREY LMSN 38.1 BRWN LMSN 39.0 GREY LMSN 40.5 BRWN LMSN 74.7
6711152	4 11	Dec-93	551117 4844955	428.9	50.3 Fr 44.2 Fr 36.6 Fr 36.6 Fr		23.8	41	60	27.4 2663 RA	WS DO	MOE# 6711152 0.0 TPSL 0.3 BRWN SAND CLAY 5.5 BRWN CLAY SAND HPAN 7.9 BRWN CLAY SAND GRVL 33.2 GREY LMSN 50.3
6711958	4 10	Sep-96	551722 4844385	427.9	65.5 Fr		12.5	91	60	15.2 6865 RC	WS DO	MOE# 6711958 0.0 TPSL 0.3 BRWN SAND 3.4 BRWN GRVL SAND 4.9 GREY CLAY STNS 25.3 GREY CLAY GRVL 35.7 GREY CLAY SILT STNS 51.2 GREY LMSN 70.1
6712452	2 12	Aug-97	550308 4843780	434.9	65.5 Fr		7.0	91	90	22.9 3317 RC	WS DO	MOE# 6712452 0.0 BRWN CLAY STNS 6.1 GREY CLAY STNS 32.0 GREY CLAY STNS BLDR 46.0 GREY LMSN 50.3 GREY LMSN 71.6
6712540	2 13	Jun-98	550241 4843906	431.3	57.9 Fr	64.9 -0.9	8.2	91	90	2576 RA	WS DO	MOE# 6712540 0.0 TPSL 0.3 BRWN CLAY GRVL 3.0 GREY CLAY GRVL 23.5 BRWN CLAY SLTY GRVL 57.9 GREY SAND GRVL WBRG 65.8
6712549	3 11	Jun-98	551171 4844480	430.1	86.0 Fr 79.2 Fr 44.2 Fr 44.2 Fr 44.2 Fr		8.5	136	60	26.8 2663 RA	WS DO	MOE# 6712549 0.0 BRWN CLAY SAND GRVL 7.6 GREY CLAY SAND GRVL 29.0 GREY CLAY GRVL LMSN 32.0 BRWN LMSN LTCL 38.1 BRWN LMSN 47.2 BRWN LMSN LTCL 71.6 GREY LMSN LTCL 76.2 GREY LMSN 79.2 GREY LMSN LTCL 86.0
6712681	3 11	Sep-98	550577 4844018	430.1	54.9 Fr		9.1	136	60	16.8 2336 RA	WS DO	MOE# 6712681 0.0 BRWN CLAY STNS 3.0 GREY CLAY STNS 22.9 GREY CLAY SAND GRVL 24.4 GREY CLAY BLDR 31.4 GREY ROCK 44.2 BRWN ROCK 56.4
6713016	3 11	Jun-99	551566 4844182	430.1	94.5 Fr 91.4 Fr 79.2 Fr 79.2 Fr 79.2 Fr 79.2 Fr		13.7	136	60	33.5 2663 RA	WS DO	MOE# 6713016 0.0 TPSL 0.3 BRWN CLAY SAND STNS 7.6 BRWN CLAY GRVL 27.4 GREY SAND GRVL 38.1 BRWN CLAY SAND 51.8 BRWN CLAY SAND GRVL 57.3 BRWN LMSN FCRD 58.5 BRWN LMSN 80.8 GREY LMSN 86.9 GREY LMSN 94.5
6714026	3 11	Mar-02	551213 4844316	430.1	74.7 Fr		9.4	68	60	36.3 2663 RA	WS DO	MOE# 6714026 0.0 BLCK TPSL 0.9 BRWN CLAY STNS 10.7 BRWN CLAY HPAN 25.9 BRWN CLAY GRVL 31.7 GREY LMSN FCRD 32.9 GREY LMSN 35.1 BLUE LMSN 74.7
7166124	4 11	NR	551624 4844811	432.5			NR			6475 -	- -	MOE# 7166124 TAG#A103263 0.0
7185591	4 9	Jul-12	551874 4844315	430.1	75.6 Fr		15.2	55	720	15.8 7154 RC	WS DO	MOE# 7185591 TAG#A125533 0.0 BRWN SAND 4.9 BRWN CLAY STNS 31.1 GREY CLAY 57.6 GREY CLAY STNS 74.7 GREY LMSN 75.6

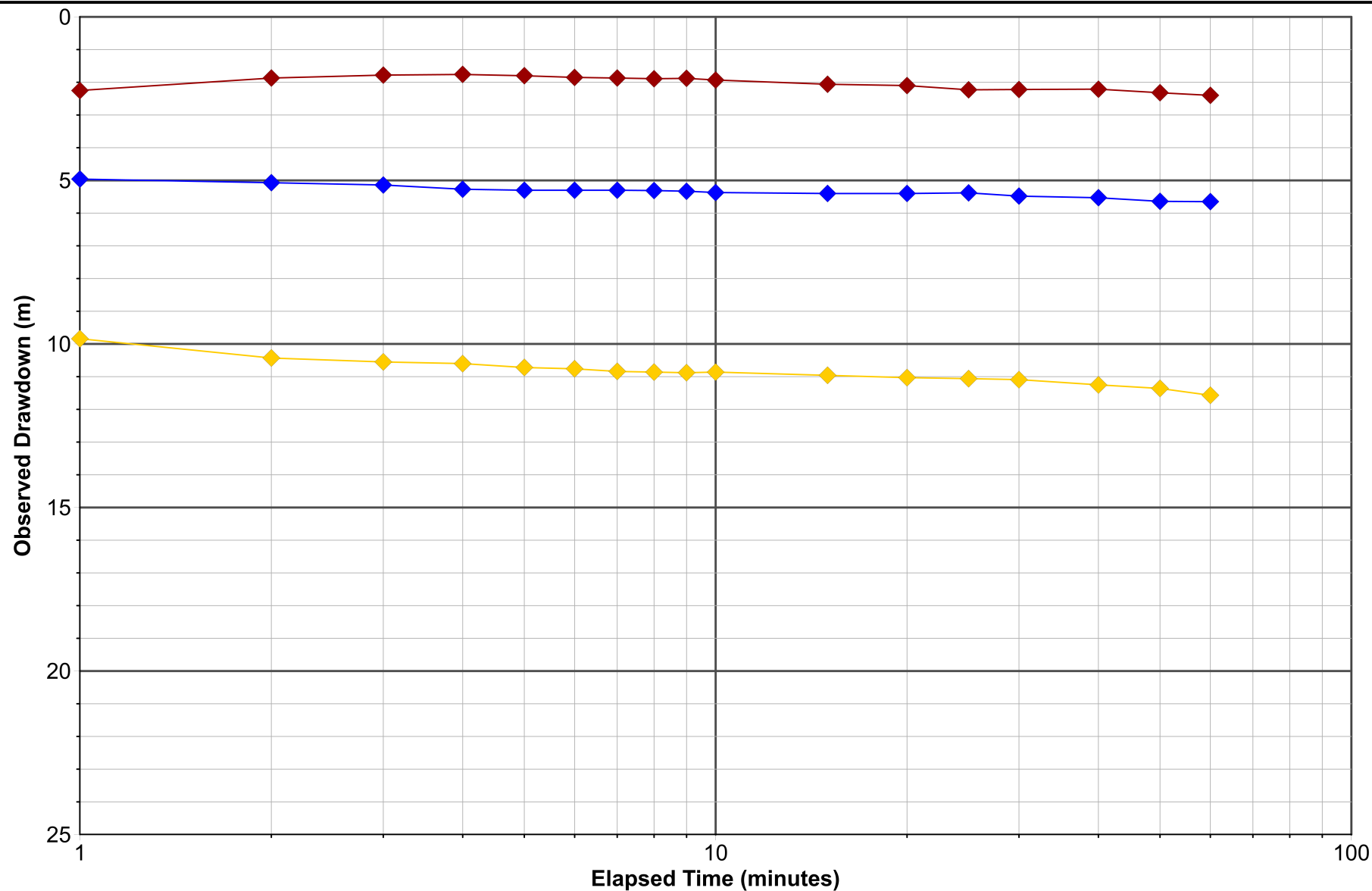
LABEL	CON	DATE	EASTING	ELEV	WTR FND	ICR TOP	LEN	SWL	RATE	TIME	PL DRILLER	TYPE	WELL NAME
	LOT	mmm-yr	NORTHING	masl	mbgl Qu	mbgl m		mbgl	L/min	min	mbgl METHOD	STAT	DESCRIPTION OF MATERIALS

QUALITY:		TYPE:		USE:		METHOD :	
Fr	Fresh	WS	Water Supply	CO	Comercial	NU	Not Used
Mn	Mineral	AQ	Abandoned Quality	DO	Domestic	IR	Irrigation
Sa	Salty	AS	Abandoned Supply	MU	Municipal	AL	Alteration
Su	Sulphur	AB	Abandonment Record	PU	Public	MO	Monitoring
--	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.
Records Copyright Ministry of Environment Queen's Printer. Selected information tabulated to metric with changes and corrections subject to Driller's Records.

APPENDIX C

Stepped Rate Pumping Test Graphs



- ◆ Step 1 (3.2 L/s)
- ◆ Step 2 (6.3 L/s)
- ◆ Step 3 (9.5 L/s)



DATE	October 2021
DESIGN	VRP
REVIEW	GRP
APPROVED	GRP

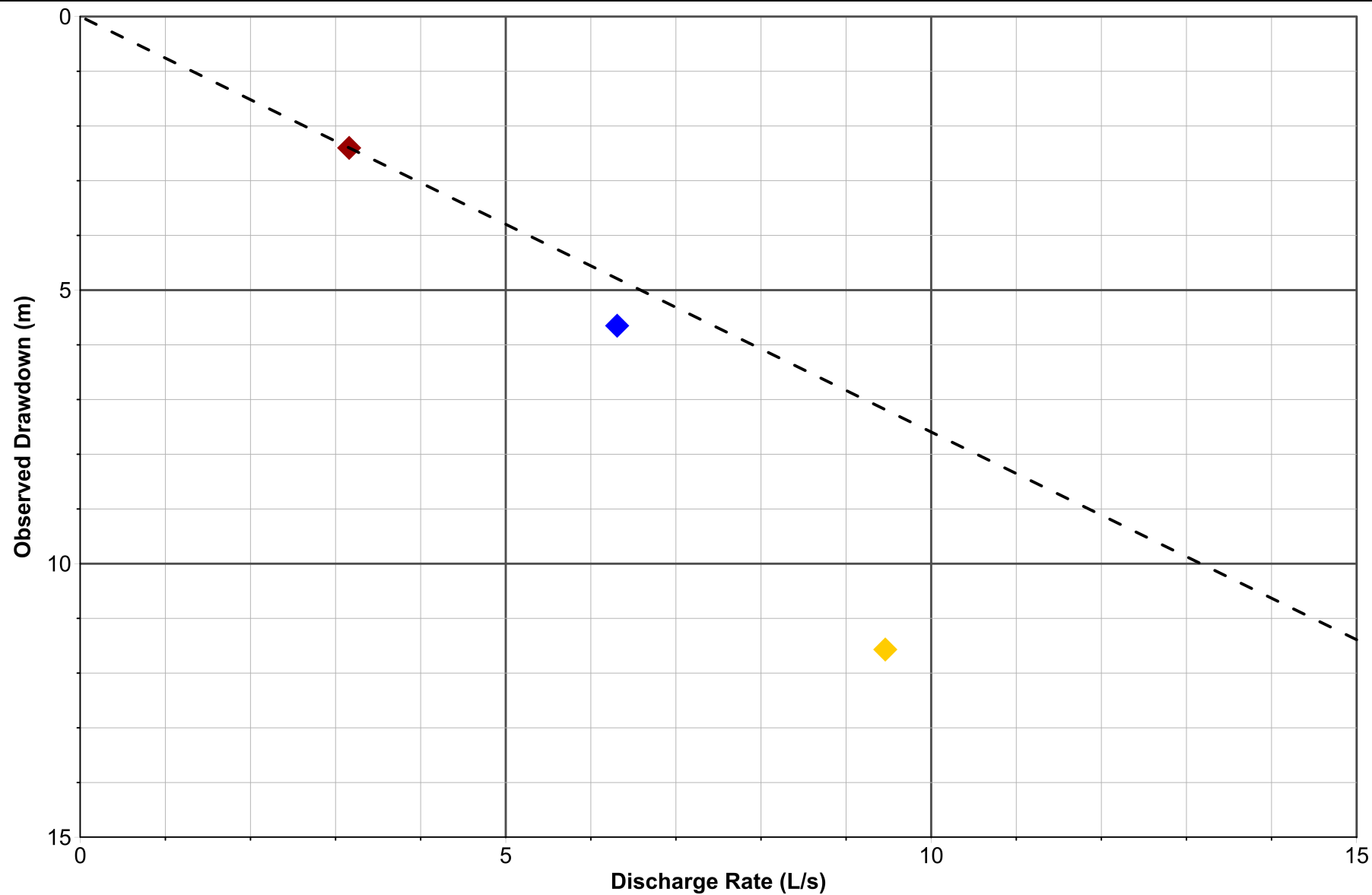
PROJECT **WATER SUPPLY INVESTIGATION
FERGUS GOLF CLUB**

TITLE **STEP TEST
DRAWDOWN VERSUS ELAPSED TIME**

PROJECT NO.
21456909

REV
A

FIGURE
C1



- ◆ Step 1 (3.2 L/s)
- ◆ Step 2 (6.3 L/s)
- ◆ Step 3 (9.5 L/s)



DATE	October 2021
DESIGN	VRP
REVIEW	GRP
APPROVED	GRP

PROJECT **WATER SUPPLY INVESTIGATION
FERGUS GOLF CLUB**

TITLE **STEP TEST
DRAWDOWN VERSUS DISCHARGE RATE**

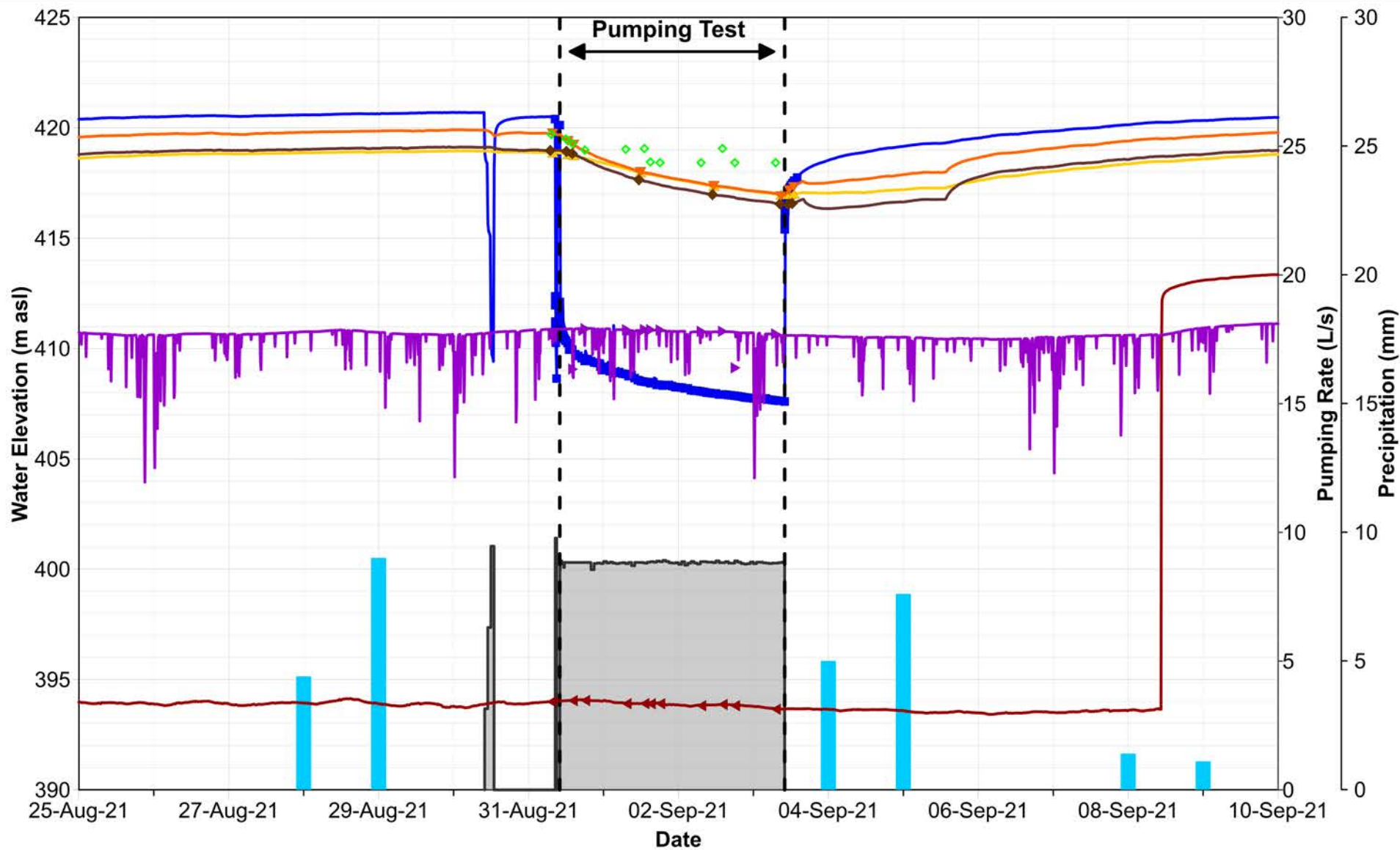
PROJECT NO.
21456909

REV
A

FIGURE
C2

APPENDIX D

Constant Rate Pumping Test Graphs



■ PW21-1 ◆ MW102 ▼ Old Clubhouse ◆ Clubhouse Well ■ Precipitation (mm)
▲ MW101 ▼ MW103 ◀ South Irrigation ■ Pumping Rate (L/s)



DATE October 2021
 DESIGN VRP
 REVIEW GRP
 APPROVED GRP

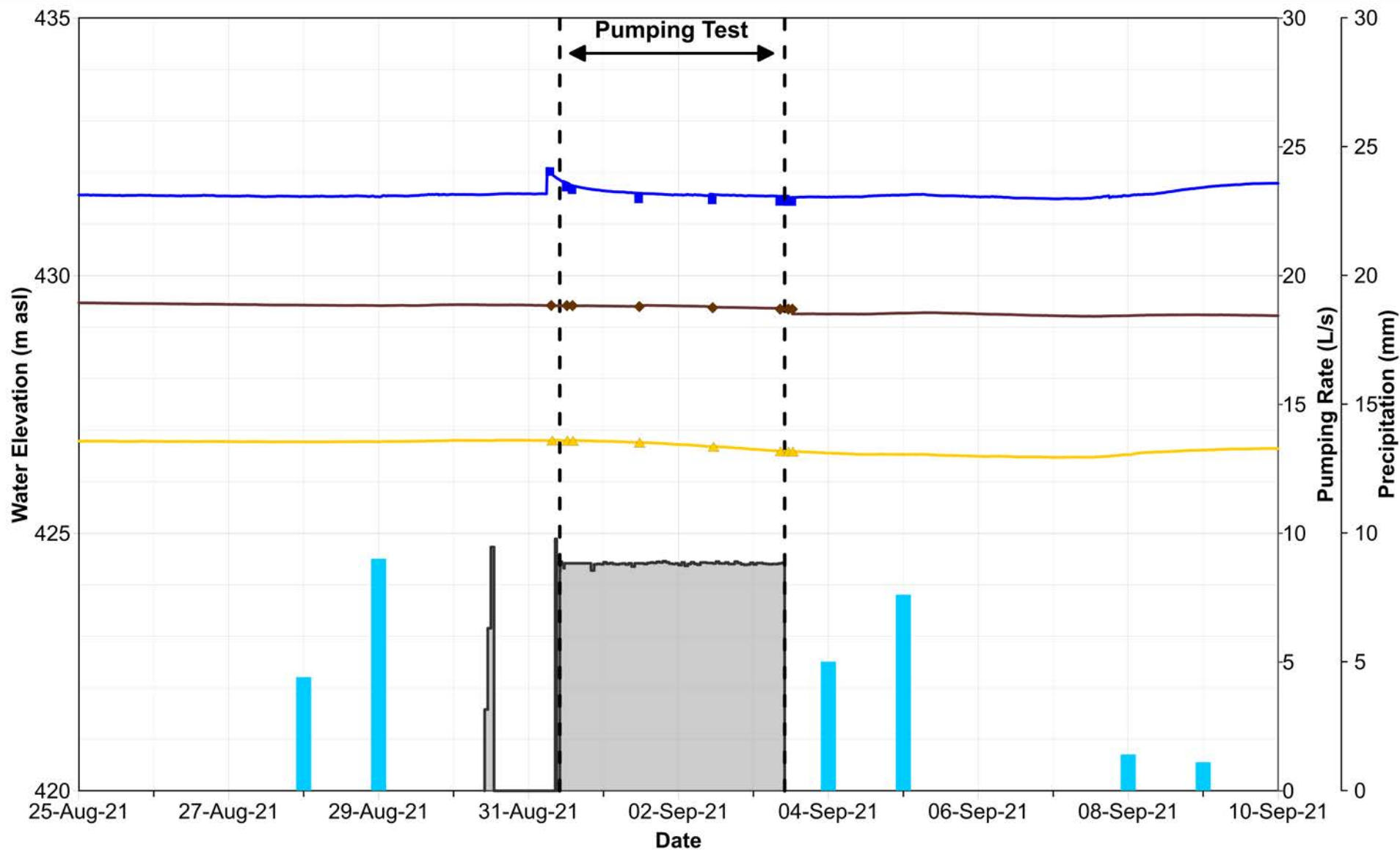
PROJECT **WATER SUPPLY INVESTIGATION
FERGUS GOLF CLUB**

