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**Hydrogeological Investigation
Residential Subdivision Water Supply
Fergus Golf Course Redevelopment
8243 and 8282 Wellington Road 19
Fergus, Ontario**

GEMTEC Project: 101987.017

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Submitted to:

Fergus Development Inc.
3190 Steeles Avenue East, Suite 300
Markham, Ontario
L3R 1G9

**Hydrogeological Investigation
Residential Subdivision Water Supply
Fergus Golf Course Redevelopment
8243 and 8282 Wellington Road 19
Fergus, Ontario**

July 2, 2026
GEMTEC Project: 101987.017

GEMTEC Consulting Engineers and Scientists Limited
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July 2, 2026

File: 101987.017 – Rev0

Fergus Development Inc.
3190 Steeles Avenue East, Suite 300
Markham, Ontario
L3R 1G9

Attention: Theyonas Manoharan, P.Eng., Senior Project Manager

**Re: Hydrogeological Investigation
Water Supply Investigation for Proposed Residential Subdivision
Fergus Golf Club Redevelopment
8243 and 8282 Wellington Road 19, Fergus, Ontario**

Please find enclosed the Water Supply Investigation for the proposed residential subdivision for the above noted project in Fergus, Ontario. If you have any comments or questions on the content of this report, please do not hesitate to contact the undersigned.



Kimberly Gilder, P.Geo.
Senior Hydrogeologist

RM/CMK/KG/CLK/sv

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1.0 INTRODUCTION

Fergus Development Inc. (FDI) retained GEMTEC Consulting Engineers and Scientists (GEMTEC) to carry out a hydrogeological water supply investigation for the proposed residential development at 8243, 8268, and 8282 Wellington Road 19, Fergus, Ontario.

The proposed redevelopment includes a 446-lot residential subdivision to the southeast of Wellington Road 19 (the SE Site), and a utility campus, water supply wells, redesigned golf course, and clubhouse to the northwest of Wellington Road 19 (the NW Site). The maximum day demand (MDD) of the proposed development is 14.4 L/s. It is anticipated that the future drinking water system is being considered by the Township of Centre Wellington (Township) as a municipal system.

This report is submitted in support of a Zoning by-law Amendment and a draft plan of subdivision for the proposed development. This report provides the methods, results and findings of the hydrogeological investigation to demonstrate that PW21-1, TW25-3 and TW25-2 (if needed) could be operated in combination to provide the MDD of 14.4 L/s. Additionally, as the site will include a re-designed golf course that will require irrigation, the testing was designed to include the North Irrigation Well in operation for seasonal golf course irrigation.

Additional investigation, including the drilling of a fourth test well followed by an additional testing program, is currently underway to assess the firm capacity of the wellfield in anticipation of and to support future drinking water and source water protection approvals.

1.1 Limitations

This report is subject to the *Conditions and Limitations of This Report*, which are provided in Appendix A, and which are considered an integral part of the report.

1.2 Site Description

The site is currently comprised of three municipal addresses, 8243 Wellington Road 19 located on the southeast side of the road, and 8282 & 8268 Wellington Road 19 on the northwest side, referred to as the Southeast (SE) site and Northwest (NW) site, respectively. All addresses are former golf courses. The closest portion of the SE site is approximately 1.63 km northeast of the Fergus limits. Currently, the SE site is vacant and the NW site is a dormant golf course. Some development-related earthworks activities have occurred in areas of both sites. The site plan is shown in Figure B1, Appendix B.

FDI is submitting a draft plan application to redevelop as follows:

- 446-lot residential subdivision (SE site);
- re-designed golf course with new clubhouse (NW site);
- communal water supply wells/servicing for the subdivision and clubhouse (NW site); and

- conventional water treatment plant with the proposed discharge of treated effluent to Lake Belwood at the Shand Dam (NW site).

The proposed concept plan is included in Appendix C.