TITLE **GROUNDWATER ELEVATION
MONITORING - BEDROCK WELLS**

PROJECT NO.
21456909

REV
A

FIGURE
D1



■ BH21-10
 ▲ BH21-13
 ◆ BH21-14
 Pumping Rate (L/s)
 ■ Precipitation (mm)



DATE	October 2021
DESIGN	VRP
REVIEW	GRP
APPROVED	GRP

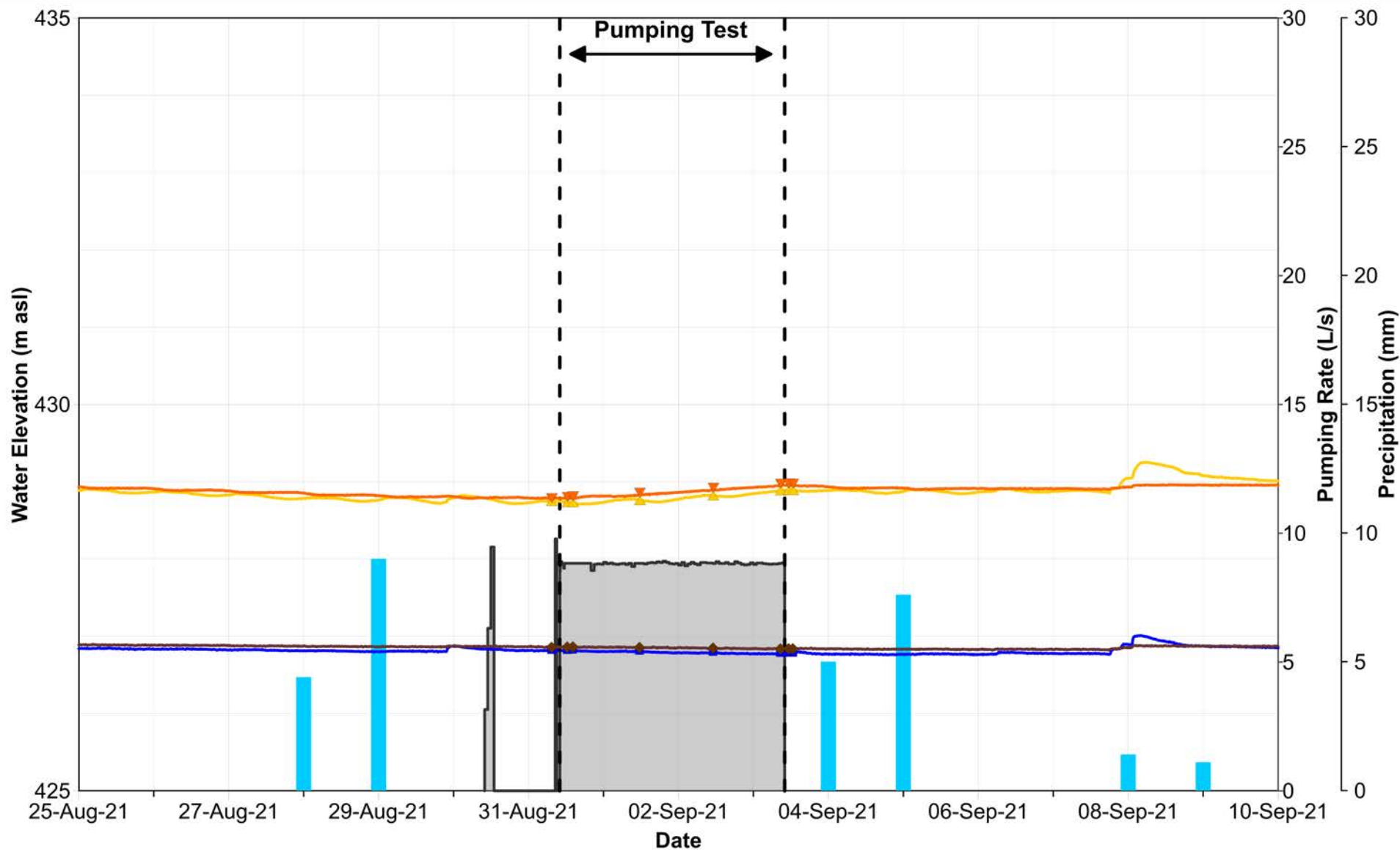
PROJECT **WATER SUPPLY INVESTIGATION
FERGUS GOLF CLUB**

TITLE **GROUNDWATER ELEVATION
MONITORING - OVERBURDEN WELLS**

PROJECT NO.
21456909

REV
A

FIGURE
D2



■ MP-1 ◆ SG-1 ■ Pumping Rate (L/s) ■ Precipitation (mm)
 ▲ MP-2 ▼ SG-2



DATE October 2021
 DESIGN VRP
 REVIEW GRP
 APPROVED GRP

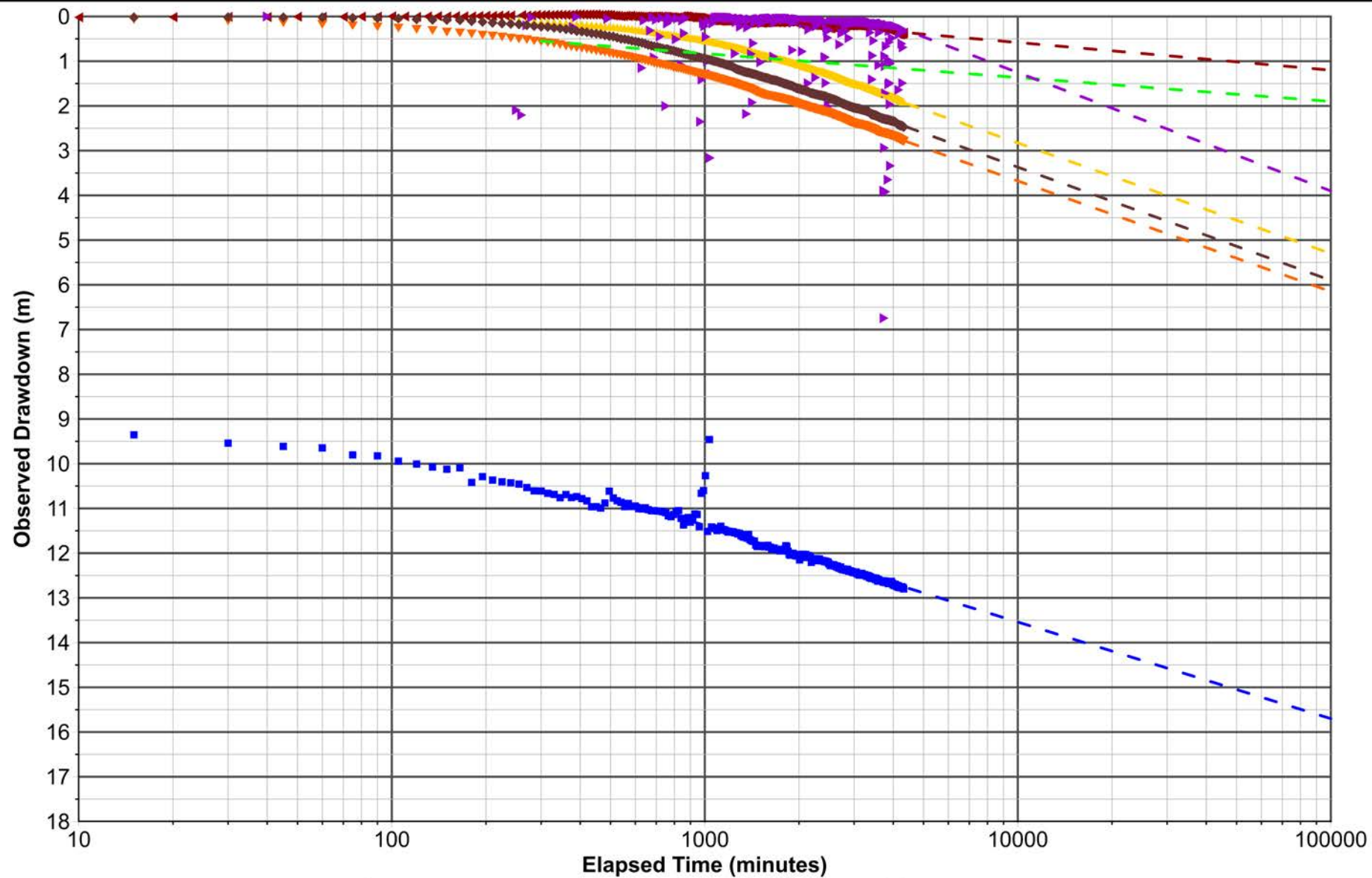
PROJECT **WATER SUPPLY INVESTIGATION
FERGUS GOLF CLUB**

TITLE **GROUNDWATER ELEVATION
MONITORING - SURFACE WATER**

PROJECT NO.
21456909

REV
A

FIGURE
D3



■ PW21-1 ▲ MW101 ◆ MW102 ▼ MW103
 ▲ Old Clubhouse ▼ South Irrigation ◆ Clubhouse Well



DATE October 2021
 DESIGN VRP
 REVIEW GRP
 APPROVED GRP

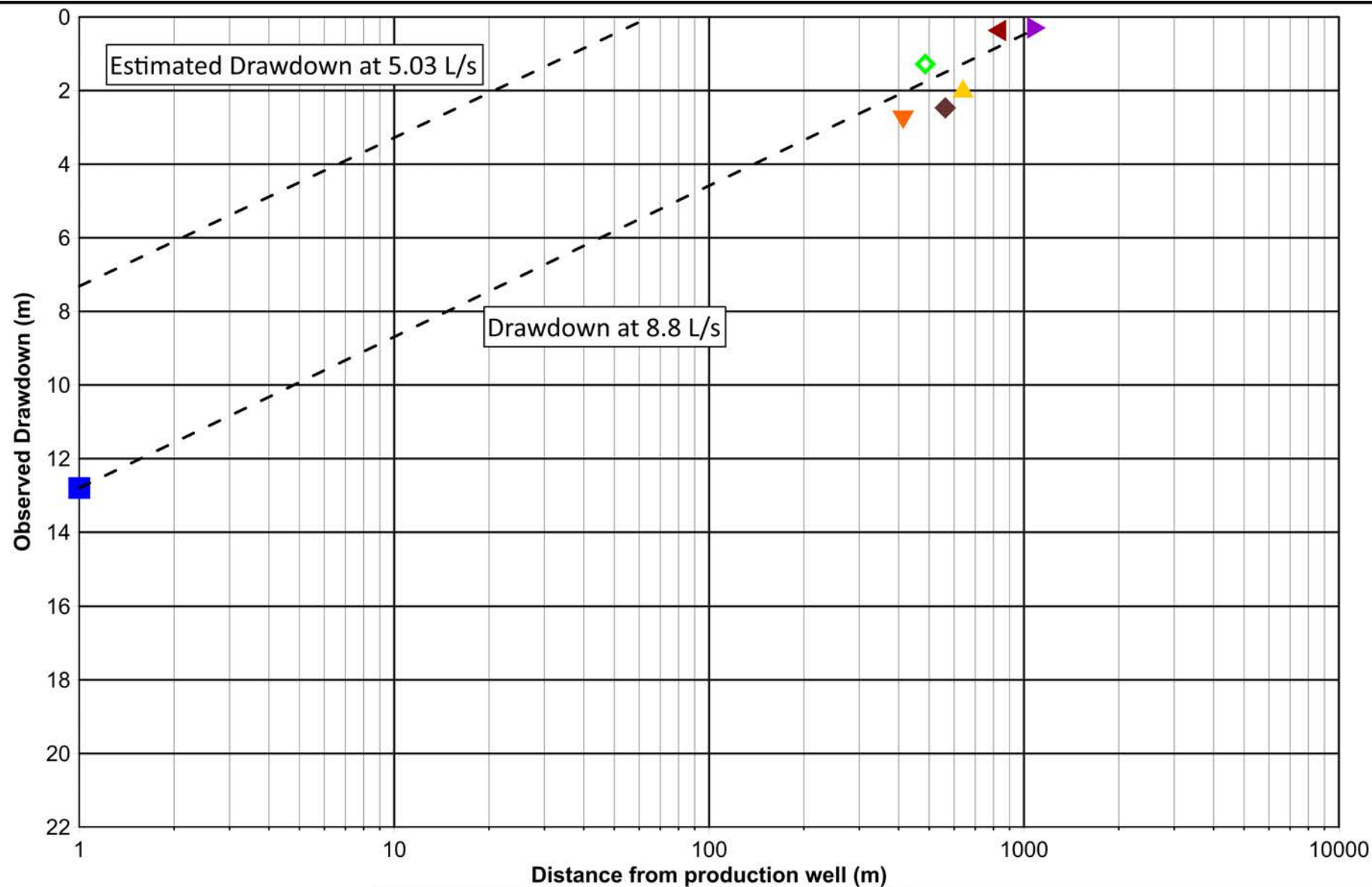
PROJECT **WATER SUPPLY INVESTIGATION
FERGUS GOLF CLUB**

TITLE **CONSTANT RATE TEST
DRAWDOWN VERSUS LOG TIME
BEDROCK WELLS**

PROJECT NO.
21456909

REV
A

FIGURE
D4



■ PW21-1 ◆ MW102 ◇ Clubhouse ◀ South Irrigation
▲ MW101 ▼ MW103 ▶ Old Clubhouse

PROJECT **WATER SUPPLY INVESTIGATION
FERGUS GOLF CLUB**

TITLE **CONSTANT RATE TEST
DRAWDOWN VERSUS DISTANCE**

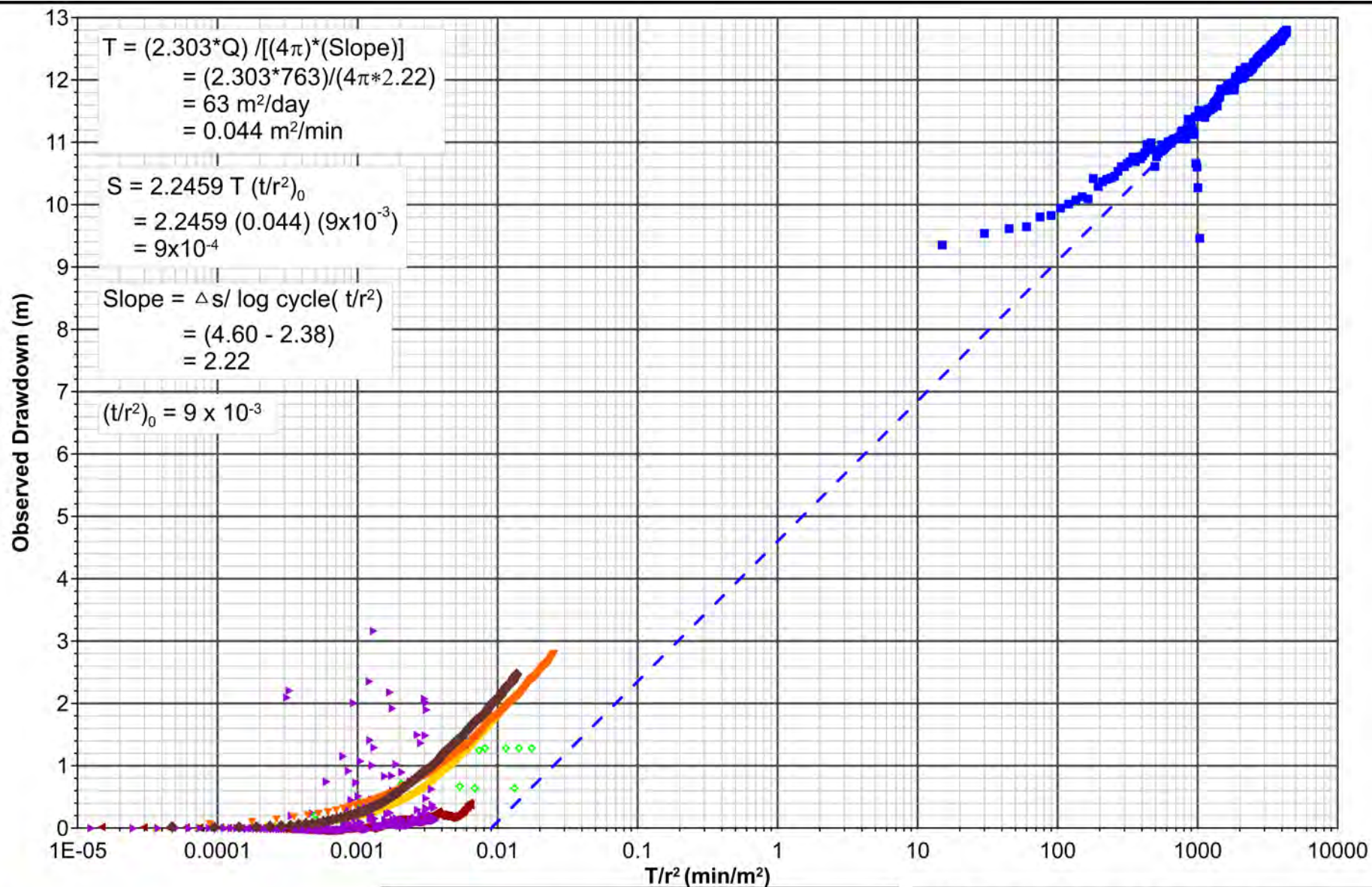
PROJECT NO.
21456909

REV
A

FIGURE
D5



DATE October 2021
 DESIGN VRP
 REVIEW GRP
 APPROVED GRP



■ PW21-1 ■ MW102 ◆ Clubhouse ▲ South Irrigation
 ▲ MW101 ▼ MW103 ▲ Old Clubhouse - PW21-1 Line



DATE October 2021
 DESIGN VRP
 REVIEW GRP
 APPROVED GRP

PROJECT **WATER SUPPLY INVESTIGATION
FERGUS GOLF CLUB**

TITLE **CONSTANT RATE TEST
DRAWDOWN VERSUS T/R²**

PROJECT NO.
21456909

REV
A

FIGURE
D6

APPENDIX E

Water Quality Summary

		Ontario Drinking Water Standards, Objectives and Guidelines	PW21-1 at 1 hour pumping	PW21-1 at 24 hours pumping	PW21-1 at 72 hours pumping
			2021-08-31 11:00	2021-09-01 10:00	2021-09-03 10:15
Inorganics					
Total Ammonia-N	mg/L		0.18	0.19	0.21
Conductivity	umho/cm		720	770	790
Dissolved Organic Carbon	mg/L	5 (AO)	0.49	<0.40	0.49
Orthophosphate (P)	mg/L		<0.010	<0.010	<0.010
pH	pH units	6.5-8.5 (OG)	8.00	7.93	8.12
Dissolved Sulphate (SO ₄)	mg/L	500 (AO)	190	220	250
Alkalinity (Total as CaCO ₃)	mg/L	30-500 (OG)	180	180	180
Dissolved Chloride (Cl)	mg/L	250 (AO)	8.5	9.1	10
Nitrite (N)	mg/L	1 (STD)	<0.010	<0.010	<0.010
Nitrate (N)	mg/L	10 (STD)	<0.10	<0.10	<0.10
Metals					
Aluminum (Al)	ug/L	100 (OG)	350	77	<4.9
Antimony (Sb)	ug/L	6 (STD)	<0.50	<0.50	<0.50
Arsenic (As)	ug/L	10 (STD)	1.8	1.4	1.5
Barium (Ba)	ug/L	1000 (STD)	24	21	21
Beryllium (Be)	ug/L		<0.40	<0.40	<0.40
Boron (B)	ug/L	5000 (STD)	70	71	70
Cadmium (Cd)	ug/L	5 (STD)	<0.090	<0.090	<0.090
Calcium (Ca)	ug/L		89000	86000	96000
Chromium (Cr)	ug/L	50 (STD)	<5.0	<5.0	<5.0
Cobalt (Co)	ug/L		<0.50	<0.50	<0.50
Copper (Cu)	ug/L	1000 (AO)	6.0	0.92	<0.90
Iron (Fe)	ug/L	300 (AO)	610	240	120
Lead (Pb)	ug/L	10 (STD)	2.7	0.67	<0.50
Lithium (Li)	ug/L		5.8	5.8	5.6
Magnesium (Mg)	ug/L		33000	34000	34000
Manganese (Mn)	ug/L	50 (AO)	58	25	19
Molybdenum (Mo)	ug/L		2.7	3.1	3.2
Nickel (Ni)	ug/L		1.1	<1.0	<1.0
Phosphorus (P)	ug/L		<100	<100	<100
Potassium (K)	ug/L		1200	1100	1100
Selenium (Se)	ug/L	50 (STD)	<2.0	<2.0	<2.0
Silicon (Si)	ug/L		6400	5900	5800
Silver (Ag)	ug/L		<0.090	<0.090	<0.090
Sodium (Na)	ug/L	200000 (AO)	29000	28000	27000
Strontium (Sr)	ug/L		3500	3600	3800
Thallium (Tl)	ug/L		<0.050	<0.050	<0.050
Titanium (Ti)	ug/L		9.6	<5.0	<5.0
Uranium (U)	ug/L	20 (STD)	0.21	0.17	0.21
Vanadium (V)	ug/L		0.79	<0.50	<0.50
Zinc (Zn)	ug/L	5000 (AO)	8.0	<5.0	<5.0