1.3 Regulator Consultations

GEMTEC held a pre-submission consultation with staff from the Ministry of the Environment, Conservation and Parks (MECP) in December 2024 at a time when FDI was preparing to submit a Permit To Take Water (PTTW) for the operation of the site wellfield. At that time the MECP requested that the planned investigation address: i) the potential for theoretical fracturing in the glacial till overburden to provide a preferential pathway for groundwater flow and ii) the addition of monitoring infrastructure to provide data on which to further assess the potential impacts of groundwater use on nearby Irvine Creek. Both are described further and addressed in this report.

Following a series of preliminary discussions, FDI obtained agreement in principle from the Township of Centre Wellington (Township) to submit a development application under the premise of the municipal roads and municipal site services, subject to the draft plan approval process and the Environmental Assessment Addendum. Subject to development approval, it is understood that the site wells will become part of the Elora-Fergus wellfield. FDI plans to demonstrate the adequate safe yield of the site wellfield and acceptable impacts to receptors, after which the Township would carry out further assessments of the expanded Elora-Fergus wellfield and obtain the necessary regulatory amendments for its ownership and operation.

1.4 Previous Investigations

A number of subsurface investigations have been carried out at the site by GEMTEC and others for hydrogeological, geotechnical and environmental purposes. References and a summary of investigations relevant to the subject investigation are provided below:

- GEMTEC Consulting Engineers and Scientists Limited, November 11, 2024. *Updated Hydrogeological Investigation Report, Fergus Golf Course Redevelopment, Residential Development, Fergus, Ontario*. Prepared for Fergus Development Inc. Reference No.: 101987.017.
- WSP Canada Inc., May 6, 2024. *Technical Memorandum – Water Supply Investigation – Proposed Residential Development, Fergus Golf Club – Addendum 1*. Prepared for 883890 Ontario Limited c/o Fergus Development Inc. Reference No. 21456909 (2300). (WSP 2024 Report)
- WSP Canada Inc., January 2024. *Water Supply Investigation, Proposed Residential Development, Fergus Golf Club, 8243 and 8282 Wellington Road 19, Fergus, Ontario*. Prepared for 883890 Ontario Limited c/o Fergus Development Inc. Reference No. 21456909 (2300). (WSP 2024 Memo).

- WSP Canada Inc., April 28, 2023. *Hydrogeological Investigation – Updated. Proposed Residential Development, 8243 and 8282 Wellington Road 19, Fergus, Ontario*. Prepared for 883890 Ontario Limited c/o Fergus Development Inc. (WSP 2023 Report).
- Morrison Environmental Limited, June 1999. *Well Testing Program at the Proposed 18 Hole Golf Course Expansion, Lot 11, Concession 3, Township of West Garafraxa, Wellington County*. Prepared for Fairview Golf and Country Club. Reference No.: 149-991. (Morrison 1999 Report).

Copies of the Morrison 1999 Report, WSP 2024 Report, and WSP 2024 Memo are provided in Appendix M.

The previous subsurface investigation work has included a combination of water well drilling, private well monitoring, drilling, construction, and monitoring (where applicable) of a network of: boreholes, monitoring wells, staff gauges, and piezometers on and surrounding both the SE and NW sites. The locations of these investigation points are shown in the figures of previous reports in Appendix M.

1.5 Bedrock Water Wells

The following seven bedrock water wells are present on the SE Site and NW Site.

Table 1.1 – Summary of Bedrock Water Wells

Name	MECP No.	Location	UTM Easting	UTM Northing	Status	Use in this Report
PW21-1	7389317 7398966 A310448	NW Site	550796	4844515	test well	pumping well
TW25-2	A424007	NW Site	550898	4844445	test well	observation well
TW25-3	A423956	NW Site	550904	4844592	test well	pumping well
North Irrigation Well (NIW)	6712549	NW Site	551157	4844464	dormant	pumping well
Clubhouse Well	6714026	NW Site	551256	4844358	inactive	observation well
South Irrigation Well (SIW)	6713016	SE Site	551546	4844183	inactive	observation well

Name	MECP No.	Location	UTM Easting	UTM Northing	Status	Use in this Report
Old Clubhouse Well	6706408?	SE Site	551466	4843649	inactive	observation well

Notes: ? = possible. UTM = Universal Transverse Mercator, Zone 17. MECP = Ministry of Environment, Conservation and Parks. MECP No. = water well record or well tag number.