Water Quality Results

		Ontario Drinking Water Standards, Objectives and Guidelines	PW21-1 at 1 hour pumping	PW21-1 at 24 hours pumping	PW21-1 at 72 hours pumping
			2021-08-31 11:00	2021-09-01 10:00	2021-09-03 10:15
Calculated Parameters		Units			
Anion Sum	me/L		7.86	8.58	9.13
Bicarb. Alkalinity (calc. as CaCO ₃)	mg/L		180	180	180
Calculated TDS	mg/L	500 (AO)	480	510	540
Carb. Alkalinity (calc. as CaCO ₃)	mg/L		1.7	1.4	2.2
Cation Sum	me/L		8.57	8.39	8.82
Hardness (CaCO ₃)	mg/L	80-100 (OG)	360	360	380
Ion Balance (% Difference)	%		4.29	1.10	1.75
Langelier Index (@ 20C)	-		0.758	0.654	0.883
Langelier Index (@ 4C)	-		0.510	0.406	0.635
Saturation pH (@ 20C)	pH units		7.25	7.27	7.23
Saturation pH (@ 4C)	pH units		7.50	7.52	7.48
Microbiological					
Background	CFU/100 mL		0	0	0
Total Coliforms	CFU/100 mL	0 (STD)	0	0	0
Escherichia Coli	CFU/100 mL	0 (STD)	0	0	0

Notes

-	No units
ug/L	micrograms per litre
mg/L	milligrams per litre
me/L	milliequivalents per litre
umho/cm	micro mho per litre
NTU	Nephelometric turbidity units
STD	Chemical Standards
OG	Operational Guidelines
AO	Aesthetic Objectives
red highlight	Ontario Drinking Water Standard, Objective or Guideline Exceedance

Ontario Drinking Water Quality Standards Water Quality Results

	UNITS	Ontario Drinking Water Standard	Aesthetic Objective or Operational Guideline	PW21-1 2021-09-03 10:00
Calculated Parameters				
Calculated TDS	mg/L	-	500	550
Hardness (CaCO ₃)	mg/L	-	80:100	380
Total Organic Nitrogen	mg/L	-	0.15	<0.10
Inorganics				
Total Ammonia-N	mg/L	-	-	0.21
Colour	TCU	-	5	<2
Fluoride (F ⁻)	mg/L	1.5	-	0.62
Total Kjeldahl Nitrogen (TKN)	mg/L	-	-	0.23
Microcystin	ug/L	-	-	<0.10
Dissolved Organic Carbon	mg/L	-	5	0.48
pH	pH	-	6.5:8.5	8.02
Dissolved Sulphate (SO ₄)	mg/L	-	500	270
Sulphide	mg/L	-	0.05	<0.020
Turbidity	NTU	-	5	0.7
WAD Cyanide (Free)	mg/L	0.2	-	<0.0010
Alkalinity (Total as CaCO ₃)	mg/L	-	30:500	180
Dissolved Chloride (Cl ⁻)	mg/L	-	250	9.6
Nitrite (N)	mg/L	1	-	<0.010
Nitrate (N)	mg/L	10	-	<0.10
Nitrate + Nitrite (N)	mg/L	10	-	<0.10
Metals				
Mercury (Hg)	mg/L	0.001	-	<0.00010
Aluminum (Al)	ug/L	-	100	<4.9
Antimony (Sb)	ug/L	6	-	<0.50
Arsenic (As)	ug/L	10	-	1.5
Barium (Ba)	ug/L	1000	-	21
Boron (B)	ug/L	5000	-	74
Cadmium (Cd)	ug/L	5	-	<0.090
Calcium (Ca)	ug/L	-	-	93000
Chromium (Cr)	ug/L	50	-	<5.0
Copper (Cu)	ug/L	-	1000	<0.90
Iron (Fe)	ug/L	-	300	130
Lead (Pb)	ug/L	10	-	<0.50
Magnesium (Mg)	ug/L	-	-	36000
Manganese (Mn)	ug/L	-	50	20
Potassium (K)	ug/L	-	-	1100
Selenium (Se)	ug/L	50	-	<2.0
Sodium (Na)	ug/L	-	200000	28000
Uranium (U)	ug/L	20	-	0.16
Zinc (Zn)	ug/L	-	5000	<5.0

Ontario Drinking Water Quality Standards Water Quality Results

	UNITS	Ontario Drinking Water Standard	Aesthetic Objective or Operational Guideline	PW21-1 2021-09-03 10:00
Fixed Gases				
Methane	L/m3		3	0.019
Miscellaneous Parameters				
NTA	mg/L	0.4	-	<0.050
Bromate	mg/L	0.01	-	<0.005
Semivolatile Organics				
2,3,4,6-Tetrachlorophenol	ug/L	100	1	<0.50
2,4,5-T	ug/L	280	-	<1.0
2,4,6-Trichlorophenol	ug/L	5	2	<0.50
2,4-D	ug/L	100	-	<1.0
2,4-Dichlorophenol	ug/L	900	0.3	<0.25
Alachlor	ug/L	5	-	<0.50
Aldicarb	ug/L	-	-	<5.0
Atrazine	ug/L	-	-	<0.50
Des-ethyl atrazine	ug/L	-	-	<0.50
Atrazine + Desethyl-atrazine	ug/L	5	-	<1.0
Bendiocarb	ug/L	-	-	<2.0
Bromoxynil	ug/L	5	-	<0.50
Carbaryl	ug/L	90	-	<5.0
Carbofuran	ug/L	90	-	<5.0
Chlorpyrifos (Dursban)	ug/L	90	-	<1.0
Cyanazine (Bladex)	ug/L	-	-	<1.0
Diazinon	ug/L	20	-	<1.0
Dicamba	ug/L	120	-	<1.0
Diclofop-methyl	ug/L	9	-	<0.90
Dimethoate	ug/L	20	-	<2.5
Dinoseb	ug/L	10	-	<1.0
Malathion	ug/L	190	-	<5.0
Metolachlor	ug/L	50	-	<0.50
Metribuzin (Sencor)	ug/L	80	-	<5.0
Ethyl Parathion	ug/L	50	-	<1.0
Pentachlorophenol	ug/L	60	30	<0.50
Phorate	ug/L	2	-	<0.50
Picloram	ug/L	190	-	<5.0
Prometryne	ug/L	1	-	<0.25
Simazine	ug/L	10	-	<1.0
Terbufos	ug/L	1	-	<0.50
Triallate	ug/L	230	-	<1.0
Trifluralin	ug/L	45	-	<1.0
Benzo(a)pyrene	ug/L	0.01	-	<0.0050
Methyl parathion	ug/L	-	-	<1.0
N-Nitrosodimethylamine	ug/L	0.009	-	<0.0009

Ontario Drinking Water Quality Standards Water Quality Results

	UNITS	Ontario Drinking Water Standard	Aesthetic Objective or Operational Guideline	PW21-1 2021-09-03 10:00
Volatile Organics				
1,1-Dichloroethylene	ug/L	14	-	<0.10
1,2-Dichlorobenzene	ug/L	200	3	<0.20
1,2-Dichloroethane	ug/L	5	-	<0.20
1,4-Dichlorobenzene	ug/L	5	1	<0.20
Benzene	ug/L	1	-	<0.10
Bromodichloromethane	ug/L	-	-	<0.10
Bromoform	ug/L	-	-	<0.20
Carbon Tetrachloride	ug/L	2	-	<0.10
Chlorobenzene	ug/L	80	30	<0.10
Chloroform	ug/L	-	-	<0.10
Dibromochloromethane	ug/L	-	-	<0.20
Methylene Chloride(Dichloromethane)	ug/L	50	-	<0.50
Ethylbenzene	ug/L	140	1.6	<0.10
Tetrachloroethylene	ug/L	10	-	<0.10
Toluene	ug/L	60	24	<0.20
Trichloroethylene	ug/L	5	-	<0.10
Vinyl Chloride	ug/L	1	-	<0.20
o-Xylene	ug/L	-	-	<0.10
p+m-Xylene	ug/L	-	-	<0.10
Total Xylenes	ug/L	90	20	<0.10
Total Trihalomethanes	ug/L	-	-	<0.20
Pesticides & Herbicides				
Glyphosate	ug/L	280	-	<10
Diquat	ug/L	70	-	<7.0
Diuron	ug/L	150	-	<10
Guthion (Azinphos-methyl)	ug/L	20	-	<2.0
Paraquat	ug/L	10	-	<1.0
Temephos	ug/L	-	-	<10
Lindane	ug/L	4	-	<0.0060
Heptachlor	ug/L	-	-	<0.0060
Aldrin	ug/L	-	-	<0.0060
Heptachlor epoxide	ug/L	-	-	<0.0060
Oxychlordane	ug/L	-	-	<0.0060
g-Chlordane	ug/L	-	-	<0.0060
a-Chlordane	ug/L	-	-	<0.0060
Dieldrin	ug/L	-	-	<0.0060
o,p-DDE	ug/L	-	-	<0.0060
p,p-DDE	ug/L	-	-	<0.0060
o,p-DDD	ug/L	-	-	<0.0060
p,p-DDD	ug/L	-	-	<0.0060
o,p-DDT	ug/L	-	-	<0.0060

Ontario Drinking Water Quality Standards Water Quality Results

	UNITS	Ontario Drinking Water Standard	Aesthetic Objective or Operational Guideline	PW21-1
				2021-09-03 10:00
p,p-DDT	ug/L	-	-	<0.0060
Methoxychlor	ug/L	900	-	<0.024
Aroclor 1016	ug/L	-	-	<0.050
Aroclor 1221	ug/L	-	-	<0.050
Aroclor 1232	ug/L	-	-	<0.050
Aroclor 1242	ug/L	-	-	<0.050
Aroclor 1248	ug/L	-	-	<0.050
Aroclor 1254	ug/L	-	-	<0.050
Aroclor 1260	ug/L	-	-	<0.050
Pesticide Calculated Parameters				
Aldrin + Dieldrin	ug/L	0.7	-	<0.006
Chlordane (Total)	ug/L	7	-	<0.006
DDT+ Metabolites	ug/L	30	-	<0.006
Heptachlor + Heptachlor epoxide	ug/L	3	-	<0.006
Total PCB	ug/L	3	-	<0.05
Dioxin and Furan				
2,3,7,8-Tetra CDD *	pg/L	15		<0.973
1,2,3,7,8-Penta CDD *	pg/L	15		<0.830
1,2,3,4,7,8-Hexa CDD *	pg/L	15		<0.875
1,2,3,6,7,8-Hexa CDD *	pg/L	15		<0.778
1,2,3,7,8,9-Hexa CDD *	pg/L	15		<0.798
1,2,3,4,6,7,8-Hepta CDD *	pg/L	15		<0.760
Octa CDD *	pg/L	15		<0.666
Total Tetra CDD *	pg/L	15		<0.973
Total Penta CDD *	pg/L	15		<0.830
Total Hexa CDD *	pg/L	15		<0.814
Total Hepta CDD *	pg/L	15		<0.760
2,3,7,8-Tetra CDF **	pg/L	15		<0.671
1,2,3,7,8-Penta CDF **	pg/L	15		<0.843
2,3,4,7,8-Penta CDF **	pg/L	15		<0.715
1,2,3,4,7,8-Hexa CDF **	pg/L	15		<0.384
1,2,3,6,7,8-Hexa CDF **	pg/L	15		<0.332
2,3,4,6,7,8-Hexa CDF **	pg/L	15		<0.349
1,2,3,7,8,9-Hexa CDF **	pg/L	15		<0.371
1,2,3,4,6,7,8-Hepta CDF **	pg/L	15		<0.313
1,2,3,4,7,8,9-Hepta CDF **	pg/L	15		<0.349
Octa CDF **	pg/L	15		<0.982
Total Tetra CDF **	pg/L	15		<0.671
Total Penta CDF **	pg/L	15		<0.775
Total Hexa CDF **	pg/L	15		<0.358
Total Hepta CDF **	pg/L	15		<0.330

Ontario Drinking Water Quality Standards Water Quality Results

		Ontario Drinking Water Standard	Aesthetic Objective or Operational Guideline	PW21-1
	UNITS			2021-09-03 10:00
Microbiological				
Heterotrophic plate count	CFU/mL	-	-	0
Background	CFU/100mL	-	-	0
Total Coliforms	CFU/100mL	0	-	0
Escherichia coli	CFU/100mL	0	-	0

Notes

-	No units
pg/L	picograms per litre
ug/L	micrograms per litre
mg/L	milligrams per litre
me/L	milliequivalents per litre
umho/cm	micro mho per litre
NTU	Nephelometric turbidity units
red highlight	Ontario Drinking Water Standard, Objective or Guideline Exceedance



Hyperion Research Ltd.

1008 Allowance Ave. SE, Medicine Hat, AB T1A 3G8
Telephone (888) 529-0847 Fax (403) 5290852 hyperion@telusplanet.net



To: Paul Menkveld
Golder Associates
210 Sheldon Drive
Cambridge ON
N1T 1A8
519 620-8182
Paul_Menkveld@golder.com

Sample Date: 02-Sep-21
Sample Type: Raw
LIMS:
Volume Filtered (L): 389
Rec'd within 96h?: yes
Temp on arrival <20 °C?: yes
Conductivity (uS/cm): 779

Project #: CX21479897
Upload to DB?:
Field pH: 7.58
Field Temp °C: 9.7
Field Turb (NTU)
Location: PW21-1

The methodology used to produce this report conforms to USEPA Method 1623 and/or the USEPA Consensus Method for the Microscopic Particulate Analysis. Based on the validation data, the method is fit for its intended use. Hyperion Research Ltd. is accredited for this analysis by CALA under the ISO/IEC 17025 standard.

Raw Data

Primary Particulates	Total Count	#/380L (100 US gal)	Relative Risk Factor
Diatoms	0	0.0	0
Other Algae	0	0.0	0
Insect/larvae	0	0.0	0
Rotifers	0	0.0	0
Plant Debris	0	0.0	0
<i>Giardia/Crypto</i>	0	0.0	0

Sum of Relative Risk Factors = **0**

From the EPA Consensus Method:

Risk of Surface Water Contamination based on sum of Relative Risk Factors

0 to 9	Low Risk
10 to 19	Moderate Risk
20+	High Risk

Processing Data

Date/Time Rec'd: 03-Sep-21 12:22:00 PM
Sample Temp: 14
Lab ID: 61550
Filter Type: Filta-Max
Date/Time Conc: 03-Sep-21 1:30:00 PM
Eluted By: CW
IMS System: Dynabeads
IMS Lot No: 01039465
Pellet Vol (mL): 0.2
Resusp Vol (uL): 100.0
MAb Conjugate: EasyStainCY3
MAb Lot No: C104G203
Control G: 4
Control C: 4
Date/Time Stained: 07-Sep-21 11:30:00 AM
Stained By: CW
Read By: PW
Vol Used (uL): 100.0
Sample Equivalent Vol (L): 389

Recovery efficiencies for particles are known to be low by the Consensus method. Minimum recovery was measured to be 6.5 +/-1.2% for Giardia cysts, 0.5 +/-0.2% for Cryptosporidium oocysts and 4.2 +/-2.3% for Euglena (algae). The average recovery using the MPA-1623 Method is 69.0 +/-6.9 for Giardia, 62.7 +/-2.9 for Cryptosporidium and 23.1 +/-6.5% for Diatoms.

Secondary Particulates

Secondary Particulates	Total Count	#/380L (100 US gal)	
Nematodes	0	0.0	These particulates are sometimes found in groundwater and are not considered to add risk
Pollen	0	0.0	
Crustacea	0	0.0	
Unknown	0	0.0	

Minerals Observed: silica, clay, iron, other carbonate minerals

Giardia cysts/100L 0 **Cryptosporidium oocysts/100L** 0

Spore Count Surface Water CFU/L: 2700

Spore Count Well Water CFU/L: 0

Comments:

Surface water contained a variety of diatoms, blue green algae and other photosynthetic pigment bearing organisms. Rotifers also observed.

Analyst:

Peter M. Wallis, Ph.D.

Conclusion:

Based on this sample, the risk of surface water contamination is judged to be: **Low**



Your Project #: 21456909
Your C.O.C. #: 842982-01-01

Attention: Gregory Padusenko

Golder Associates Ltd
210 Sheldon Drive
Cambridge, ON
CANADA N1T 1A8

Report Date: 2021/09/07
Report #: R6799650
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C109389

Received: 2021/08/31, 15:39

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity	1	N/A	2021/09/02	CAM SOP-00448	SM 23 2320 B m
Carbonate, Bicarbonate and Hydroxide	1	N/A	2021/09/03	CAM SOP-00102	APHA 4500-CO2 D
Chloride by Automated Colourimetry	1	N/A	2021/09/01	CAM SOP-00463	SM 23 4500-Cl E m
Conductivity	1	N/A	2021/09/02	CAM SOP-00414	SM 23 2510 m
Dissolved Organic Carbon (DOC) (1)	1	N/A	2021/09/02	CAM SOP-00446	SM 23 5310 B m
Hardness (calculated as CaCO3)	1	N/A	2021/09/03	CAM SOP 00102/00408/00447	SM 2340 B
Metals Analysis by ICPMS (as received) (2)	1	N/A	2021/09/02	CAM SOP-00447	EPA 6020B m
Ion Balance (% Difference)	1	N/A	2021/09/03		
Anion and Cation Sum	1	N/A	2021/09/03		
Total Coliforms/ E. coli, CFU/100mL	1	N/A	2021/08/31	CAM SOP-00551	MOE E3407
Total Ammonia-N	1	N/A	2021/09/03	CAM SOP-00441	USGS I-2522-90 m
Nitrate (NO3) and Nitrite (NO2) in Water (3)	1	N/A	2021/09/04	CAM SOP-00440	SM 23 4500-NO3I/NO2B
pH	1	2021/09/01	2021/09/02	CAM SOP-00413	SM 4500H+ B m
Orthophosphate	1	N/A	2021/09/01	CAM SOP-00461	EPA 365.1 m
Sat. pH and Langelier Index (@ 20C)	1	N/A	2021/09/03		Auto Calc
Sat. pH and Langelier Index (@ 4C)	1	N/A	2021/09/03		Auto Calc
Sulphate by Automated Colourimetry	1	N/A	2021/09/01	CAM SOP-00464	EPA 375.4 m
Total Dissolved Solids (TDS calc)	1	N/A	2021/09/03		Auto Calc

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas 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. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report.



Your Project #: 21456909
Your C.O.C. #: 842982-01-01

Attention: Gregory Padusenko

Golder Associates Ltd
210 Sheldon Drive
Cambridge, ON
CANADA N1T 1A8

Report Date: 2021/09/07
Report #: R6799650
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C109389

Received: 2021/08/31, 15:39

Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

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. When sampling is not conducted by Bureau Veritas, results relate to the supplied 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) Metals analysis was performed on the sample 'as received'.

(3) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Ema Gitej, Senior Project Manager

Email: emese.gitej@bureauveritas.com

Phone# (905)817-5829

=====

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



RCAP - COMPREHENSIVE (DRINKING WATER)

BV Labs ID		QNK225		
Sampling Date		2021/08/31 11:00		
COC Number		842982-01-01		
	UNITS	PW21-1-1H	RDL	QC Batch
Calculated Parameters				
Anion Sum	me/L	7.86	N/A	7551574
Bicarb. Alkalinity (calc. as CaCO ₃)	mg/L	180	1.0	7551572
Calculated TDS	mg/L	480	1.0	7551581
Carb. Alkalinity (calc. as CaCO ₃)	mg/L	1.7	1.0	7551572
Cation Sum	me/L	8.57	N/A	7551574
Hardness (CaCO ₃)	mg/L	360	1.0	7551575
Ion Balance (% Difference)	%	4.29	N/A	7551573
Langelier Index (@ 20C)	N/A	0.758		7551576
Langelier Index (@ 4C)	N/A	0.510		7551577
Saturation pH (@ 20C)	N/A	7.25		7551576
Saturation pH (@ 4C)	N/A	7.50		7551577
Inorganics				
Total Ammonia-N	mg/L	0.18	0.050	7556775
Conductivity	umho/cm	720	1.0	7554995
Dissolved Organic Carbon	mg/L	0.49	0.40	7554317
Orthophosphate (P)	mg/L	<0.010	0.010	7553950
pH	pH	8.00		7554984
Dissolved Sulphate (SO ₄)	mg/L	190	1.0	7553936
Alkalinity (Total as CaCO ₃)	mg/L	180	1.0	7554993
Dissolved Chloride (Cl ⁻)	mg/L	8.5	1.0	7553932
Nitrite (N)	mg/L	<0.010	0.010	7554359
Nitrate (N)	mg/L	<0.10	0.10	7554359
Metals				
Aluminum (Al)	ug/L	350	4.9	7554226
Antimony (Sb)	ug/L	<0.50	0.50	7554226
Arsenic (As)	ug/L	1.8	1.0	7554226
Barium (Ba)	ug/L	24	2.0	7554226
Beryllium (Be)	ug/L	<0.40	0.40	7554226
Boron (B)	ug/L	70	10	7554226
Cadmium (Cd)	ug/L	<0.090	0.090	7554226
Calcium (Ca)	ug/L	89000	200	7554226
RDL = Reportable Detection Limit QC Batch = Quality Control Batch N/A = Not Applicable				



BV Labs Job #: C109389
Report Date: 2021/09/07

Golder Associates Ltd
Client Project #: 21456909
Sampler Initials: PGM

RCAP - COMPREHENSIVE (DRINKING WATER)

BV Labs ID		QNK225		
Sampling Date		2021/08/31 11:00		
COC Number		842982-01-01		
	UNITS	PW21-1-1H	RDL	QC Batch
Chromium (Cr)	ug/L	<5.0	5.0	7554226
Cobalt (Co)	ug/L	<0.50	0.50	7554226
Copper (Cu)	ug/L	6.0	0.90	7554226
Iron (Fe)	ug/L	610	100	7554226
Lead (Pb)	ug/L	2.7	0.50	7554226
Lithium (Li)	ug/L	5.8	5.0	7554226
Magnesium (Mg)	ug/L	33000	50	7554226
Manganese (Mn)	ug/L	58	2.0	7554226
Molybdenum (Mo)	ug/L	2.7	0.50	7554226
Nickel (Ni)	ug/L	1.1	1.0	7554226
Phosphorus (P)	ug/L	<100	100	7554226
Potassium (K)	ug/L	1200	200	7554226
Selenium (Se)	ug/L	<2.0	2.0	7554226
Silicon (Si)	ug/L	6400	50	7554226
Silver (Ag)	ug/L	<0.090	0.090	7554226
Sodium (Na)	ug/L	29000	100	7554226
Strontium (Sr)	ug/L	3500	1.0	7554226
Thallium (Tl)	ug/L	<0.050	0.050	7554226
Titanium (Ti)	ug/L	9.6	5.0	7554226
Uranium (U)	ug/L	0.21	0.10	7554226
Vanadium (V)	ug/L	0.79	0.50	7554226
Zinc (Zn)	ug/L	8.0	5.0	7554226
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				



BV Labs Job #: C109389
Report Date: 2021/09/07

Golder Associates Ltd
Client Project #: 21456909
Sampler Initials: PGM

MICROBIOLOGY (WATER)

BV Labs ID		QNK225	
Sampling Date		2021/08/31 11:00	
COC Number		842982-01-01	
	UNITS	PW21-1-1H	QC Batch
Microbiological			
Background	CFU/100mL	0	7552730
Total Coliforms	CFU/100mL	0	7552730
Escherichia coli	CFU/100mL	0	7552730
QC Batch = Quality Control Batch			



BV Labs Job #: C109389
Report Date: 2021/09/07

Golder Associates Ltd
Client Project #: 21456909
Sampler Initials: PGM

TEST SUMMARY

BV Labs ID: QNK225
Sample ID: PW21-1-1H
Matrix: Water

Collected: 2021/08/31
Shipped:
Received: 2021/08/31

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	7554993	N/A	2021/09/02	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	7551572	N/A	2021/09/03	Automated Statchk
Chloride by Automated Colourimetry	KONE	7553932	N/A	2021/09/01	Alina Dobreanu
Conductivity	AT	7554995	N/A	2021/09/02	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	7554317	N/A	2021/09/02	Julianna Castiglione
Hardness (calculated as CaCO ₃)		7551575	N/A	2021/09/03	Automated Statchk
Metals Analysis by ICPMS (as received)	ICP/MS	7554226	N/A	2021/09/02	Arefa Dabhad
Ion Balance (% Difference)	CALC	7551573	N/A	2021/09/03	Automated Statchk
Anion and Cation Sum	CALC	7551574	N/A	2021/09/03	Automated Statchk
Total Coliforms/ E. coli, CFU/100mL	PL	7552730	N/A	2021/08/31	Soham Patel
Total Ammonia-N	LACH/NH ₄	7556775	N/A	2021/09/03	Amanpreet Sappal
Nitrate (NO ₃) and Nitrite (NO ₂) in Water	LACH	7554359	N/A	2021/09/04	Nimarta Singh
pH	AT	7554984	2021/09/01	2021/09/02	Surinder Rai
Orthophosphate	KONE	7553950	N/A	2021/09/01	Avneet Kour Sudan
Sat. pH and Langelier Index (@ 20C)	CALC	7551576	N/A	2021/09/03	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	7551577	N/A	2021/09/03	Automated Statchk
Sulphate by Automated Colourimetry	KONE	7553936	N/A	2021/09/01	Alina Dobreanu
Total Dissolved Solids (TDS calc)	CALC	7551581	N/A	2021/09/03	Automated Statchk



BV Labs Job #: C109389
Report Date: 2021/09/07

Golder Associates Ltd
Client Project #: 21456909
Sampler Initials: PGM

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	8.3°C
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Results relate only to the items tested.

BUREAU
VERITAS

BV Labs Job #: C109389

Report Date: 2021/09/07

QUALITY ASSURANCE REPORT

Golder Associates Ltd

Client Project #: 21456909

Sampler Initials: PGM

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
7553932	Dissolved Chloride (Cl-)	2021/09/01	125 (1)	80 - 120	106	80 - 120	<1.0	mg/L	17	20
7553936	Dissolved Sulphate (SO4)	2021/09/01	103	75 - 125	107	80 - 120	<1.0	mg/L	NC	20
7553950	Orthophosphate (P)	2021/09/01	116	75 - 125	98	80 - 120	<0.010	mg/L	NC	25
7554226	Aluminum (Al)	2021/09/02	99	80 - 120	105	80 - 120	<4.9	ug/L	0.91	20
7554226	Antimony (Sb)	2021/09/02	100	80 - 120	101	80 - 120	<0.50	ug/L	NC	20
7554226	Arsenic (As)	2021/09/02	95	80 - 120	98	80 - 120	<1.0	ug/L	NC	20
7554226	Barium (Ba)	2021/09/02	98	80 - 120	98	80 - 120	<2.0	ug/L	0.63	20
7554226	Beryllium (Be)	2021/09/02	92	80 - 120	98	80 - 120	<0.40	ug/L	NC	20
7554226	Boron (B)	2021/09/02	92	80 - 120	93	80 - 120	<10	ug/L	1.4	20
7554226	Cadmium (Cd)	2021/09/02	100	80 - 120	101	80 - 120	<0.090	ug/L	NC	20
7554226	Calcium (Ca)	2021/09/02	NC	80 - 120	101	80 - 120	<200	ug/L	1.6	20
7554226	Chromium (Cr)	2021/09/02	91	80 - 120	96	80 - 120	<5.0	ug/L	NC	20
7554226	Cobalt (Co)	2021/09/02	96	80 - 120	96	80 - 120	<0.50	ug/L	NC	20
7554226	Copper (Cu)	2021/09/02	95	80 - 120	100	80 - 120	<0.90	ug/L	1.1	20
7554226	Iron (Fe)	2021/09/02	98	80 - 120	100	80 - 120	<100	ug/L	NC	20
7554226	Lead (Pb)	2021/09/02	93	80 - 120	99	80 - 120	<0.50	ug/L	NC	20
7554226	Lithium (Li)	2021/09/02	101	80 - 120	105	80 - 120	<5.0	ug/L	NC	20
7554226	Magnesium (Mg)	2021/09/02	93	80 - 120	101	80 - 120	<50	ug/L	1.3	20
7554226	Manganese (Mn)	2021/09/02	95	80 - 120	98	80 - 120	<2.0	ug/L	NC	20
7554226	Molybdenum (Mo)	2021/09/02	96	80 - 120	96	80 - 120	<0.50	ug/L	4.2	20
7554226	Nickel (Ni)	2021/09/02	91	80 - 120	96	80 - 120	<1.0	ug/L	NC	20
7554226	Phosphorus (P)	2021/09/02	NC	80 - 120	105	80 - 120	<100	ug/L	0.12	20
7554226	Potassium (K)	2021/09/02	98	80 - 120	102	80 - 120	<200	ug/L	0.59	20
7554226	Selenium (Se)	2021/09/02	99	80 - 120	101	80 - 120	<2.0	ug/L	NC	20
7554226	Silicon (Si)	2021/09/02	100	80 - 120	104	80 - 120	<50	ug/L	0.68	20
7554226	Silver (Ag)	2021/09/02	97	80 - 120	97	80 - 120	<0.090	ug/L	NC	20
7554226	Sodium (Na)	2021/09/02	96	80 - 120	104	80 - 120	<100	ug/L	2.5	20
7554226	Strontium (Sr)	2021/09/02	92	80 - 120	98	80 - 120	<1.0	ug/L	0.56	20
7554226	Thallium (Tl)	2021/09/02	97	80 - 120	99	80 - 120	<0.050	ug/L	NC	20
7554226	Titanium (Ti)	2021/09/02	96	80 - 120	99	80 - 120	<5.0	ug/L	NC	20
7554226	Uranium (U)	2021/09/02	99	80 - 120	101	80 - 120	<0.10	ug/L	8.9	20



BV Labs Job #: C109389
Report Date: 2021/09/07

QUALITY ASSURANCE REPORT(CONT'D)

Golder Associates Ltd
Client Project #: 21456909
Sampler Initials: PGM

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
7554226	Vanadium (V)	2021/09/02	91	80 - 120	93	80 - 120	<0.50	ug/L	NC	20
7554226	Zinc (Zn)	2021/09/02	93	80 - 120	98	80 - 120	<5.0	ug/L	0.33	20
7554317	Dissolved Organic Carbon	2021/09/01	96	80 - 120	97	80 - 120	<0.40	mg/L	3.2	20
7554359	Nitrate (N)	2021/09/04	103	80 - 120	99	80 - 120	<0.10	mg/L	NC	20
7554359	Nitrite (N)	2021/09/04	108	80 - 120	101	80 - 120	<0.010	mg/L	0	20
7554984	pH	2021/09/02			102	98 - 103			0.71	N/A
7554993	Alkalinity (Total as CaCO ₃)	2021/09/02			95	85 - 115	<1.0	mg/L	2.2	20
7554995	Conductivity	2021/09/02			99	85 - 115	<1.0	umho/cm	0.99	25
7556775	Total Ammonia-N	2021/09/03	98	75 - 125	100	80 - 120	<0.050	mg/L	NC	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.

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.



BV Labs Job #: C109389
Report Date: 2021/09/07

Golder Associates Ltd
Client Project #: 21456909
Sampler Initials: PGM

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Ewa Pranjić


Ewa Pranjić, M.Sc., C.Chem, Scientific Specialist

Soham N Patel

Soham Patel, Analyst 2

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



Bureau Veritas Laboratories
6740 Campbell Road, Mississauga, Ontario Canada L5N 2L8 Tel: (905) 817-5700 Toll-free 800-563-6266 Fax: (905) 817-5777 www.bvlab.com

CHAIN OF CUSTODY RECORD

Page 1 of 1

INVOICE TO:		REPORT TO:		PROJECT INFORMATION:		Laboratory Use Only:	
Company Name: #21375 Golder Associates Ltd		Company Name: Gregory Padusenko		Quotation #: B80683		BV Labs Job #:	
Attention: Accounts Payable		Attention: Gregory Padusenko		P.O. #: 21456909		Bottle Order #:	
Address: 210 Sheldon Drive		Address:		Project Name:		COC #:	
Cambridge ON N1T 1A8		Tel: (519) 620-8182 Ext: 6509 Fax: (519) 620-9878		Site #:		Project Manager:	
Tel: (519) 620-8182		Email: Gregory_Padusenko@golder.com		Sampled By: PGM		C#842982-01-01	
Email: CanadaAccountsPayableInvoices@golder.com						Ema Gitej	
MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE BV LABS DRINKING WATER CHAIN OF CUSTODY				ANALYSIS REQUESTED (PLEASE BE SPECIFIC)			
Regulation 153 (2011)		Other Regulations		Special Instructions		Turnaround Time (TAT) Required:	
☐ Table 1 ☐ Res/Park ☐ Medium/Fine		☐ CCME ☐ Sanitary Sewer Bylaw				Please provide advance notice for rush projects	
☐ Table 2 ☐ Ind/Comm ☐ Coarse		☐ Reg 558 ☐ Storm Sewer Bylaw				Regular (Standard) TAT:	
☐ Table 3 ☐ Agr/Other ☐ For RSC		☐ MISA Municipality				(will be applied if Rush TAT is not specified)	
☐ Table		☐ PWGO ☐ Reg 405 Table				Standard TAT = 5-7 Working days for most tests.	
		☐ Other				Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.	
Include Criteria on Certificate of Analysis (Y/N)?				Field Filtered (please circle):		Job Specific Rush TAT (if applies to entire submission)	
				Metals / Hg / Cr / V		Date Required: Time Required:	
				RCAP - Comprehensive		Rush Confirmation Number: (call lab for #)	
				Total Coliforms / E. coli, CFU/100mL		# of Bottles	
						Comments	
Sample Barcode Label				Sample (Location) Identification		Date Sampled	
Time Sampled				Matrix			
1				PW21-1-1h		21/08/31 11:00 GW	
2							
3							
4							
5							
6							
7							
8							
9							
10							
31-Aug-21 15:39							
Ema Gitej							
C109389							
REC'D IN WATERLOO							
MICRO							
* RELINQUISHED BY: (Signature/Print)		Date: (YY/MM/DD)		Time		RECEIVED BY: (Signature/Print)	
Date: (YY/MM/DD)		Time		# jars used and not submitted		Laboratory Use Only	
Time Sensitive		Temperature (°C) on Receipt		Custody Seal		Yes No	
Present		Intact					
White: BV Labs		Yellow: Client					
SAMPLES MUST BE KEPT COOL (< 10° C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BV LABS							



Your Project #: 21456909
Your C.O.C. #: 842982-02-01

Attention: Gregory Padusenko

Golder Associates Ltd
210 Sheldon Drive
Cambridge, ON
CANADA N1T 1A8

Report Date: 2021/09/08

Report #: R6801679

Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C1P0721

Received: 2021/09/01, 12:47

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity	1	N/A	2021/09/02	CAM SOP-00448	SM 23 2320 B m
Carbonate, Bicarbonate and Hydroxide	1	N/A	2021/09/03	CAM SOP-00102	APHA 4500-CO2 D
Chloride by Automated Colourimetry	1	N/A	2021/09/03	CAM SOP-00463	SM 23 4500-Cl E m
Conductivity	1	N/A	2021/09/02	CAM SOP-00414	SM 23 2510 m
Dissolved Organic Carbon (DOC) (1)	1	N/A	2021/09/04	CAM SOP-00446	SM 23 5310 B m
Hardness (calculated as CaCO3)	1	N/A	2021/09/08	CAM SOP 00102/00408/00447	SM 2340 B
Metals Analysis by ICPMS (as received) (2)	1	N/A	2021/09/07	CAM SOP-00447	EPA 6020B m
Ion Balance (% Difference)	1	N/A	2021/09/08		
Anion and Cation Sum	1	N/A	2021/09/08		
Total Coliforms/ E. coli, CFU/100mL	1	N/A	2021/09/01	CAM SOP-00551	MOE E3407
Total Ammonia-N	1	N/A	2021/09/07	CAM SOP-00441	USGS I-2522-90 m
Nitrate (NO3) and Nitrite (NO2) in Water (3)	1	N/A	2021/09/07	CAM SOP-00440	SM 23 4500-NO3I/NO2B
pH	1	2021/09/02	2021/09/02	CAM SOP-00413	SM 4500H+ B m
Orthophosphate	1	N/A	2021/09/07	CAM SOP-00461	EPA 365.1 m
Sat. pH and Langelier Index (@ 20C)	1	N/A	2021/09/08		Auto Calc
Sat. pH and Langelier Index (@ 4C)	1	N/A	2021/09/08		Auto Calc
Sulphate by Automated Colourimetry	1	N/A	2021/09/03	CAM SOP-00464	EPA 375.4 m
Total Dissolved Solids (TDS calc)	1	N/A	2021/09/08		Auto Calc

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas 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. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report.



Your Project #: 21456909
Your C.O.C. #: 842982-02-01

Attention: Gregory Padusenko

Golder Associates Ltd
210 Sheldon Drive
Cambridge, ON
CANADA N1T 1A8

Report Date: 2021/09/08
Report #: R6801679
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C1P0721

Received: 2021/09/01, 12:47

Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

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. When sampling is not conducted by Bureau Veritas, results relate to the supplied 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) Metals analysis was performed on the sample 'as received'.

(3) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Ema Gitej, Senior Project Manager

Email: emese.gitej@bureauveritas.com

Phone# (905)817-5829

=====

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RCAP - COMPREHENSIVE (DRINKING WATER)

BV Labs ID		QNR201		
Sampling Date		2021/09/01 10:00		
COC Number		842982-02-01		
	UNITS	PW21-1-24H	RDL	QC Batch
Calculated Parameters				
Anion Sum	me/L	8.58	N/A	7554531
Bicarb. Alkalinity (calc. as CaCO ₃)	mg/L	180	1.0	7554527
Calculated TDS	mg/L	510	1.0	7554151
Carb. Alkalinity (calc. as CaCO ₃)	mg/L	1.4	1.0	7554527
Cation Sum	me/L	8.39	N/A	7554531
Hardness (CaCO ₃)	mg/L	360	1.0	7553628
Ion Balance (% Difference)	%	1.10	N/A	7554530
Langelier Index (@ 20C)	N/A	0.654		7554532
Langelier Index (@ 4C)	N/A	0.406		7554533
Saturation pH (@ 20C)	N/A	7.27		7554532
Saturation pH (@ 4C)	N/A	7.52		7554533
Inorganics				
Total Ammonia-N	mg/L	0.19	0.050	7559941
Conductivity	umho/cm	770	1.0	7556506
Dissolved Organic Carbon	mg/L	<0.40	0.40	7557669
Orthophosphate (P)	mg/L	<0.010	0.010	7557512
pH	pH	7.93		7556498
Dissolved Sulphate (SO ₄)	mg/L	220	1.0	7557509
Alkalinity (Total as CaCO ₃)	mg/L	180	1.0	7556503
Dissolved Chloride (Cl ⁻)	mg/L	9.1	1.0	7557483
Nitrite (N)	mg/L	<0.010	0.010	7556524
Nitrate (N)	mg/L	<0.10	0.10	7556524
Metals				
Aluminum (Al)	ug/L	77	4.9	7556622
Antimony (Sb)	ug/L	<0.50	0.50	7556622
Arsenic (As)	ug/L	1.4	1.0	7556622
Barium (Ba)	ug/L	21	2.0	7556622
Beryllium (Be)	ug/L	<0.40	0.40	7556622
Boron (B)	ug/L	71	10	7556622
Cadmium (Cd)	ug/L	<0.090	0.090	7556622
Calcium (Ca)	ug/L	86000	200	7556622
RDL = Reportable Detection Limit QC Batch = Quality Control Batch N/A = Not Applicable				



BV Labs Job #: C1P0721
Report Date: 2021/09/08

Golder Associates Ltd
Client Project #: 21456909
Sampler Initials: PGM

RCAP - COMPREHENSIVE (DRINKING WATER)

BV Labs ID		QNR201		
Sampling Date		2021/09/01 10:00		
COC Number		842982-02-01		
	UNITS	PW21-1-24H	RDL	QC Batch
Chromium (Cr)	ug/L	<5.0	5.0	7556622
Cobalt (Co)	ug/L	<0.50	0.50	7556622
Copper (Cu)	ug/L	0.92	0.90	7556622
Iron (Fe)	ug/L	240	100	7556622
Lead (Pb)	ug/L	0.67	0.50	7556622
Lithium (Li)	ug/L	5.8	5.0	7556622
Magnesium (Mg)	ug/L	34000	50	7556622
Manganese (Mn)	ug/L	25	2.0	7556622
Molybdenum (Mo)	ug/L	3.1	0.50	7556622
Nickel (Ni)	ug/L	<1.0	1.0	7556622
Phosphorus (P)	ug/L	<100	100	7556622
Potassium (K)	ug/L	1100	200	7556622
Selenium (Se)	ug/L	<2.0	2.0	7556622
Silicon (Si)	ug/L	5900	50	7556622
Silver (Ag)	ug/L	<0.090	0.090	7556622
Sodium (Na)	ug/L	28000	100	7556622
Strontium (Sr)	ug/L	3600	1.0	7556622
Thallium (Tl)	ug/L	<0.050	0.050	7556622
Titanium (Ti)	ug/L	<5.0	5.0	7556622
Uranium (U)	ug/L	0.17	0.10	7556622
Vanadium (V)	ug/L	<0.50	0.50	7556622
Zinc (Zn)	ug/L	<5.0	5.0	7556622
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				



BV Labs Job #: C1P0721
Report Date: 2021/09/08

Golder Associates Ltd
Client Project #: 21456909
Sampler Initials: PGM

MICROBIOLOGY (WATER)

BV Labs ID		QNR201	
Sampling Date		2021/09/01 10:00	
COC Number		842982-02-01	
	UNITS	PW21-1-24H	QC Batch
Microbiological			
Background	CFU/100mL	0	7555081
Total Coliforms	CFU/100mL	0	7555081
Escherichia coli	CFU/100mL	0	7555081
QC Batch = Quality Control Batch			



BV Labs Job #: C1P0721
Report Date: 2021/09/08

Golder Associates Ltd
Client Project #: 21456909
Sampler Initials: PGM

TEST SUMMARY

BV Labs ID: QNR201
Sample ID: PW21-1-24H
Matrix: Water

Collected: 2021/09/01
Shipped:
Received: 2021/09/01

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	7556503	N/A	2021/09/02	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	7554527	N/A	2021/09/03	Automated Statchk
Chloride by Automated Colourimetry	KONE	7557483	N/A	2021/09/03	Alina Dobreanu
Conductivity	AT	7556506	N/A	2021/09/02	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	7557669	N/A	2021/09/04	Nimarta Singh
Hardness (calculated as CaCO ₃)		7553628	N/A	2021/09/08	Automated Statchk
Metals Analysis by ICPMS (as received)	ICP/MS	7556622	N/A	2021/09/07	Nan Raykha
Ion Balance (% Difference)	CALC	7554530	N/A	2021/09/08	Automated Statchk
Anion and Cation Sum	CALC	7554531	N/A	2021/09/08	Automated Statchk
Total Coliforms/ E. coli, CFU/100mL	PL	7555081	N/A	2021/09/01	Soham Patel
Total Ammonia-N	LACH/NH ₄	7559941	N/A	2021/09/07	Viorica Rotaru
Nitrate (NO ₃) and Nitrite (NO ₂) in Water	LACH	7556524	N/A	2021/09/07	Chandra Nandlal
pH	AT	7556498	2021/09/02	2021/09/02	Surinder Rai
Orthophosphate	KONE	7557512	N/A	2021/09/07	Avneet Kour Sudan
Sat. pH and Langelier Index (@ 20C)	CALC	7554532	N/A	2021/09/08	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	7554533	N/A	2021/09/08	Automated Statchk
Sulphate by Automated Colourimetry	KONE	7557509	N/A	2021/09/03	Alina Dobreanu
Total Dissolved Solids (TDS calc)	CALC	7554151	N/A	2021/09/08	Automated Statchk



BV Labs Job #: C1P0721
Report Date: 2021/09/08

Golder Associates Ltd
Client Project #: 21456909
Sampler Initials: PGM

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	15.0°C
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Results relate only to the items tested.