The locations of the bedrock water wells are shown on Figure B1, Appendix B. Whereas there are seven bedrock water wells on the site, details are only provided in this report for the two pumping wells to be used for water supply to meet the MDD of the proposed residential subdivision (i.e., PW21-1 and TW25-3) and the pumping well for commercial golf course irrigation (i.e., North Irrigation Well [NIW]). The four remaining water wells were used as observation wells for the purposes of this report.

2.0 SCOPE OF WORK

The following table summarizes the scope of work included in this report and the corresponding report section.

Table 2.1 – Summary of Scope of Work

Task	Location(s)	Section
Consultation with Ministry of the Environment, Conservation and Parks (MECP) staff, and with Township of Centre Wellington staff	n/a	1.3
Assessment of the project setting through review of publicly available information sources and site-specific investigation reports	n/a	3.0
Shallow monitoring well installation	MW25-1	4.1
Staff gauge/piezometer pair installation in Irvine Creek	SG26-1	4.2
Site-wide water level readings in water supply wells, other on-site water wells and off-site private wells, monitoring wells and staff gauge-piezometer pairs	various	5.1
Supplemental single-well response testing	various	4.3
Drilling and construction of a nominal 152 mm diameter test well	TW25-3	4.4.1
Cement bond log and plumbness and alignment testing	TW25-3	4.4.2
Acid Well Enhancement	TW25-3	5.0 5.6.1

Task	Location(s)	Section
Stepped rate pumping tests	PW21-1 TW25-3 NIW	5.6
72-hour constant rate pumping tests	PW21-1 TW25-3 NIW	5.7
Groundwater quality sampling	TW25-3	5.8
Interpretation of the field investigation data, aquifer parameters, safe yield and water quality, assessment of the direct influence of surface water on groundwater quality, assessment of potential interference effects, and assessment of potential impacts to receptors	all	10.0
Conclusions	n/a	6.0
Anticipated Next Steps	n/a	7.0
Recommendations	n/a	13.0

3.0 PROJECT SETTING

3.1 Topography and Drainage

The Site elevation ranges from approximately 427 to 437 metres above sea level (masl), as shown on Figure B3 – Physiography and Drainage in Appendix B (Government of Ontario, 2026a). The NW Site generally ranges in elevation from approximately 427 to 433 masl and exhibits a gentle slope toward the north. A survey prepared by R-PE Surveying Ltd., O.L.S. (2021), included in Appendix C, indicates that elevations across the SE Site vary from approximately 427.5 to 437 masl. The SE Site exhibits a trough-shaped topography. From Wellington Road 19 along the northern boundary, the ground surface slopes downward toward the south and east. A topographic low associated with a wetland is present in the central portion of the SE Site, while elevations increase again toward the eastern boundary of the property.

The Site is located in the Grand River watershed. Surface water bodies near the Site are shown on Figure B3 – Physiography and Drainage (Appendix B) and include:

- Lake Belwood, located approximately 145 m to the east of the SE Site, is a reservoir on the Grand River created by the Shand Dam. The Grand River flows in a southwesterly direction, and
- Irvine Creek located approximately 150 m to the northwest of the NW Site, which also flows in a southwesterly direction.

According to the Ministry of Agriculture, Food, and Agribusiness (Government of Ontario, 2026a) and within the SE Site, a portion of a former municipal drain (at least within the site limits), known as Black Drain (or Black Drainage Works), and a central wetland area will be retained in the concept plan. The upstream limit of Black Drain currently receives runoff from the roadside ditch along Wellington Road 19 and flows southeastward to the middle of the central wetland in the centre of the SE Site and then southward and off-site. Black Drain eventually discharges to Irvine Creek approximately 2.3 km west of the SE Site.