BV Labs Job #: C1P0721
Report Date: 2021/09/08

QUALITY ASSURANCE REPORT

Golder Associates Ltd
Client Project #: 21456909
Sampler Initials: PGM

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
7556498	pH	2021/09/02			102	98 - 103			0.16	N/A
7556503	Alkalinity (Total as CaCO3)	2021/09/02			97	85 - 115	<1.0	mg/L	1.3	20
7556506	Conductivity	2021/09/02			99	85 - 115	<1.0	umho/cm	0.27	25
7556524	Nitrate (N)	2021/09/07	97	80 - 120	100	80 - 120	<0.10	mg/L	NC	20
7556524	Nitrite (N)	2021/09/07	102	80 - 120	102	80 - 120	<0.010	mg/L	NC	20
7556622	Aluminum (Al)	2021/09/07	105	80 - 120	104	80 - 120	<4.9	ug/L	1.9	20
7556622	Antimony (Sb)	2021/09/07	103	80 - 120	103	80 - 120	<0.50	ug/L	NC	20
7556622	Arsenic (As)	2021/09/07	100	80 - 120	99	80 - 120	<1.0	ug/L	NC	20
7556622	Barium (Ba)	2021/09/07	102	80 - 120	100	80 - 120	<2.0	ug/L	1.7	20
7556622	Beryllium (Be)	2021/09/07	101	80 - 120	99	80 - 120	<0.40	ug/L	NC	20
7556622	Boron (B)	2021/09/07	NC	80 - 120	99	80 - 120	<10	ug/L	5.5	20
7556622	Cadmium (Cd)	2021/09/07	99	80 - 120	99	80 - 120	<0.090	ug/L	NC	20
7556622	Calcium (Ca)	2021/09/07	100	80 - 120	98	80 - 120	<200	ug/L	0.79	20
7556622	Chromium (Cr)	2021/09/07	99	80 - 120	101	80 - 120	<5.0	ug/L	NC	20
7556622	Cobalt (Co)	2021/09/07	99	80 - 120	99	80 - 120	<0.50	ug/L	NC	20
7556622	Copper (Cu)	2021/09/07	100	80 - 120	100	80 - 120	<0.90	ug/L	1.4	20
7556622	Iron (Fe)	2021/09/07	99	80 - 120	100	80 - 120	<100	ug/L	NC	20
7556622	Lead (Pb)	2021/09/07	99	80 - 120	98	80 - 120	<0.50	ug/L	1.6	20
7556622	Lithium (Li)	2021/09/07	102	80 - 120	102	80 - 120	<5.0	ug/L	1.2	20
7556622	Magnesium (Mg)	2021/09/07	96	80 - 120	102	80 - 120	<50	ug/L	0.17	20
7556622	Manganese (Mn)	2021/09/07	97	80 - 120	98	80 - 120	<2.0	ug/L	NC	20
7556622	Molybdenum (Mo)	2021/09/07	101	80 - 120	102	80 - 120	<0.50	ug/L	5.2	20
7556622	Nickel (Ni)	2021/09/07	97	80 - 120	97	80 - 120	<1.0	ug/L	2.3	20
7556622	Phosphorus (P)	2021/09/07	110	80 - 120	113	80 - 120	<100	ug/L	1.3	20
7556622	Potassium (K)	2021/09/07	100	80 - 120	101	80 - 120	<200	ug/L	0.42	20
7556622	Selenium (Se)	2021/09/07	99	80 - 120	99	80 - 120	<2.0	ug/L	NC	20
7556622	Silicon (Si)	2021/09/07	107	80 - 120	104	80 - 120	<50	ug/L	1.7	20
7556622	Silver (Ag)	2021/09/07	97	80 - 120	98	80 - 120	<0.090	ug/L	NC	20
7556622	Sodium (Na)	2021/09/07	98	80 - 120	100	80 - 120	<100	ug/L	0.71	20
7556622	Strontium (Sr)	2021/09/07	100	80 - 120	99	80 - 120	<1.0	ug/L	0.80	20
7556622	Thallium (Tl)	2021/09/07	98	80 - 120	97	80 - 120	<0.050	ug/L	NC	20



BV Labs Job #: C1P0721
Report Date: 2021/09/08

QUALITY ASSURANCE REPORT(CONT'D)

Golder Associates Ltd
Client Project #: 21456909
Sampler Initials: PGM

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
7556622	Titanium (Ti)	2021/09/07	103	80 - 120	100	80 - 120	<5.0	ug/L	NC	20
7556622	Uranium (U)	2021/09/07	100	80 - 120	100	80 - 120	<0.10	ug/L	5.8	20
7556622	Vanadium (V)	2021/09/07	97	80 - 120	97	80 - 120	<0.50	ug/L	NC	20
7556622	Zinc (Zn)	2021/09/07	98	80 - 120	97	80 - 120	<5.0	ug/L	4.6	20
7557483	Dissolved Chloride (Cl-)	2021/09/03	123 (1)	80 - 120	107	80 - 120	<1.0	mg/L	9.2	20
7557509	Dissolved Sulphate (SO4)	2021/09/03	128 (1)	75 - 125	99	80 - 120	<1.0	mg/L	NC	20
7557512	Orthophosphate (P)	2021/09/07	126 (1)	75 - 125	100	80 - 120	<0.010	mg/L	NC	25
7557669	Dissolved Organic Carbon	2021/09/04	92	80 - 120	96	80 - 120	<0.40	mg/L	0.35	20
7559941	Total Ammonia-N	2021/09/07	99	75 - 125	100	80 - 120	<0.050	mg/L	NC	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.

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 $\leq 2 \times$ RDL).

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.



BV Labs Job #: C1P0721
Report Date: 2021/09/08

Golder Associates Ltd
Client Project #: 21456909
Sampler Initials: PGM

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Ewa Pranjić


Ewa Pranjić, M.Sc., C.Chem, Scientific Specialist

Soham N Patel

Soham Patel, Analyst 2

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CHAIN OF CUSTODY RECORD

Page 1 of 1

INVOICE TO:		REPORT TO:		PROJECT INFORMATION:		Laboratory Use Only:	
Company Name:	#21375 Golder Associates Ltd	Company Name:		Quotation #:	B80683	BV Labs Job #:	
Attention:	Accounts Payable	Attention:	Gregory Padusenko	P.O. #:		Bottle Order #:	
Address:	210 Sheldon Drive Cambridge ON N1T 1A8	Address:		Project:	21456909		
Tel:	(519) 620-8182	Tel:	(519) 620-8182 Ext: 6509	Project Name:		COC #:	
Email:	CanadaAccountsPayableInvoices@golder.com	Email:	Gregory_Padusenko@golder.com	Site #:			
				Sampled By:	PEM		

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE BV LABS DRINKING WATER CHAIN OF CUSTODY						ANALYSIS REQUESTED (PLEASE BE SPECIFIC)										Turnaround Time (TAT) Required: Please provide advance notice for rush projects				
Regulation 153 (2011) ☐ Table 1 ☐ Res/Park ☐ Medium/Fine ☐ Table 2 ☐ Ind/Comm ☐ Coarse ☐ Table 3 ☐ Agr/Other ☐ For RSC ☐ Table _____			Other Regulations ☐ CCME ☐ Sanitary Sewer Bylaw ☐ Reg 558 ☐ Storm Sewer Bylaw ☐ MISA ☐ Municipality _____ ☐ PWQO ☐ Reg 406 Table _____ ☐ Other _____			Special Instructions 			Field Filtered (please circle) Metals / Hg / Cr VI RCAp - Comprehensive Total Coliforms/ E. coli, CFU/100mL										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 #)	
Include Criteria on Certificate of Analysis (Y/N)? _____																				
	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix											# of Bottles Comments				
1		PW21-1-24h	21/09/01	10:00	GW												5 metals as received			
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				

* RELINQUISHED BY: (Signature/Print)		Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)		Date: (YY/MM/DD)	Time	# jars used and not submitted	Laboratory Use Only	
Paul Marshall		21/09/01	12:45	Jay Dipka		21/09/01	12:47		Time Sensitive Temperature (°C) on Receipt 14/15/16	
									Custody Seal Present Intact	

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BV LABS' STANDARD TERMS AND CONDITIONS. SIGNED BY THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVLABS.COM/TERMS-AND-CONDITIONS.

* 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 WWW.BVLABS.COM/RESOURCES/CHAIN-OF-CUSTODY-FORMS.

SAMPLES MUST BE KEPT COOL (< 10° C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BV LABS

White: BV Labs Yellow: Client

1244701104 11/19



Your Project #: 21456909
Your C.O.C. #: 842982-03-01

Attention: Gregory Padusenko

Golder Associates Ltd
210 Sheldon Drive
Cambridge, ON
CANADA N1T 1A8

Report Date: 2021/09/09
Report #: R6803629
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C1P4142

Received: 2021/09/03, 13:54

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity	1	N/A	2021/09/07	CAM SOP-00448	SM 23 2320 B m
Carbonate, Bicarbonate and Hydroxide	1	N/A	2021/09/08	CAM SOP-00102	APHA 4500-CO2 D
Chloride by Automated Colourimetry	1	N/A	2021/09/07	CAM SOP-00463	SM 23 4500-Cl E m
Conductivity	1	N/A	2021/09/07	CAM SOP-00414	SM 23 2510 m
Dissolved Organic Carbon (DOC) (1)	1	N/A	2021/09/08	CAM SOP-00446	SM 23 5310 B m
Hardness (calculated as CaCO3)	1	N/A	2021/09/08	CAM SOP 00102/00408/00447	SM 2340 B
Metals Analysis by ICPMS (as received) (2)	1	N/A	2021/09/08	CAM SOP-00447	EPA 6020B m
Ion Balance (% Difference)	1	N/A	2021/09/08		
Anion and Cation Sum	1	N/A	2021/09/08		
Total Coliforms/ E. coli, CFU/100mL	1	N/A	2021/09/03	CAM SOP-00551	MOE E3407
Total Ammonia-N	1	N/A	2021/09/09	CAM SOP-00441	USGS I-2522-90 m
Nitrate (NO3) and Nitrite (NO2) in Water (3)	1	N/A	2021/09/07	CAM SOP-00440	SM 23 4500-NO3I/NO2B
pH	1	2021/09/04	2021/09/07	CAM SOP-00413	SM 4500H+ B m
Orthophosphate	1	N/A	2021/09/07	CAM SOP-00461	EPA 365.1 m
Sat. pH and Langelier Index (@ 20C)	1	N/A	2021/09/08		Auto Calc
Sat. pH and Langelier Index (@ 4C)	1	N/A	2021/09/08		Auto Calc
Sulphate by Automated Colourimetry	1	N/A	2021/09/07	CAM SOP-00464	EPA 375.4 m
Total Dissolved Solids (TDS calc)	1	N/A	2021/09/08		Auto Calc

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas 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. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report.



Your Project #: 21456909
Your C.O.C. #: 842982-03-01

Attention: Gregory Padusenko

Golder Associates Ltd
210 Sheldon Drive
Cambridge, ON
CANADA N1T 1A8

Report Date: 2021/09/09
Report #: R6803629
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C1P4142

Received: 2021/09/03, 13:54

Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

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. When sampling is not conducted by Bureau Veritas, results relate to the supplied 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) Metals analysis was performed on the sample 'as received'.

(3) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Ema Gitej, Senior Project Manager

Email: emese.gitej@bureauveritas.com

Phone# (905)817-5829

=====

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



RCAP - COMPREHENSIVE (DRINKING WATER)

BV Labs ID		QOI301		
Sampling Date		2021/09/03 10:15		
COC Number		842982-03-01		
	UNITS	PW21-1-72H	RDL	QC Batch
Calculated Parameters				
Anion Sum	me/L	9.13	N/A	7559095
Bicarb. Alkalinity (calc. as CaCO ₃)	mg/L	180	1.0	7559092
Calculated TDS	mg/L	540	1.0	7559099
Carb. Alkalinity (calc. as CaCO ₃)	mg/L	2.2	1.0	7559092
Cation Sum	me/L	8.82	N/A	7559095
Hardness (CaCO ₃)	mg/L	380	1.0	7558603
Ion Balance (% Difference)	%	1.75	N/A	7559094
Langelier Index (@ 20C)	N/A	0.883		7559096
Langelier Index (@ 4C)	N/A	0.635		7559098
Saturation pH (@ 20C)	N/A	7.23		7559096
Saturation pH (@ 4C)	N/A	7.48		7559098
Inorganics				
Total Ammonia-N	mg/L	0.21	0.050	7564734
Conductivity	umho/cm	790	1.0	7560958
Dissolved Organic Carbon	mg/L	0.49	0.40	7562606
Orthophosphate (P)	mg/L	<0.010	0.010	7561002
pH	pH	8.12		7560957
Dissolved Sulphate (SO ₄)	mg/L	250	1.0	7561000
Alkalinity (Total as CaCO ₃)	mg/L	180	1.0	7560955
Dissolved Chloride (Cl ⁻)	mg/L	10	1.0	7560992
Nitrite (N)	mg/L	<0.010	0.010	7560968
Nitrate (N)	mg/L	<0.10	0.10	7560968
Metals				
Aluminum (Al)	ug/L	<4.9	4.9	7563979
Antimony (Sb)	ug/L	<0.50	0.50	7563979
Arsenic (As)	ug/L	1.5	1.0	7563979
Barium (Ba)	ug/L	21	2.0	7563979
Beryllium (Be)	ug/L	<0.40	0.40	7563979
Boron (B)	ug/L	70	10	7563979
Cadmium (Cd)	ug/L	<0.090	0.090	7563979
Calcium (Ca)	ug/L	96000	200	7563979
RDL = Reportable Detection Limit QC Batch = Quality Control Batch N/A = Not Applicable				



BV Labs Job #: C1P4142
Report Date: 2021/09/09

Golder Associates Ltd
Client Project #: 21456909
Sampler Initials: PGM

RCAP - COMPREHENSIVE (DRINKING WATER)

BV Labs ID		QOI301		
Sampling Date		2021/09/03 10:15		
COC Number		842982-03-01		
	UNITS	PW21-1-72H	RDL	QC Batch
Chromium (Cr)	ug/L	<5.0	5.0	7563979
Cobalt (Co)	ug/L	<0.50	0.50	7563979
Copper (Cu)	ug/L	<0.90	0.90	7563979
Iron (Fe)	ug/L	120	100	7563979
Lead (Pb)	ug/L	<0.50	0.50	7563979
Lithium (Li)	ug/L	5.6	5.0	7563979
Magnesium (Mg)	ug/L	34000	50	7563979
Manganese (Mn)	ug/L	19	2.0	7563979
Molybdenum (Mo)	ug/L	3.2	0.50	7563979
Nickel (Ni)	ug/L	<1.0	1.0	7563979
Phosphorus (P)	ug/L	<100	100	7563979
Potassium (K)	ug/L	1100	200	7563979
Selenium (Se)	ug/L	<2.0	2.0	7563979
Silicon (Si)	ug/L	5800	50	7563979
Silver (Ag)	ug/L	<0.090	0.090	7563979
Sodium (Na)	ug/L	27000	100	7563979
Strontium (Sr)	ug/L	3800	1.0	7563979
Thallium (Tl)	ug/L	<0.050	0.050	7563979
Titanium (Ti)	ug/L	<5.0	5.0	7563979
Uranium (U)	ug/L	0.21	0.10	7563979
Vanadium (V)	ug/L	<0.50	0.50	7563979
Zinc (Zn)	ug/L	<5.0	5.0	7563979
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				



BV Labs Job #: C1P4142
Report Date: 2021/09/09

Golder Associates Ltd
Client Project #: 21456909
Sampler Initials: PGM

MICROBIOLOGY (WATER)

BV Labs ID		QOI301	
Sampling Date		2021/09/03 10:15	
COC Number		842982-03-01	
	UNITS	PW21-1-72H	QC Batch
Microbiological			
Background	CFU/100mL	0	7560239
Total Coliforms	CFU/100mL	0	7560239
Escherichia coli	CFU/100mL	0	7560239
QC Batch = Quality Control Batch			



BV Labs Job #: C1P4142
Report Date: 2021/09/09

Golder Associates Ltd
Client Project #: 21456909
Sampler Initials: PGM

TEST SUMMARY

BV Labs ID: QOI301
Sample ID: PW21-1-72H
Matrix: Water

Collected: 2021/09/03
Shipped:
Received: 2021/09/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	7560955	N/A	2021/09/07	Yogesh Patel
Carbonate, Bicarbonate and Hydroxide	CALC	7559092	N/A	2021/09/08	Automated Statchk
Chloride by Automated Colourimetry	KONE	7560992	N/A	2021/09/07	Alina Dobreanu
Conductivity	AT	7560958	N/A	2021/09/07	Yogesh Patel
Dissolved Organic Carbon (DOC)	TOCV/NDIR	7562606	N/A	2021/09/08	Julianna Castiglione
Hardness (calculated as CaCO ₃)		7558603	N/A	2021/09/08	Automated Statchk
Metals Analysis by ICPMS (as received)	ICP/MS	7563979	N/A	2021/09/08	Arefa Dabhad
Ion Balance (% Difference)	CALC	7559094	N/A	2021/09/08	Automated Statchk
Anion and Cation Sum	CALC	7559095	N/A	2021/09/08	Automated Statchk
Total Coliforms/ E. coli, CFU/100mL	PL	7560239	N/A	2021/09/03	Soham Patel
Total Ammonia-N	LACH/NH ₄	7564734	N/A	2021/09/09	Viorica Rotaru
Nitrate (NO ₃) and Nitrite (NO ₂) in Water	LACH	7560968	N/A	2021/09/07	Chandra Nandlal
pH	AT	7560957	2021/09/04	2021/09/07	Yogesh Patel
Orthophosphate	KONE	7561002	N/A	2021/09/07	Avneet Kour Sudan
Sat. pH and Langelier Index (@ 20C)	CALC	7559096	N/A	2021/09/08	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	7559098	N/A	2021/09/08	Automated Statchk
Sulphate by Automated Colourimetry	KONE	7561000	N/A	2021/09/07	Avneet Kour Sudan
Total Dissolved Solids (TDS calc)	CALC	7559099	N/A	2021/09/08	Automated Statchk



BV Labs Job #: C1P4142
Report Date: 2021/09/09

Golder Associates Ltd
Client Project #: 21456909
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GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	10.7°C
Package 2	15.0°C

Results relate only to the items tested.