Further, a second municipal drain, Armstrong Drain, drains from the north corner of the NW Site boundary southwestward along the property line to the central portion of the NW Site, and then westward to Irvine Creek. The NW Site includes two centrally located irrigation ponds (East and West Ponds) reported to be interconnected by an underground pipe. The North Irrigation Well (NIW) is located near the south shore of the West Pond. A smaller aesthetic pond is located approximately 80 m northwest of test well TW25-2 and 50 m southeast of test well TW25-3. If the ponds overflow due to precipitation, they discharge via a sinuous anthropogenic swale in an overall westerly direction to Armstrong Drain, and then to Irvine Creek at a location approximately 270 m from the NW Site boundary.

3.2 Natural Heritage Resources, Conservation Lands

According to the Ministry of Natural Resources (Government of Ontario, 2026b), two areas of evaluated provincially significant wetland (swamp), which are part of the Living Springs Wetland Complex, are present off-site to the west of the NW Site. The larger is present in the vicinity of Irvine Creek on the opposite side of Armstrong Drain, and the smaller is approximately 50 m west of the west corner of the NW Site (Figure B3 – Physiography and Drainage, Appendix B).

3.3 Physiography and Geology

3.3.1 Physiography

The Site physiography is shown in Figure B3 (Appendix B). Physiographic mapping (Chapman & Putnam, 2007) indicates that the Site is located across two physiographic regions: Drumlinized Till Plains and Spillway. The northern third of the NW Site and the majority of the SE Site are mapped as spillway, and the southern two-thirds of the NW Site is mapped as drumlinized till plains.

3.3.2 Overburden Geology

Surficial geology mapping of the Site is shown in Figure B4 – Quaternary Geology (Appendix B). Published surficial geology mapping by the Ontario Geological Survey (Ontario Geological Survey, 2010) indicates that the surficial geology of the NW Site is variable. The western portion of the NW Site is underlain by a stone-poor, sandy silt to silty sand ablation till, referred to as Port Stanley Till (WSP, 2024), which is exposed at the surface. The eastern portion of the NW Site is underlain by a fine-grained till deposit, referred to as Tavistock Till (WSP, 2024), and the

northeastern corner of the NW site shows glaciofluvial outwash sand and gravel deposits. The SE Site is predominantly underlain by distal sand and gravel deposits overlying glacial till.

Based on previous investigations completed within the Fergus area (WSP, 2024; GEMTEC, 2024), overburden thickness generally ranges from approximately 25 to 40 m and overlies fractured Silurian carbonate bedrock, although thicknesses of up to 78 m have been identified within a buried valley feature (WSP, 2024). Representative overburden thicknesses include approximately 30 m at PW21-1; 31 to 34 m at MW101, MW102, and MW103; 28 m at the Clubhouse and North Irrigation wells, 60 m at the South Irrigation Well, and 78 m at the Old Clubhouse Well. Water well records are presented in Appendix D.

The overburden consists predominantly of glacial till, generally characterized as silt till, sandy silt till, and gravelly silt till, with localized sand and gravel horizons interbedded between silt to clay till units overlying the bedrock surface (WSP, 2024).

GEMTEC boreholes completed in 2023 did not extend to bedrock but generally encountered topsoil and native silt, silty clay, sand to silty sand, and glacial till deposits. Localized sand, silty sand, and gravelly silty sand layers were identified; however, these units appear discontinuous and limited in thickness (GEMTEC, 2024).

3.3.3 Overburden Hydrogeology

Based on the Three-dimensional Modelling of Surficial Deposits in the Orangeville-Fergus Area of Southern Ontario (Burt & Dodge, 2016), the surficial geology beneath the Site comprises six hydrostratigraphic units, including two aquifers and four aquitards. These units are summarized below in order from shallowest to deepest:

Table 3.1 – Hydrostratigraphic Units on the Site (Burt & Dodge, 2016).