BV Labs Job #: C1P4142
Report Date: 2021/09/09

QUALITY ASSURANCE REPORT

Golder Associates Ltd
Client Project #: 21456909
Sampler Initials: PGM

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
7560955	Alkalinity (Total as CaCO ₃)	2021/09/07			95	85 - 115	<1.0	mg/L	0.40	20
7560957	pH	2021/09/07			101	98 - 103			2.0	N/A
7560958	Conductivity	2021/09/07			100	85 - 115	<1.0	umho/cm	0.35	25
7560968	Nitrate (N)	2021/09/07	99	80 - 120	101	80 - 120	<0.10	mg/L	NC	20
7560968	Nitrite (N)	2021/09/07	104	80 - 120	103	80 - 120	<0.010	mg/L	NC	20
7560992	Dissolved Chloride (Cl ⁻)	2021/09/07	104	80 - 120	103	80 - 120	<1.0	mg/L	4.7	20
7561000	Dissolved Sulphate (SO ₄)	2021/09/07	115	75 - 125	100	80 - 120	<1.0	mg/L	0.31	20
7561002	Orthophosphate (P)	2021/09/07	NC	75 - 125	100	80 - 120	<0.010	mg/L	13	25
7562606	Dissolved Organic Carbon	2021/09/08	80	80 - 120	96	80 - 120	<0.40	mg/L	0.84	20
7563979	Aluminum (Al)	2021/09/08	101	80 - 120	102	80 - 120	<4.9	ug/L		
7563979	Antimony (Sb)	2021/09/08	112	80 - 120	104	80 - 120	<0.50	ug/L		
7563979	Arsenic (As)	2021/09/08	98	80 - 120	101	80 - 120	<1.0	ug/L		
7563979	Barium (Ba)	2021/09/08	99	80 - 120	101	80 - 120	<2.0	ug/L		
7563979	Beryllium (Be)	2021/09/08	97	80 - 120	100	80 - 120	<0.40	ug/L		
7563979	Boron (B)	2021/09/08	88	80 - 120	94	80 - 120	<10	ug/L		
7563979	Cadmium (Cd)	2021/09/08	101	80 - 120	100	80 - 120	<0.090	ug/L		
7563979	Calcium (Ca)	2021/09/08	NC	80 - 120	103	80 - 120	<200	ug/L		
7563979	Chromium (Cr)	2021/09/08	93	80 - 120	97	80 - 120	<5.0	ug/L		
7563979	Cobalt (Co)	2021/09/08	96	80 - 120	100	80 - 120	<0.50	ug/L		
7563979	Copper (Cu)	2021/09/08	101	80 - 120	102	80 - 120	<0.90	ug/L		
7563979	Iron (Fe)	2021/09/08	94	80 - 120	99	80 - 120	<100	ug/L		
7563979	Lead (Pb)	2021/09/08	97	80 - 120	99	80 - 120	<0.50	ug/L	0.96	20
7563979	Lithium (Li)	2021/09/08	103	80 - 120	109	80 - 120	<5.0	ug/L		
7563979	Magnesium (Mg)	2021/09/08	92	80 - 120	100	80 - 120	<50	ug/L		
7563979	Manganese (Mn)	2021/09/08	95	80 - 120	100	80 - 120	<2.0	ug/L		
7563979	Molybdenum (Mo)	2021/09/08	101	80 - 120	99	80 - 120	<0.50	ug/L		
7563979	Nickel (Ni)	2021/09/08	94	80 - 120	98	80 - 120	<1.0	ug/L		
7563979	Phosphorus (P)	2021/09/08	99	80 - 120	104	80 - 120	<100	ug/L		
7563979	Potassium (K)	2021/09/08	100	80 - 120	101	80 - 120	<200	ug/L		
7563979	Selenium (Se)	2021/09/08	101	80 - 120	101	80 - 120	<2.0	ug/L		
7563979	Silicon (Si)	2021/09/08	103	80 - 120	104	80 - 120	<50	ug/L		



BV Labs Job #: C1P4142
Report Date: 2021/09/09

QUALITY ASSURANCE REPORT(CONT'D)

Golder Associates Ltd
Client Project #: 21456909
Sampler Initials: PGM

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
7563979	Silver (Ag)	2021/09/08	98	80 - 120	97	80 - 120	<0.090	ug/L		
7563979	Sodium (Na)	2021/09/08	94	80 - 120	98	80 - 120	<100	ug/L		
7563979	Strontium (Sr)	2021/09/08	94	80 - 120	101	80 - 120	<1.0	ug/L		
7563979	Thallium (Tl)	2021/09/08	100	80 - 120	99	80 - 120	<0.050	ug/L		
7563979	Titanium (Ti)	2021/09/08	98	80 - 120	100	80 - 120	<5.0	ug/L		
7563979	Uranium (U)	2021/09/08	100	80 - 120	96	80 - 120	<0.10	ug/L		
7563979	Vanadium (V)	2021/09/08	93	80 - 120	97	80 - 120	<0.50	ug/L		
7563979	Zinc (Zn)	2021/09/08	95	80 - 120	101	80 - 120	<5.0	ug/L		
7564734	Total Ammonia-N	2021/09/09	101	75 - 125	99	80 - 120	<0.050	mg/L	15	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.

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 $\leq 2 \times \text{RDL}$).



BV Labs Job #: C1P4142
Report Date: 2021/09/09

Golder Associates Ltd
Client Project #: 21456909
Sampler Initials: PGM

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Ewa Pranjić


Ewa Pranjić, M.Sc., C.Chem, Scientific Specialist

Soham N Patel

Soham Patel, Analyst 2

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



Bureau Veritas Laboratories
6740 Campbell Road, Mississauga, Ontario Canada L5N 2L8 Tel: (905) 817-5700 Toll-free 800-563-6266 Fax: (905) 817-5777 www.bvlabs.com

CHAIN OF CUSTODY RECORD

Page 1 of 1

INVOICE TO:			REPORT TO:			PROJECT INFORMATION:			Laboratory Use Only:																
Company Name: #21375 Golder Associates Ltd			Company Name: Gregory Padusenko			Quotation #: B80683			BV Labs Job #:																
Attention: Accounts Payable			Attention: Gregory Padusenko			P.O. #:			Bottle Order #:																
Address: 210 Sheldon Drive			Address:			Project: 21456909			COC #:																
Cambridge ON N1T 1A8			Tel: (519) 620-8182 Ext: 6509 Fax: (519) 620-9878			Project Name:			Project Manager:																
Tel: (519) 620-8182			Email: Gregory_Padusenko@golder.com			Site #:			Ema Gitej																
Email: CanadaAccountsPayableInvoices@golder.com						Sampled By: PGM			C#842982-03-01																
MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE BV LABS DRINKING WATER CHAIN OF CUSTODY						ANALYSIS REQUESTED (PLEASE BE SPECIFIC)						Turnaround Time (TAT) Required:													
Regulation 153 (2011)						Other Regulations						Special Instructions													
☐ Table 1 ☐ Res/Park ☐ Medium/Fine						☐ CCME ☐ Sanitary Sewer Bylaw																			
☐ Table 2 ☐ Ind/Comm ☐ Coarse						☐ Reg 558 ☐ Storm Sewer Bylaw																			
☐ Table 3 ☐ Agri/Other ☐ For RSC						☐ MISA ☐ Municipality																			
☐ Table 4						☐ PWQO ☐ Reg 406 Table																			
☐ Other																									
Include Criteria on Certificate of Analysis (Y/N)?																									
Sample Barcode Label		Sample (Location) Identification		Date Sampled		Time Sampled		Matrix		Field Filtered (please circle):		Metals / Hg / Cr / VI		ICAP - Comprehensive		Total Coliforms E. coli CFU/100mL		# of Bottles		Comments					
1		PW21-1-72h		21/09/03		10:15		6W						X		X		5		-metals as received -discard labelled date					
2																									
3																									
4																									
5																									
6																									
7																									
8																									
9																									
10																									
* RELINQUISHED BY: (Signature/Print)				Date: (YY/MM/DD)		Time		RECEIVED BY: (Signature/Print)				Date: (YY/MM/DD)		Time		# jars used and not submitted		Laboratory Use Only							
PD PMA / Paul Markard				21/09/03		13:55		Gregory Padusenko				2021/09/03		13:54				Time Sensitive							
												21/09/03		18:05				Temperature (°C) on Receipt							
																		Custody Seal							
																		Present							
																		Intact							
																		Yes							
																		No							
* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BV LABS' 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.BVLABS.COM/TERMS-AND-CONDITIONS.																		White: BV Labs				Yellow: Client			
* 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.																		SAMPLES MUST BE KEPT COOL (< 10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BV LABS							
** SAMPLE CONTAINER, PRESERVATION, HOLD TIME AND PACKAGE INFORMATION CAN BE VIEWED AT WWW.BVLABS.COM/RESOURCES/CHAIN-OF-CUSTODY-FORMS.																									

Bureau Veritas Canada (2019) Inc.

WTH 421156 7/7/4 9/4/6 9/4/9



Your Project #: 21456909
Your C.O.C. #: 842984-01-01

Attention: Gregory Padusenko

Golder Associates Ltd
210 Sheldon Drive
Cambridge, ON
CANADA N1T 1A8

Report Date: 2021/10/06
Report #: R6842011
Version: 4 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C1P4129

Received: 2021/09/03, 13:54

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity	1	N/A	2021/09/07	CAM SOP-00448	SM 23 2320 B m
Chloride by Automated Colourimetry	1	N/A	2021/09/07	CAM SOP-00463	SM 23 4500-Cl E m
Colour	1	N/A	2021/09/09	CAM SOP-00412	SM 23 2120C m
Free (WAD) Cyanide	1	N/A	2021/09/10	CAM SOP-00457	OMOE E3015 m
Dioxins/Furans in Water (1613B) (1)	1	2021/10/01	2021/10/04	BRL SOP-00410	EPA 1613B m
Diuron, Guthion, Temephos	1	2021/09/10	2021/09/10	CAM SOP-00306	EPA 532 m
Dissolved Organic Carbon (DOC) (2)	1	N/A	2021/09/08	CAM SOP-00446	SM 23 5310 B m
Diquat / Paraquat	1	2021/09/07	2021/09/09	CAM SOP-00327	EPA 549.2 m
Fluoride	1	2021/09/04	2021/09/07	CAM SOP-00449	SM 23 4500-F C m
Glyphosate	1	2021/09/09	2021/09/09	CAM SOP-00305	HPLC in-house method
Hardness (calculated as CaCO ₃)	1	N/A	2021/09/08	CAM SOP 00102/00408/00447	SM 2340 B
Mercury in Water by CVAA	1	2021/09/07	2021/09/07	CAM SOP-00453	EPA 7470A m
Metals Analysis by ICPMS (as received) (3)	1	N/A	2021/09/07	CAM SOP-00447	EPA 6020B m
Total Coliforms/ E. coli, CFU/100mL	1	N/A	2021/09/03	CAM SOP-00551	MOE E3407
Dissolved Methane in Water	1	N/A	2021/09/08	CAM SOP-00219 Modified Combustible Gas Indicator Method	RSKSOP-175 m
Heterotrophic plate count, (CFU/mL)	1	N/A	2021/09/03	CAM SOP-00512	SM 9215B
Microcystin	1	N/A	2021/09/08	CAM SOP-00476	OMECC-LSB E3469
NDMA in Drinking Water (MSABN-3291Amod)	1	2021/09/09	2021/09/14	BRL SOP-00012	MOE Method E3388
Total Ammonia-N	1	N/A	2021/09/09	CAM SOP-00441	USGS I-2522-90 m
Nitrate (NO ₃) and Nitrite (NO ₂) in Water (4)	1	N/A	2021/09/07	CAM SOP-00440	SM 23 4500-NO ₃ /NO ₂ B
Nitrilotriacetic Acid (NTA) (5)	1	2021/09/07	2021/09/07	CAM SOP-00411	EPA 430.1 m
OC Pesticides (Selected) & PCB (6)	1	2021/09/08	2021/09/10	CAM SOP-00307	EPA 8081A/ 8082B m
OC Pesticides Summed Parameters	1	N/A	2021/09/04	CAM SOP-00307	EPA 8081A/8082B m
ODWS - Semi-Volatiles	1	2021/09/09	2021/09/10	CAM SOP-00301	EPA 8270 m
Organic Nitrogen	1	N/A	2021/09/10	Auto Calc.	
pH	1	2021/09/04	2021/09/07	CAM SOP-00413	SM 4500H+ B m
Sulphate by Automated Colourimetry	1	N/A	2021/09/07	CAM SOP-00464	EPA 375.4 m
Sulphide	1	N/A	2021/09/07	CAM SOP-00455	SM 23 4500-S G m



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CERTIFICATE OF ANALYSIS

BV LABS JOB #: C1P4129

Received: 2021/09/03, 13:54

Sample Matrix: Water
Samples Received: 1

Analyses	Date		Laboratory Method	Analytical Method
	Quantity	Extracted		
Total Dissolved Solids (TDS calc)	1	N/A	2021/09/08	Auto Calc
Total Kjeldahl Nitrogen in Water	1	2021/09/07	2021/09/09 CAM SOP-00938	OMOE E3516 m
Turbidity	1	N/A	2021/09/07 CAM SOP-00417	SM 23 2130 B m
VOCs (Drinking Water)	1	N/A	2021/09/07 CAM SOP-00226	EPA 8260C m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas 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. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas 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 Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

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. When sampling is not conducted by Bureau Veritas, results relate to the supplied 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) Confirmatory runs for 2,3,7,8-TCDF are performed only if the primary result is greater than the RDL.

(2) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.

(3) Metals analysis was performed on the sample 'as received'.

(4) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

(5) Bureau Veritas Laboratories attempt to commence NTA analysis as soon as possible in accordance with the reference method. However, rapid analysis may not be practically achievable, particularly for samples from remote locations. Extended delay in analysis times may increase the uncertainty of the test results, but does not necessarily imply that the results are compromised.

(6) Chlordane (Total) = Alpha Chlordane + Gamma Chlordane



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Your C.O.C. #: 842984-01-01

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Report Date: 2021/10/06
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CERTIFICATE OF ANALYSIS

BV LABS JOB #: C1P4129

Received: 2021/09/03, 13:54

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Ema Gitej, Senior Project Manager

Email: emese.gitej@bureauveritas.com

Phone# (905)817-5829

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BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



BV Labs Job #: C1P4129
Report Date: 2021/10/06

Golder Associates Ltd
Client Project #: 21456909
Sampler Initials: PM

ODWQSOG TABLES 1, 2 AND 4 (WATER)

BV Labs ID		QOI268						
Sampling Date		2021/09/03 10:00						
COC Number		842984-01-01			TOXIC EQUIVALENCY		# of	
	UNITS	PW21-1	EDL	RDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
Calculated Parameters								
Calculated TDS	mg/L	550	N/A	1.0				7559099
Hardness (CaCO ₃)	mg/L	380	N/A	1.0				7558603
Total Organic Nitrogen	mg/L	<0.10	N/A	0.10				7560118
Inorganics								
Total Ammonia-N	mg/L	0.21	N/A	0.050				7564744
Colour	TCU	<2	N/A	2				7563603
Fluoride (F ⁻)	mg/L	0.62	N/A	0.10				7560960
Total Kjeldahl Nitrogen (TKN)	mg/L	0.23	N/A	0.10				7563005
Microcystin	ug/L	<0.10	N/A	0.10				7564587
Dissolved Organic Carbon	mg/L	0.48	N/A	0.40				7562606
pH	pH	8.02						7560966
Dissolved Sulphate (SO ₄)	mg/L	270	N/A	1.0				7560983
Sulphide	mg/L	<0.020	N/A	0.020				7562455
Turbidity	NTU	0.7	N/A	0.1				7560716
WAD Cyanide (Free)	mg/L	<0.0010	N/A	0.0010				7567661
Alkalinity (Total as CaCO ₃)	mg/L	180	N/A	1.0				7560961
Dissolved Chloride (Cl ⁻)	mg/L	9.6	N/A	1.0				7560985
Nitrite (N)	mg/L	<0.010	N/A	0.010				7560968
Nitrate (N)	mg/L	<0.10	N/A	0.10				7560968
Nitrate + Nitrite (N)	mg/L	<0.10	N/A	0.10				7560968
Miscellaneous Parameters								
NTA	mg/L	<0.050	N/A	0.050				7561547
Fixed Gases								
Methane	L/m ³	0.019	N/A	0.005				7565203
Metals								
Mercury (Hg)	mg/L	<0.00010	N/A	0.00010				7562014
EDL = Estimated Detection Limit RDL = Reportable Detection Limit TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient, The Total Toxic Equivalency (TEQ) value reported is the sum of Toxic Equivalent Quotients for the congeners tested. WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds QC Batch = Quality Control Batch N/A = Not Applicable								



BV Labs Job #: C1P4129
Report Date: 2021/10/06

Golder Associates Ltd
Client Project #: 21456909
Sampler Initials: PM

ODWQSOG TABLES 1, 2 AND 4 (WATER)

BV Labs ID		QOI268						
Sampling Date		2021/09/03 10:00						
COC Number		842984-01-01			TOXIC EQUIVALENCY		# of	
	UNITS	PW21-1	EDL	RDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
Aluminum (Al)	ug/L	<4.9	N/A	4.9				7561948
Antimony (Sb)	ug/L	<0.50	N/A	0.50				7561948
Arsenic (As)	ug/L	1.5	N/A	1.0				7561948
Barium (Ba)	ug/L	21	N/A	2.0				7561948
Boron (B)	ug/L	74	N/A	10				7561948
Cadmium (Cd)	ug/L	<0.090	N/A	0.090				7561948
Calcium (Ca)	ug/L	93000	N/A	200				7561948
Chromium (Cr)	ug/L	<5.0	N/A	5.0				7561948
Copper (Cu)	ug/L	<0.90	N/A	0.90				7561948
Iron (Fe)	ug/L	130	N/A	100				7561948
Lead (Pb)	ug/L	<0.50	N/A	0.50				7561948
Magnesium (Mg)	ug/L	36000	N/A	50				7561948
Manganese (Mn)	ug/L	20	N/A	2.0				7561948
Potassium (K)	ug/L	1100	N/A	200				7561948
Selenium (Se)	ug/L	<2.0	N/A	2.0				7561948
Sodium (Na)	ug/L	28000	N/A	100				7561948
Uranium (U)	ug/L	0.16	N/A	0.10				7561948
Zinc (Zn)	ug/L	<5.0	N/A	5.0				7561948
Semivolatile Organics								
2,3,4,6-Tetrachlorophenol	ug/L	<0.50	N/A	0.50				7566501
2,4,5-T	ug/L	<1.0	N/A	1.0				7566501
2,4,6-Trichlorophenol	ug/L	<0.50	N/A	0.50				7566501
2,4-D	ug/L	<1.0	N/A	1.0				7566501
2,4-Dichlorophenol	ug/L	<0.25	N/A	0.25				7566501
Alachlor	ug/L	<0.50	N/A	0.50				7566501
Aldicarb	ug/L	<5.0	N/A	5.0				7566501
Atrazine	ug/L	<0.50	N/A	0.50				7566501
EDL = Estimated Detection Limit RDL = Reportable Detection Limit TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient, The Total Toxic Equivalency (TEQ) value reported is the sum of Toxic Equivalent Quotients for the congeners tested. WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds QC Batch = Quality Control Batch N/A = Not Applicable								



ODWQSOG TABLES 1, 2 AND 4 (WATER)

BV Labs ID		QOI268						
Sampling Date		2021/09/03 10:00						
COC Number		842984-01-01			TOXIC EQUIVALENCY		# of	
	UNITS	PW21-1	EDL	RDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
Des-ethyl atrazine	ug/L	<0.50	N/A	0.50				7566501
Atrazine + Desethyl-atrazine	ug/L	<1.0	N/A	1.0				7566501
Bendiocarb	ug/L	<2.0	N/A	2.0				7566501
Bromoxynil	ug/L	<0.50	N/A	0.50				7566501
Carbaryl	ug/L	<5.0	N/A	5.0				7566501
Carbofuran	ug/L	<5.0	N/A	5.0				7566501
Chlorpyrifos (Dursban)	ug/L	<1.0	N/A	1.0				7566501
Cyanazine (Bladex)	ug/L	<1.0	N/A	1.0				7566501
Diazinon	ug/L	<1.0	N/A	1.0				7566501
Dicamba	ug/L	<1.0	N/A	1.0				7566501
Diclofop-methyl	ug/L	<0.90	N/A	0.90				7566501
Dimethoate	ug/L	<2.5	N/A	2.5				7566501
Dinoseb	ug/L	<1.0	N/A	1.0				7566501
Malathion	ug/L	<5.0	N/A	5.0				7566501
Metolachlor	ug/L	<0.50	N/A	0.50				7566501
Metribuzin (Sencor)	ug/L	<5.0	N/A	5.0				7566501
Ethyl Parathion	ug/L	<1.0	N/A	1.0				7566501
Pentachlorophenol	ug/L	<0.50	N/A	0.50				7566501
Phorate	ug/L	<0.50	N/A	0.50				7566501
Picloram	ug/L	<5.0	N/A	5.0				7566501
Prometryne	ug/L	<0.25	N/A	0.25				7566501
Simazine	ug/L	<1.0	N/A	1.0				7566501
Terbufos	ug/L	<0.50	N/A	0.50				7566501
Triallate	ug/L	<1.0	N/A	1.0				7566501
Trifluralin	ug/L	<1.0	N/A	1.0				7566501
Benzo(a)pyrene	ug/L	<0.0050	N/A	0.0050				7566501
Methyl parathion	ug/L	<1.0	N/A	1.0				7566501

EDL = Estimated Detection Limit

RDL = Reportable Detection Limit

TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient,

The Total Toxic Equivalency (TEQ) value reported is the sum of Toxic Equivalent Quotients for the congeners tested.

WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds

QC Batch = Quality Control Batch

N/A = Not Applicable



ODWQSOG TABLES 1, 2 AND 4 (WATER)

BV Labs ID		QOI268						
Sampling Date		2021/09/03 10:00						
COC Number		842984-01-01			TOXIC EQUIVALENCY		# of	
	UNITS	PW21-1	EDL	RDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
Volatile Organics								
1,1-Dichloroethylene	ug/L	<0.10	N/A	0.10				7559332
1,2-Dichlorobenzene	ug/L	<0.20	N/A	0.20				7559332
1,2-Dichloroethane	ug/L	<0.20	N/A	0.20				7559332
1,4-Dichlorobenzene	ug/L	<0.20	N/A	0.20				7559332
Benzene	ug/L	<0.10	N/A	0.10				7559332
Bromodichloromethane	ug/L	<0.10	N/A	0.10				7559332
Bromoform	ug/L	<0.20	N/A	0.20				7559332
Carbon Tetrachloride	ug/L	<0.10	N/A	0.10				7559332
Chlorobenzene	ug/L	<0.10	N/A	0.10				7559332
Chloroform	ug/L	<0.10	N/A	0.10				7559332
Dibromochloromethane	ug/L	<0.20	N/A	0.20				7559332
Methylene Chloride(Dichloromethane)	ug/L	<0.50	N/A	0.50				7559332
Ethylbenzene	ug/L	<0.10	N/A	0.10				7559332
Tetrachloroethylene	ug/L	<0.10	N/A	0.10				7559332
Toluene	ug/L	<0.20	N/A	0.20				7559332
Trichloroethylene	ug/L	<0.10	N/A	0.10				7559332
Vinyl Chloride	ug/L	<0.20	N/A	0.20				7559332
o-Xylene	ug/L	<0.10	N/A	0.10				7559332
p+m-Xylene	ug/L	<0.10	N/A	0.10				7559332
Total Xylenes	ug/L	<0.10	N/A	0.10				7559332
Total Trihalomethanes	ug/L	<0.20	N/A	0.20				7559332
Pesticides & Herbicides								
Glyphosate	ug/L	<10	N/A	10				7567026
Diquat	ug/L	<7.0	N/A	7.0				7561822
Diuron	ug/L	<10	N/A	10				7569961
Guthion (Azinphos-methyl)	ug/L	<2.0	N/A	2.0				7569961
EDL = Estimated Detection Limit RDL = Reportable Detection Limit TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient, The Total Toxic Equivalency (TEQ) value reported is the sum of Toxic Equivalent Quotients for the congeners tested. WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds QC Batch = Quality Control Batch N/A = Not Applicable								



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Golder Associates Ltd
Client Project #: 21456909
Sampler Initials: PM

ODWQSOG TABLES 1, 2 AND 4 (WATER)

BV Labs ID		QOI268						
Sampling Date		2021/09/03 10:00						
COC Number		842984-01-01			TOXIC EQUIVALENCY		# of	
	UNITS	PW21-1	EDL	RDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
Paraquat	ug/L	<1.0	N/A	1.0				7561822
Temephos	ug/L	<10	N/A	10				7569961
Calculated Parameters								
Aldrin + Dieldrin	ug/L	<0.006	N/A	0.006				7558226
Chlordane (Total)	ug/L	<0.006	N/A	0.006				7558226
DDT+ Metabolites	ug/L	<0.006	N/A	0.006				7558226
Heptachlor + Heptachlor epoxide	ug/L	<0.006	N/A	0.006				7558226
Total PCB	ug/L	<0.05	N/A	0.05				7558226
Pesticides & Herbicides								
Lindane	ug/L	<0.0060	N/A	0.0060				7565829
Heptachlor	ug/L	<0.0060	N/A	0.0060				7565829
Aldrin	ug/L	<0.0060	N/A	0.0060				7565829
Heptachlor epoxide	ug/L	<0.0060	N/A	0.0060				7565829
Oxychlordane	ug/L	<0.0060	N/A	0.0060				7565829
g-Chlordane	ug/L	<0.0060	N/A	0.0060				7565829
a-Chlordane	ug/L	<0.0060	N/A	0.0060				7565829
Dieldrin	ug/L	<0.0060	N/A	0.0060				7565829
o,p-DDE	ug/L	<0.0060	N/A	0.0060				7565829
p,p-DDE	ug/L	<0.0060	N/A	0.0060				7565829
o,p-DDD	ug/L	<0.0060	N/A	0.0060				7565829
p,p-DDD	ug/L	<0.0060	N/A	0.0060				7565829
o,p-DDT	ug/L	<0.0060	N/A	0.0060				7565829
p,p-DDT	ug/L	<0.0060	N/A	0.0060				7565829
Methoxychlor	ug/L	<0.024	N/A	0.024				7565829
Aroclor 1016	ug/L	<0.050	N/A	0.050				7565829
Aroclor 1221	ug/L	<0.050	N/A	0.050				7565829
Aroclor 1232	ug/L	<0.050	N/A	0.050				7565829
EDL = Estimated Detection Limit RDL = Reportable Detection Limit TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient, The Total Toxic Equivalency (TEQ) value reported is the sum of Toxic Equivalent Quotients for the congeners tested. WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds QC Batch = Quality Control Batch N/A = Not Applicable								



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Report Date: 2021/10/06

Golder Associates Ltd
Client Project #: 21456909
Sampler Initials: PM

ODWQSOG TABLES 1, 2 AND 4 (WATER)

BV Labs ID		QOI268						
Sampling Date		2021/09/03 10:00						
COC Number		842984-01-01			TOXIC EQUIVALENCY		# of	
	UNITS	PW21-1	EDL	RDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
Aroclor 1242	ug/L	<0.050	N/A	0.050				7565829
Aroclor 1248	ug/L	<0.050	N/A	0.050				7565829
Aroclor 1254	ug/L	<0.050	N/A	0.050				7565829
Aroclor 1260	ug/L	<0.050	N/A	0.050				7565829
Dioxins & Furans								
2,3,7,8-Tetra CDD *	pg/L	<0.973	0.973	10.0	1.00	0.973	0	7615543
1,2,3,7,8-Penta CDD *	pg/L	<0.830	0.830	50.0	1.00	0.830	0	7615543
1,2,3,4,7,8-Hexa CDD *	pg/L	<0.875	0.875	50.0	0.100	0.0875	0	7615543
1,2,3,6,7,8-Hexa CDD *	pg/L	<0.778	0.778	50.0	0.100	0.0778	0	7615543
1,2,3,7,8,9-Hexa CDD *	pg/L	<0.798	0.798	50.0	0.100	0.0798	0	7615543
1,2,3,4,6,7,8-Hepta CDD *	pg/L	<0.760	0.760	50.0	0.0100	0.00760	0	7615543
Octa CDD *	pg/L	<0.666	0.666	100	0.000300	0.000200	0	7615543
Total Tetra CDD *	pg/L	<0.973	0.973	10.0			0	7615543
Total Penta CDD *	pg/L	<0.830	0.830	50.0			0	7615543
Total Hexa CDD *	pg/L	<0.814	0.814	50.0			0	7615543
Total Hepta CDD *	pg/L	<0.760	0.760	50.0			0	7615543
2,3,7,8-Tetra CDF **	pg/L	<0.671	0.671	10.0	0.100	0.0671	0	7615543
1,2,3,7,8-Penta CDF **	pg/L	<0.843	0.843	50.0	0.0300	0.0253	0	7615543
2,3,4,7,8-Penta CDF **	pg/L	<0.715	0.715	50.0	0.300	0.215	0	7615543
1,2,3,4,7,8-Hexa CDF **	pg/L	<0.384	0.384	50.0	0.100	0.0384	0	7615543
1,2,3,6,7,8-Hexa CDF **	pg/L	<0.332	0.332	50.0	0.100	0.0332	0	7615543
2,3,4,6,7,8-Hexa CDF **	pg/L	<0.349	0.349	50.0	0.100	0.0349	0	7615543
1,2,3,7,8,9-Hexa CDF **	pg/L	<0.371	0.371	50.0	0.100	0.0371	0	7615543
1,2,3,4,6,7,8-Hepta CDF **	pg/L	<0.313	0.313	50.0	0.0100	0.00313	0	7615543
1,2,3,4,7,8,9-Hepta CDF **	pg/L	<0.349	0.349	50.0	0.0100	0.00349	0	7615543
EDL = Estimated Detection Limit RDL = Reportable Detection Limit TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient, The Total Toxic Equivalency (TEQ) value reported is the sum of Toxic Equivalent Quotients for the congeners tested. WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds QC Batch = Quality Control Batch N/A = Not Applicable * CDD = Chloro Dibenzo-p-Dioxin ** CDF = Chloro Dibenzo-p-Furan								



BV Labs Job #: C1P4129
Report Date: 2021/10/06

Golder Associates Ltd
Client Project #: 21456909
Sampler Initials: PM

ODWQSOG TABLES 1, 2 AND 4 (WATER)

BV Labs ID		QOI268						
Sampling Date		2021/09/03 10:00						
COC Number		842984-01-01			TOXIC EQUIVALENCY		# of	
	UNITS	PW21-1	EDL	RDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
Octa CDF **	pg/L	<0.982	0.982	100	0.000300	0.000295	0	7615543
Total Tetra CDF **	pg/L	<0.671	0.671	10.0			0	7615543
Total Penta CDF **	pg/L	<0.775	0.775	50.0			0	7615543
Total Hexa CDF **	pg/L	<0.358	0.358	50.0			0	7615543
Total Hepta CDF **	pg/L	<0.330	0.330	50.0			0	7615543
Semivolatile Organics								
N-Nitrosodimethylamine	ug/L	<0.0009	N/A	0.0009				7566404
Microbiological								
Heterotrophic plate count	CFU/mL	0	N/A	N/A				7560282
Background	CFU/100mL	0	N/A	N/A				7560239
Total Coliforms	CFU/100mL	0	N/A	N/A				7560239
Escherichia coli	CFU/100mL	0	N/A	N/A				7560239
TOTAL TOXIC EQUIVALENCY	pg/L					2.5		
Surrogate Recovery (%)								
37CL4 2378 Tetra CDD *	%	70						7615543
C13-1234678 HeptaCDD *	%	120						7615543
C13-1234678 HeptaCDF **	%	111						7615543
C13-123478 HexaCDD *	%	96						7615543
C13-123478 HexaCDF **	%	92						7615543
C13-1234789 HeptaCDF **	%	121						7615543
C13-123678 HexaCDD *	%	97						7615543
C13-123678 HexaCDF **	%	97						7615543
C13-12378 PentaCDD *	%	78						7615543
C13-12378 PentaCDF **	%	74						7615543
C13-123789 HexaCDF **	%	105						7615543
EDL = Estimated Detection Limit RDL = Reportable Detection Limit TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient, The Total Toxic Equivalency (TEQ) value reported is the sum of Toxic Equivalent Quotients for the congeners tested. WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds QC Batch = Quality Control Batch ** CDF = Chloro Dibenzo-p-Furan N/A = Not Applicable * CDD = Chloro Dibenzo-p-Dioxin								



BV Labs Job #: C1P4129
Report Date: 2021/10/06

Golder Associates Ltd
Client Project #: 21456909
Sampler Initials: PM

ODWQSOG TABLES 1, 2 AND 4 (WATER)

BV Labs ID		QOI268						
Sampling Date		2021/09/03 10:00						
COC Number		842984-01-01			TOXIC EQUIVALENCY		# of	
	UNITS	PW21-1	EDL	RDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
C13-234678 HexaCDF **	%	99						7615543
C13-23478 PentaCDF **	%	82						7615543
C13-2378 TetraCDD *	%	63						7615543
C13-2378 TetraCDF **	%	61						7615543
C13-OCDD *	%	115						7615543
D6-N-Nitrosodimethylamine	%	39						7566404
2,4,5,6-Tetrachloro-m-xylene	%	50						7565829
Decachlorobiphenyl	%	104						7565829
2,4,6-Tribromophenol	%	78						7566501
2,4-Dichlorophenyl Acetic Acid	%	79						7566501
2-Fluorobiphenyl	%	69						7566501
D14-Terphenyl (FS)	%	83						7566501
D5-Nitrobenzene	%	83						7566501
4-Bromofluorobenzene	%	96						7559332
D4-1,2-Dichloroethane	%	96						7559332
D8-Toluene	%	106						7559332
EDL = Estimated Detection Limit RDL = Reportable Detection Limit TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient, The Total Toxic Equivalency (TEQ) value reported is the sum of Toxic Equivalent Quotients for the congeners tested. WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds QC Batch = Quality Control Batch ** CDF = Chloro Dibenzo-p-Furan * CDD = Chloro Dibenzo-p-Dioxin								



BV Labs Job #: C1P4129
Report Date: 2021/10/06

Golder Associates Ltd
Client Project #: 21456909
Sampler Initials: PM

ODWQSOG TABLES 1, 2 AND 4 (WATER)

BV Labs ID		QOI268					
Sampling Date		2021/09/03 10:00					
COC Number		842984-01-01		TOXIC EQUIVALENCY		# of	
	UNITS	PW21-1 Lab-Dup	RDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
Inorganics							
Fluoride (F-)	mg/L	0.62	0.10				7560960
pH	pH	8.05					7560966
Alkalinity (Total as CaCO ₃)	mg/L	180	1.0				7560961
Nitrite (N)	mg/L	<0.010	0.010				7560968
Nitrate (N)	mg/L	<0.10	0.10				7560968
Nitrate + Nitrite (N)	mg/L	<0.10	0.10				7560968
Metals							
Mercury (Hg)	mg/L	<0.00010	0.00010				7562014
Volatile Organics							
1,1-Dichloroethylene	ug/L	<0.10	0.10				7559332
1,2-Dichlorobenzene	ug/L	<0.20	0.20				7559332
1,2-Dichloroethane	ug/L	<0.20	0.20				7559332
1,4-Dichlorobenzene	ug/L	<0.20	0.20				7559332
Benzene	ug/L	<0.10	0.10				7559332
Bromodichloromethane	ug/L	<0.10	0.10				7559332
Bromoform	ug/L	<0.20	0.20				7559332
Carbon Tetrachloride	ug/L	<0.10	0.10				7559332
Chlorobenzene	ug/L	<0.10	0.10				7559332
Chloroform	ug/L	<0.10	0.10				7559332
Dibromochloromethane	ug/L	<0.20	0.20				7559332
Methylene Chloride(Dichloromethane)	ug/L	<0.50	0.50				7559332
Ethylbenzene	ug/L	<0.10	0.10				7559332
RDL = Reportable Detection Limit TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient, The Total Toxic Equivalency (TEQ) value reported is the sum of Toxic Equivalent Quotients for the congeners tested. WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds QC Batch = Quality Control Batch Lab-Dup = Laboratory Initiated Duplicate							



BV Labs Job #: C1P4129
Report Date: 2021/10/06

Golder Associates Ltd
Client Project #: 21456909
Sampler Initials: PM

ODWQSOG TABLES 1, 2 AND 4 (WATER)

BV Labs ID		QOI268					
Sampling Date		2021/09/03 10:00					
COC Number		842984-01-01		TOXIC EQUIVALENCY		# of	
	UNITS	PW21-1 Lab-Dup	RDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
Tetrachloroethylene	ug/L	<0.10	0.10				7559332
Toluene	ug/L	<0.20	0.20				7559332
Trichloroethylene	ug/L	<0.10	0.10				7559332
Vinyl Chloride	ug/L	<0.20	0.20				7559332
o-Xylene	ug/L	<0.10	0.10				7559332
p+m-Xylene	ug/L	<0.10	0.10				7559332
Total Xylenes	ug/L	<0.10	0.10				7559332
Total Trihalomethanes	ug/L	<0.20	0.20				7559332
Pesticides & Herbicides							
Diuron	ug/L	<10	10				7569961
Guthion (Azinphos-methyl)	ug/L	<2.0	2.0				7569961
Temephos	ug/L	<10	10				7569961
TOTAL TOXIC EQUIVALENCY	pg/L				0		
Surrogate Recovery (%)							
4-Bromofluorobenzene	%	96					7559332
D4-1,2-Dichloroethane	%	98					7559332
D8-Toluene	%	104					7559332
RDL = Reportable Detection Limit TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient, The Total Toxic Equivalency (TEQ) value reported is the sum of Toxic Equivalent Quotients for the congeners tested. WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds QC Batch = Quality Control Batch Lab-Dup = Laboratory Initiated Duplicate							



BV Labs Job #: C1P4129
Report Date: 2021/10/06

Golder Associates Ltd
Client Project #: 21456909
Sampler Initials: PM

TEST SUMMARY

BV Labs ID: QOI268
Sample ID: PW21-1
Matrix: Water

Collected: 2021/09/03
Shipped:
Received: 2021/09/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	7560961	N/A	2021/09/07	Yogesh Patel
Chloride by Automated Colourimetry	KONE	7560985	N/A	2021/09/07	Alina Dobreanu
Colour	SPEC	7563603	N/A	2021/09/09	Viorica Rotaru
Free (WAD) Cyanide	SKAL/CN	7567661	N/A	2021/09/10	Aditiben Patel
Dioxins/Furans in Water (1613B)	HRMS/MS	7615543	2021/10/01	2021/10/04	Cathy Xu
Diuron, Guthion, Temephos	LC/UV	7569961	2021/09/10	2021/09/10	Kimberley Linde
Dissolved Organic Carbon (DOC)	TOCV/NDIR	7562606	N/A	2021/09/08	Julianna Castiglione
Diquat / Paraquat	LC/UV	7561822	2021/09/07	2021/09/09	James Lee
Fluoride	ISE	7560960	2021/09/04	2021/09/07	Yogesh Patel
Glyphosate	LC/FLU	7567026	2021/09/09	2021/09/09	Furneesh Kumar
Hardness (calculated as CaCO ₃)		7558603	N/A	2021/09/08	Automated Statchk
Mercury in Water by CVAA	CV/AA	7562014	2021/09/07	2021/09/07	Gagandeep Rai
Metals Analysis by ICPMS (as received)	ICP/MS	7561948	N/A	2021/09/07	Azita Fazaeli
Total Coliforms/ E. coli, CFU/100mL	PL	7560239	N/A	2021/09/03	Soham Patel
Dissolved Methane in Water	GC/FID	7565203	N/A	2021/09/08	Shilpa Kataria
Heterotrophic plate count, (CFU/mL)	PL	7560282	N/A	2021/09/03	Farhana Rahman
Microcystin	ELIS	7564587	N/A	2021/09/08	Chris Li
NDMA in Drinking Water (MSABN-3291Amod)	GCTQ/MS	7566404	2021/09/09	2021/09/14	Wenhui (Susie) Shi
Total Ammonia-N	LACH/NH ₄	7564744	N/A	2021/09/09	Viorica Rotaru
Nitrate (NO ₃) and Nitrite (NO ₂) in Water	LACH	7560968	N/A	2021/09/07	Chandra Nandlal
Nitrotoltriacetic Acid (NTA)	SPEC	7561547	2021/09/07	2021/09/07	Viorica Rotaru
OC Pesticides (Selected) & PCB	GC/ECD	7565829	2021/09/08	2021/09/10	Joy Zhang
OC Pesticides Summed Parameters	CALC	7558226	N/A	2021/09/04	Automated Statchk
ODWS - Semi-Volatiles	GC/MS	7566501	2021/09/09	2021/09/10	Wendy Zhao
Organic Nitrogen	CALC	7560118	N/A	2021/09/10	Automated Statchk
pH	AT	7560966	2021/09/04	2021/09/07	Yogesh Patel
Sulphate by Automated Colourimetry	KONE	7560983	N/A	2021/09/07	Alina Dobreanu
Sulphide	ISE/S	7562455	N/A	2021/09/07	Neil Dassanayake
Total Dissolved Solids (TDS calc)	CALC	7559099	N/A	2021/09/08	Automated Statchk
Total Kjeldahl Nitrogen in Water	SKAL	7563005	2021/09/07	2021/09/09	Rajni Tyagi
Turbidity	AT	7560716	N/A	2021/09/07	Neil Dassanayake
VOCs (Drinking Water)	P&T/MS	7559332	N/A	2021/09/07	Dina Wang

BV Labs ID: QOI268 Dup
Sample ID: PW21-1
Matrix: Water

Collected: 2021/09/03
Shipped:
Received: 2021/09/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	7560961	N/A	2021/09/07	Yogesh Patel
Diuron, Guthion, Temephos	LC/UV	7569961	2021/09/10	2021/09/10	Kimberley Linde
Fluoride	ISE	7560960	2021/09/04	2021/09/07	Yogesh Patel
Mercury in Water by CVAA	CV/AA	7562014	2021/09/07	2021/09/07	Gagandeep Rai
Nitrate (NO ₃) and Nitrite (NO ₂) in Water	LACH	7560968	N/A	2021/09/07	Chandra Nandlal
pH	AT	7560966	2021/09/04	2021/09/07	Yogesh Patel
VOCs (Drinking Water)	P&T/MS	7559332	N/A	2021/09/07	Dina Wang



BV Labs Job #: C1P4129
Report Date: 2021/10/06

Golder Associates Ltd
Client Project #: 21456909
Sampler Initials: PM

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	10.7°C
Package 2	15.0°C

Results relate only to the items tested.