HS Unit	Lithostratigraphic Unit	Lithology	Characteristics
AFA2 (Aquifer)	• Caledon – Grand River Outwash Aquifer: Glaciofluvial outwash, coarse-textured glaciolacustrine sediments, alluvium, and recent organics.	• Gravel and cobbles. • Dirty sand and gravel. • Sand gravel. • Rare silty sand, peat, and wetland deposits.	• Deposited in channels incised into Tavistock Till (Port Bruce aquitard). • Unconfined conditions. • Thickness across the Site ranges from 0-8 m.
ATB1 (Aquitard)	• Port Bruce Phase aquitard: Tavistock till, Port Stanley Till, upper sandy till, and associated fine-textured glaciolacustrine sediments.	• Stone-poor, clayey silt to silt till (Tavistock Till). • Stony sandy silt till (Port Stanley Till). • Stony sand till (upper sandy till).	• Till associated with glaciolacustrine deposits during lobate ice advances from the northwest (Georgian Bay lobe Tavistock Till). • Thickness across the Site ranges from 0-18 m.

HS Unit	Lithostratigraphic Unit	Lithology	Characteristics
ATB3 (Aquitard)	• Lower Erie Phase aquitard: Maryhill till, fine-textured glaciolacustrine sediments and equivalents.	• Clayey silt till. • Silt and clay rhythmites. • Sand and silt rhythmites. • Silt.	• Fine-textured aquitard. • Thickness across the Site ranges from 0-14 m.
ATC1 (Aquitard)	• Upper Catfish Creek Till aquitard: Catfish Creek Till and associated fine-textured glaciolacustrine sediments.	• Stony, sandy silt till. • Rare gravel. • Rare silty sand.	• Important regional confining layer. • Thickness across the Site ranges from 15-33 m.
AFD1 (Aquifer)	• Pre-Catfish aquifer: pre-Catfish Creek glaciofluvial and coarse-textured glaciolacustrine sediments; rare alluvium.	• Gravel. • Sand. • Silt.	• This aquifer forms the Elora buried-bedrock valley fill, with thickness up to 60 m in the Fergus area. • Thickness across the Site ranges from 3-18 m.
ATG1 (Aquitard)	• Pre-Canning aquitard: pre-Canning coarse textured till.	• Stony to very stony, sandy silt till.	• Overlying bedrock. • Laterally continuous deposits confine the bedrock aquifer in the NW study area. • Thickness across the Site ranges from 0-23 m.

Notes: HS = Hydrostratigraphic Unit.

Based on the regional hydrostratigraphic framework developed by Burt and Dodge (2016), the overburden beneath the Site is interpreted to include six hydrostratigraphic units: the AFA2 and AFD1 aquifers, and the ATB1, ATB3, ATC1, and ATG1 aquitards (Figure B9. Cross-Sections, Appendix B). The shallow AFA2 aquifer is interpreted to be associated with glaciofluvial sand and gravel outwash mapped in the northeastern portion of the Site and distal sand and gravel deposits mapped across the SE Site, which are also identified in several private well records (Well IDs 6710904, 6706640, 6711152, 6708770, 6710384, 6704650, and 6711958) (Water Well Records in Appendix D).

Beneath these shallow granular deposits, the overburden is dominated by silt- to clay-rich till units, including ablation till and fine-grained till mapped across the NW Site, and clay-rich intervals identified in private well records and Site wells (Well IDs 670658, 6713018, 6712549 [North Irrigation Well], 6714026 [Clubhouse Well], PW21-1, MW101, MW102, and MW103). These fine-grained deposits are interpreted to correspond to the mapped aquitard units (ATB1, ATB3, and ATC1), which act as confining layers between the shallow granular deposits, deeper overburden aquifers, and the underlying bedrock aquifers. Burt and Dodge (2016) describe the ATC1 unit as an important regional confining layer and indicate that ATG1 deposits locally confine the bedrock aquifer.