BV Labs Job #: C1P4129
Report Date: 2021/10/06

QUALITY ASSURANCE REPORT

Golder Associates Ltd
Client Project #: 21456909
Sampler Initials: PM

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
7559332	4-Bromofluorobenzene	2021/09/07	98	70 - 130	97	70 - 130	94	%				
7559332	D4-1,2-Dichloroethane	2021/09/07	91	70 - 130	95	70 - 130	98	%				
7559332	D8-Toluene	2021/09/07	105	70 - 130	103	70 - 130	105	%				
7565829	2,4,5,6-Tetrachloro-m-xylene	2021/09/09	58	30 - 130	57	30 - 130	58	%				
7565829	Decachlorobiphenyl	2021/09/09	108	30 - 130	95	30 - 130	98	%				
7566404	D6-N-Nitrosodimethylamine	2021/09/14			39	10 - 85	40	%				
7566501	2,4,6-Tribromophenol	2021/09/09	77	30 - 130	76	30 - 130	82	%				
7566501	2,4-Dichlorophenyl Acetic Acid	2021/09/09	75	30 - 130	71	30 - 130	77	%				
7566501	2-Fluorobiphenyl	2021/09/09	63	30 - 130	65	30 - 130	67	%				
7566501	D14-Terphenyl (FS)	2021/09/09	81	30 - 130	81	30 - 130	87	%				
7566501	D5-Nitrobenzene	2021/09/09	75	30 - 130	77	30 - 130	85	%				
7615543	37CL4 2378 Tetra CDD	2021/10/03			77	35 - 197	84	%				
7615543	C13-1234678 HeptaCDD	2021/10/03			119	23 - 140	111	%				
7615543	C13-1234678 HeptaCDF	2021/10/03			110	28 - 143	105	%				
7615543	C13-123478 HexaCDD	2021/10/03			97	32 - 141	88	%				
7615543	C13-123478 HexaCDF	2021/10/03			93	26 - 152	96	%				
7615543	C13-1234789 HeptaCDF	2021/10/03			121	28 - 138	111	%				
7615543	C13-123678 HexaCDD	2021/10/03			95	28 - 130	103	%				
7615543	C13-123678 HexaCDF	2021/10/03			98	26 - 123	96	%				
7615543	C13-12378 PentaCDD	2021/10/03			77	25 - 181	72	%				
7615543	C13-12378 PentaCDF	2021/10/03			75	24 - 185	73	%				
7615543	C13-123789 HexaCDF	2021/10/03			104	29 - 147	102	%				
7615543	C13-234678 HexaCDF	2021/10/03			98	28 - 136	96	%				
7615543	C13-23478 PentaCDF	2021/10/03			81	21 - 178	78	%				
7615543	C13-2378 TetraCDD	2021/10/03			66	25 - 164	75	%				
7615543	C13-2378 TetraCDF	2021/10/03			63	24 - 169	75	%				
7615543	C13-OCDD	2021/10/03			114	17 - 157	100	%				
7559332	1,1-Dichloroethylene	2021/09/07	93	70 - 130	92	70 - 130	<0.10	ug/L	NC	30		
7559332	1,2-Dichlorobenzene	2021/09/07	88	70 - 130	90	70 - 130	<0.20	ug/L	NC	30		
7559332	1,2-Dichloroethane	2021/09/07	78	70 - 130	83	70 - 130	<0.20	ug/L	NC	30		
7559332	1,4-Dichlorobenzene	2021/09/07	105	70 - 130	105	70 - 130	<0.20	ug/L	NC	30		

BUREAU
VERITAS

BV Labs Job #: C1P4129

Report Date: 2021/10/06

QUALITY ASSURANCE REPORT(CONT'D)

Golder Associates Ltd

Client Project #: 21456909

Sampler Initials: PM

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
7559332	Benzene	2021/09/07	81	70 - 130	84	70 - 130	<0.10	ug/L	NC	30		
7559332	Bromodichloromethane	2021/09/07	NC	70 - 130	88	70 - 130	<0.10	ug/L	NC	30		
7559332	Bromoform	2021/09/07	82	70 - 130	87	70 - 130	<0.20	ug/L	NC	30		
7559332	Carbon Tetrachloride	2021/09/07	88	70 - 130	88	70 - 130	<0.10	ug/L	NC	30		
7559332	Chlorobenzene	2021/09/07	90	70 - 130	90	70 - 130	<0.10	ug/L	NC	30		
7559332	Chloroform	2021/09/07	NC	70 - 130	89	70 - 130	<0.10	ug/L	NC	30		
7559332	Dibromochloromethane	2021/09/07	82	70 - 130	87	70 - 130	<0.20	ug/L	NC	30		
7559332	Ethylbenzene	2021/09/07	88	70 - 130	86	70 - 130	<0.10	ug/L	NC	30		
7559332	Methylene Chloride(Dichloromethane)	2021/09/07	85	70 - 130	86	70 - 130	<0.50	ug/L	NC	30		
7559332	o-Xylene	2021/09/07	87	70 - 130	86	70 - 130	<0.10	ug/L	NC	30		
7559332	p+m-Xylene	2021/09/07	95	70 - 130	90	70 - 130	<0.10	ug/L	NC	30		
7559332	Tetrachloroethylene	2021/09/07	85	70 - 130	83	70 - 130	<0.10	ug/L	NC	30		
7559332	Toluene	2021/09/07	88	70 - 130	88	70 - 130	<0.20	ug/L	NC	30		
7559332	Total Trihalomethanes	2021/09/07					<0.20	ug/L	NC	30		
7559332	Total Xylenes	2021/09/07					<0.10	ug/L	NC	30		
7559332	Trichloroethylene	2021/09/07	92	70 - 130	91	70 - 130	<0.10	ug/L	NC	30		
7559332	Vinyl Chloride	2021/09/07	92	70 - 130	88	70 - 130	<0.20	ug/L	NC	30		
7560716	Turbidity	2021/09/07			99	85 - 115	<0.1	NTU	5.2	20		
7560960	Fluoride (F-)	2021/09/07	101	80 - 120	96	80 - 120	<0.10	mg/L	1.4	20		
7560961	Alkalinity (Total as CaCO3)	2021/09/07			96	85 - 115	<1.0	mg/L	0.48	20		
7560966	pH	2021/09/07			101	98 - 103			0.36	N/A		
7560968	Nitrate (N)	2021/09/07	99	80 - 120	101	80 - 120	<0.10	mg/L	NC	20		
7560968	Nitrite (N)	2021/09/07	104	80 - 120	103	80 - 120	<0.010	mg/L	NC	20		
7560983	Dissolved Sulphate (SO4)	2021/09/07	NC	75 - 125	103	80 - 120	<1.0	mg/L	0.25	20		
7560985	Dissolved Chloride (Cl-)	2021/09/07	NC	80 - 120	104	80 - 120	<1.0	mg/L	1.3	20		
7561547	NTA	2021/09/07	83	80 - 120	93	80 - 120	<0.050	mg/L	NC	20		
7561822	Diquat	2021/09/09	83	50 - 130	95	50 - 130	<7.0	ug/L	4.2	40		
7561822	Paraquat	2021/09/09	62	50 - 130	101	50 - 130	<1.0	ug/L	7.7	40		
7561948	Aluminum (Al)	2021/09/07	101	80 - 120	101	80 - 120	<4.9	ug/L	NC	20		
7561948	Antimony (Sb)	2021/09/07	103	80 - 120	99	80 - 120	<0.50	ug/L	NC	20		
7561948	Arsenic (As)	2021/09/07	100	80 - 120	97	80 - 120	<1.0	ug/L	0.41	20		



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QUALITY ASSURANCE REPORT(CONT'D)

Golder Associates Ltd
Client Project #: 21456909
Sampler Initials: PM

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
7561948	Barium (Ba)	2021/09/07	97	80 - 120	98	80 - 120	<2.0	ug/L	1.4	20		
7561948	Boron (B)	2021/09/07	97	80 - 120	97	80 - 120	<10	ug/L	2.0	20		
7561948	Cadmium (Cd)	2021/09/07	100	80 - 120	100	80 - 120	<0.090	ug/L	NC	20		
7561948	Calcium (Ca)	2021/09/07	NC	80 - 120	99	80 - 120	<200	ug/L	2.1	20		
7561948	Chromium (Cr)	2021/09/07	100	80 - 120	99	80 - 120	<5.0	ug/L	NC	20		
7561948	Copper (Cu)	2021/09/07	98	80 - 120	98	80 - 120	<0.90	ug/L	11	20		
7561948	Iron (Fe)	2021/09/07	98	80 - 120	97	80 - 120	<100	ug/L	1.1	20		
7561948	Lead (Pb)	2021/09/07	96	80 - 120	98	80 - 120	<0.50	ug/L	NC	20		
7561948	Magnesium (Mg)	2021/09/07	NC	80 - 120	97	80 - 120	<50	ug/L	1.4	20		
7561948	Manganese (Mn)	2021/09/07	98	80 - 120	99	80 - 120	<2.0	ug/L	1.0	20		
7561948	Potassium (K)	2021/09/07	98	80 - 120	96	80 - 120	<200	ug/L	1.9	20		
7561948	Selenium (Se)	2021/09/07	103	80 - 120	102	80 - 120	<2.0	ug/L	NC	20		
7561948	Sodium (Na)	2021/09/07	97	80 - 120	98	80 - 120	<100	ug/L	1.2	20		
7561948	Uranium (U)	2021/09/07	100	80 - 120	104	80 - 120	<0.10	ug/L	3.0	20		
7561948	Zinc (Zn)	2021/09/07	98	80 - 120	98	80 - 120	<5.0	ug/L	NC	20		
7562014	Mercury (Hg)	2021/09/07	95	75 - 125	97	80 - 120	<0.00010	mg/L	NC	20		
7562455	Sulphide	2021/09/07	103	80 - 120	103	80 - 120	<0.020	mg/L	NC	20		
7562606	Dissolved Organic Carbon	2021/09/08	80	80 - 120	96	80 - 120	<0.40	mg/L	0.84	20		
7563005	Total Kjeldahl Nitrogen (TKN)	2021/09/09	NC	80 - 120	95	80 - 120	<0.10	mg/L			96	80 - 120
7563603	Colour	2021/09/09			99	80 - 120	<2	TCU	NC	25		
7564587	Microcystin	2021/09/08	96	60 - 140	94	60 - 140	<0.10	ug/L	NC	20		
7564744	Total Ammonia-N	2021/09/09	100	75 - 125	97	80 - 120	<0.050	mg/L	2.8	20		
7565203	Methane	2021/09/09					<0.005	L/m3	6.1	20		
7565829	a-Chlordane	2021/09/09	89	30 - 130	85	30 - 130	<0.0060	ug/L	6.5	40		
7565829	Aldrin	2021/09/09	78	30 - 130	71	30 - 130	<0.0060	ug/L	5.0	40		
7565829	Aroclor 1016	2021/09/09					<0.050	ug/L				
7565829	Aroclor 1221	2021/09/09					<0.050	ug/L				
7565829	Aroclor 1232	2021/09/09					<0.050	ug/L				
7565829	Aroclor 1242	2021/09/09					<0.050	ug/L				
7565829	Aroclor 1248	2021/09/09					<0.050	ug/L				
7565829	Aroclor 1254	2021/09/09					<0.050	ug/L				



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Golder Associates Ltd
Client Project #: 21456909
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QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
7565829	Aroclor 1260	2021/09/09					<0.050	ug/L				
7565829	Dieldrin	2021/09/09	105	30 - 130	99	30 - 130	<0.0060	ug/L	5.2	40		
7565829	g-Chlordane	2021/09/09	94	30 - 130	85	30 - 130	<0.0060	ug/L	5.6	40		
7565829	Heptachlor epoxide	2021/09/09	100	30 - 130	89	30 - 130	<0.0060	ug/L	3.4	40		
7565829	Heptachlor	2021/09/09	83	30 - 130	75	30 - 130	<0.0060	ug/L	6.1	40		
7565829	Lindane	2021/09/09	97	30 - 130	88	30 - 130	<0.0060	ug/L	3.7	40		
7565829	Methoxychlor	2021/09/09	110	30 - 130	100	30 - 130	<0.024	ug/L	6.6	40		
7565829	o,p-DDD	2021/09/09	105	30 - 130	102	30 - 130	<0.0060	ug/L	6.0	40		
7565829	o,p-DDE	2021/09/09	114	30 - 130	94	30 - 130	<0.0060	ug/L	4.5	40		
7565829	o,p-DDT	2021/09/09	104	30 - 130	90	30 - 130	<0.0060	ug/L	7.6	40		
7565829	Oxychlordane	2021/09/09	91	30 - 130	84	30 - 130	<0.0060	ug/L	5.0	40		
7565829	p,p-DDD	2021/09/09	101	30 - 130	93	30 - 130	<0.0060	ug/L	6.0	40		
7565829	p,p-DDE	2021/09/09	82	30 - 130	74	30 - 130	<0.0060	ug/L	6.8	40		
7565829	p,p-DDT	2021/09/09	107	30 - 130	91	30 - 130	<0.0060	ug/L	9.9	40		
7566404	N-Nitrosodimethylamine	2021/09/14			102	65 - 135	<0.0009	ug/L	1.5	25		
7566501	2,3,4,6-Tetrachlorophenol	2021/09/09	83	30 - 130	82	30 - 130	<0.50	ug/L	1.7	40		
7566501	2,4,5-T	2021/09/09	82	30 - 130	80	30 - 130	<1.0	ug/L	4.9	40		
7566501	2,4,6-Trichlorophenol	2021/09/09	77	30 - 130	78	30 - 130	<0.50	ug/L	2.4	40		
7566501	2,4-D	2021/09/09	74	30 - 130	70	30 - 130	<1.0	ug/L	3.3	40		
7566501	2,4-Dichlorophenol	2021/09/09	68	30 - 130	69	30 - 130	<0.25	ug/L	0.99	40		
7566501	Alachlor	2021/09/09	108	40 - 130	108	40 - 130	<0.50	ug/L	2.0	40		
7566501	Aldicarb	2021/09/09	89	70 - 130	90	70 - 130	<5.0	ug/L	3.4	40		
7566501	Atrazine + Desethyl-atrazine	2021/09/09	64	30 - 130	62	30 - 130	<1.0	ug/L	0.36	40		
7566501	Atrazine	2021/09/09	86	30 - 130	84	30 - 130	<0.50	ug/L	0.95	40		
7566501	Bendiocarb	2021/09/09	89	40 - 130	90	40 - 130	<2.0	ug/L	2.4	40		
7566501	Benzo(a)pyrene	2021/09/09	101	30 - 130	96	30 - 130	<0.0050	ug/L	3.3	40		
7566501	Bromoxynil	2021/09/09	87	40 - 130	85	40 - 130	<0.50	ug/L	1.3	40		
7566501	Carbaryl	2021/09/09	91	40 - 130	91	40 - 130	<5.0	ug/L	0.80	40		
7566501	Carbofuran	2021/09/09	92	40 - 130	90	40 - 130	<5.0	ug/L	0.47	40		
7566501	Chlorpyrifos (Dursban)	2021/09/09	86	40 - 130	86	40 - 130	<1.0	ug/L	3.0	40		
7566501	Cyanazine (Bladex)	2021/09/09	80	40 - 130	76	40 - 130	<1.0	ug/L	1.9	40		



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Golder Associates Ltd
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QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
7566501	Des-ethyl atrazine	2021/09/09	42	30 - 130	40	30 - 130	<0.50	ug/L	3.1	40		
7566501	Diazinon	2021/09/09	77	40 - 130	78	40 - 130	<1.0	ug/L	2.4	40		
7566501	Dicamba	2021/09/09	75	30 - 130	73	30 - 130	<1.0	ug/L	2.8	40		
7566501	Diclofop-methyl	2021/09/09	89	40 - 130	87	40 - 130	<0.90	ug/L	1.2	40		
7566501	Dimethoate	2021/09/09	76	40 - 130	74	40 - 130	<2.5	ug/L	1.9	40		
7566501	Dinoseb	2021/09/09	84	40 - 130	82	40 - 130	<1.0	ug/L	1.3	40		
7566501	Ethyl Parathion	2021/09/09	80	40 - 130	78	40 - 130	<1.0	ug/L	0.67	40		
7566501	Malathion	2021/09/09	86	40 - 130	85	40 - 130	<5.0	ug/L	0.19	40		
7566501	Methyl parathion	2021/09/09	81	30 - 130	79	30 - 130	<1.0	ug/L	0.14	40		
7566501	Metolachlor	2021/09/09	77	40 - 130	77	40 - 130	<0.50	ug/L	0.72	40		
7566501	Metribuzin (Sencor)	2021/09/09	107	40 - 130	105	40 - 130	<5.0	ug/L	0.63	40		
7566501	Pentachlorophenol	2021/09/09	80	25 - 130	79	25 - 130	<0.50	ug/L	0.13	40		
7566501	Phorate	2021/09/09	74	40 - 130	74	40 - 130	<0.50	ug/L	2.5	40		
7566501	Picloram	2021/09/09	41	10 - 130	38	10 - 130	<5.0	ug/L	13	40		
7566501	Prometryne	2021/09/09	85	30 - 130	81	30 - 130	<0.25	ug/L	4.9	40		
7566501	Simazine	2021/09/09	80	40 - 130	78	40 - 130	<1.0	ug/L	0.038	40		
7566501	Terbufos	2021/09/09	79	40 - 130	79	40 - 130	<0.50	ug/L	1.3	40		
7566501	Triallate	2021/09/09	84	40 - 130	83	40 - 130	<1.0	ug/L	1.2	40		
7566501	Trifluralin	2021/09/09	94	40 - 130	91	40 - 130	<1.0	ug/L	3.6	40		
7567026	Glyphosate	2021/09/09	106	50 - 130	108	50 - 130	<10	ug/L	NC	40		
7567661	WAD Cyanide (Free)	2021/09/10	97	80 - 120	98	80 - 120	<0.0010	mg/L	NC	20		
7569961	Diuron	2021/09/10	88	40 - 130	85	40 - 130	<10	ug/L	NC	40		
7569961	Guthion (Azinphos-methyl)	2021/09/10	102	40 - 130	98	40 - 130	<2.0	ug/L	NC	40		
7569961	Temephos	2021/09/10	70	40 - 130	65	40 - 130	<10	ug/L	NC	40		
7615543	1,2,3,4,6,7,8-Hepta CDD	2021/10/03			105	70 - 140	<1.02, EDL=1.02	pg/L	2.8	25		
7615543	1,2,3,4,6,7,8-Hepta CDF	2021/10/03			99	82 - 122	<1.20, EDL=1.20	pg/L	3.0	25		
7615543	1,2,3,4,7,8,9-Hepta CDF	2021/10/03			99	78 - 138	<1.38, EDL=1.38	pg/L	2.0	25		



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Golder Associates Ltd
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QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
7615543	1,2,3,4,7,8-Hexa CDD	2021/10/03			104	70 - 164	<1.19, EDL=1.19	pg/L	8.3	25		
7615543	1,2,3,4,7,8-Hexa CDF	2021/10/03			103	72 - 134	<1.32, EDL=1.32	pg/L	1.9	25		
7615543	1,2,3,6,7,8-Hexa CDD	2021/10/03			114	76 - 134	<0.906, EDL=0.906	pg/L	0.88	25		
7615543	1,2,3,6,7,8-Hexa CDF	2021/10/03			103	84 - 130	<1.21, EDL=1.21	pg/L	2.9	25		
7615543	1,2,3,7,8,9-Hexa CDD	2021/10/03			111	64 - 162	<0.995, EDL=0.995	pg/L	4.4	25		
7615543	1,2,3,7,8,9-Hexa CDF	2021/10/03			103	78 - 130	<1.37, EDL=1.37	pg/L	0.97	25		
7615543	1,2,3,7,8-Penta CDD	2021/10/03			110	25 - 181	<1.03, EDL=1.03	pg/L	1.8	25		
7615543	1,2,3,7,8-Penta CDF	2021/10/03			107	80 - 134	<1.47, EDL=1.47	pg/L	3.7	25		
7615543	2,3,4,6,7,8-Hexa CDF	2021/10/03			108	70 - 156	<1.29, EDL=1.29	pg/L	1.8	25		
7615543	2,3,4,7,8-Penta CDF	2021/10/03			111	68 - 160	<1.27, EDL=1.27	pg/L	3.5	25		
7615543	2,3,7,8-Tetra CDD	2021/10/03			99	67 - 158	<1.33, EDL=1.33	pg/L	2.0	25		
7615543	2,3,7,8-Tetra CDF	2021/10/03			102	75 - 158	<1.06, EDL=1.06	pg/L	1.9	25		
7615543	Octa CDD	2021/10/03			112	78 - 144	<1.14, EDL=1.14	pg/L	2.6	25		
7615543	Octa CDF	2021/10/03			116	63 - 170	1.31, EDL=1.24	pg/L	3.4	25		
7615543	Total Hepta CDD	2021/10/03					<1.02, EDL=1.02	pg/L				
7615543	Total Hepta CDF	2021/10/03					<1.28, EDL=1.28	pg/L				



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QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
7615543	Total Hexa CDD	2021/10/03					<1.02, EDL=1.02	pg/L				
7615543	Total Hexa CDF	2021/10/03					<1.30, EDL=1.30	pg/L				
7615543	Total Penta CDD	2021/10/03					<1.03, EDL=1.03	pg/L				
7615543	Total Penta CDF	2021/10/03					<1.36, EDL=1.36	pg/L				
7615543	Total Tetra CDD	2021/10/03					<1.33, EDL=1.33	pg/L				
7615543	Total Tetra CDF	2021/10/03					<1.06, EDL=1.06	pg/L				

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.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

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 $\leq 2 \times \text{RDL}$).



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Client Project #: 21456909
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VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Brad Newman, B.Sc., C.Chem., Scientific Service Specialist

Cathy Xu, Scientific Specialist, Ultra Trace Analysis, HRMS

Ewa Pranjic, M.Sc., C.Chem, Scientific Specialist

Farhana Rahman, Senior Analyst

Melissa DiGrazia, Operations Manager, HRMS Department

Soham Patel, Analyst 2

Tom Mitchell, B.Sc, Supervisor, Compressed Gases

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports.



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Client Project #: 21456909
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VALIDATION SIGNATURE PAGE(CONT'D)

The analytical data and all QC contained in this report were reviewed and validated by:

For Service Group specific validation please refer to the Validation Signature Page.



Works #: 210000568-NR

SGS Canada Inc.

P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - K0L 2H0
Phone: 705-652-2000 FAX: 705-652-6365

22-September-2021

Bureau Veritas Canada - Mississauga

Attn : Subcontract Coordinator

6740 Campobello Road
Mississauga, ON
L5N 2L8, Canada

Phone: 905-817-5798
Fax:

Date Rec. : 07 September 2021
LR Report: CA15208-SEP21
Reference: Job#: C1P4129

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	Bromate mg/L
1: Analysis Start Date		---	16-Sep-21
2: Analysis Start Time		---	13:01
3: Analysis Completed Date		---	22-Sep-21
4: Analysis Completed Time		---	11:40
5: MAC		---	0.01
6: MDL		---	0.005
7: QC - Blank		---	< 0.005
8: QC - STD % Recovery		---	98%
9: QC - DUP % RPD		---	ND
10: NR PW21-1	03-Sep-21 10:00	14.0	< 0.005

MAC - Maximum Acceptable Concentration

MDL - SGS Method Detection Limit

NR - Not regulated / reportable under applicable Provincial drinking water regulations as per client.

ND - Not Detected

Method Descriptions

Parameter	Description	SGS Method Code
Bromate	Bromate by Ion Chromatograph	ME-CA-[ENV]IC-LAK-AN-006

Kimberley Didsbury
Project Specialist,
Environment, Health & Safety



golder.com