Most of the wells where hydraulic conductivity testing was completed, including BH21-01 to BH21-18 (WSP, 2024), BH23-02 to BH23-46 (GEMTEC, 2024), and BH23-N1, MW23-N2, BH24-01 to BH24-03, and MW25-1 (this report), were screened within the overburden aquitard sequence. The location of these wells and boreholes is presented in Figure B2 – Hydraulic Response Wells Site Location, Appendix B. These tests provide hydraulic conductivity values for the fine-grained till units interpreted to correspond generally to the ATB1, ATB3, and ATC1 aquitards.

The deeper AFD1 aquifer is interpreted to be associated with the Elora buried-bedrock valley, where Burt and Dodge (2016) identify thick pre-Catfish aquifer deposits. At the Site, this buried-valley aquifer interpretation is supported by deeper granular intervals identified in selected private and on-Site well records, located in the Elora buried-bedrock valley area (Well IDs 6702915, 6706408 [Old Clubhouse Well], 6713016 [South Irrigation Well], and 6706528). The Elora buried-bedrock valley can be observed in Figure B5 – Bedrock Geology and Figure B9 – Cross-Sections, Appendix B.

A deeper fine-grained layer beneath sand and gravel was identified in a limited number of well records (Well IDs 6706528, 6713016 [South Irrigation Well], and 6705605) and may be related to the lower ATG1 aquitard described by Burt and Dodge (2016); however, its lateral continuity beneath the Site is uncertain. Overall, fine-grained till layers were identified across most of the Site between the surficial deposits and the deeper sand and gravel unit. These deposits are interpreted to correspond generally to the ATC1 aquitard, which Burt and Dodge (2016) describe as an important regional confining layer between the surficial AFA2 aquifer and the deeper AFD1 aquifer associated with the Elora buried-bedrock valley.

3.3.4 Bedrock Geology

The regional bedrock geology of the Fergus area is characterized by Silurian carbonate units of the Lockport Group, which include the Gasport, Goat Island, Eramosa, and Guelph formations (Burt & Dodge, 2016) (Figure B5 – Bedrock Geology, Appendix B). Local Paleozoic bedrock mapping (Armstrong & Dodge, 2007) indicates that the overburden underlies the Guelph and Eramosa Formations.

The Guelph Formation forms the uppermost bedrock unit across the central and western portions of the Orangeville–Fergus area and crops out locally in river valleys such as the Elora Gorge. It is described as grey to cream-coloured, medium- to thick-bedded crinoidal grainstone and wackestone, thinly bedded megalodont–gastropod-dominated wackestones and packstones, and dolostones, while the underlying Eramosa Formation is described as black to dark grey, bituminous, thinly bedded finely crystalline dolostone with shaly laminations (Burt & Dodge, 2016).

At the Site, WSP (2024) reports that the bedrock surface is generally around 400 masl and consists of limestone, dolostone, and shale. Site-specific bedrock wells include PW21-1, MW101, MW102, MW103, the Clubhouse Well, the Old Clubhouse Well, the South Irrigation Well, and the

North Irrigation Well. WSP cross-sections and well logs (WSP, 2024, report is included in Appendix M) indicate that the upper bedrock is generally associated with the Guelph Formation, with depth to bedrock typically ranging from approximately 25 to 40 mbgs and increasing locally to approximately 60 to 80 mbgs at the South Irrigation Well and Old Clubhouse Well, respectively, within the interpreted buried-bedrock valley. The deeper portion of PW21-1 extends into the Eramosa Formation to approximately 85.3 mbgs.

The bedrock surface is variable across the Site. Burt and Dodge (2016) identify re-entrant and buried bedrock valleys in the Orangeville–Fergus area, including the northeast–southwest trending Elora buried-bedrock valley, which runs approximately parallel to Wellington Road 19 and separates the NW and SE portions of the Site (Figure B5 – Bedrock Geology and Figure B9 – Cross-Sections, Appendix B). WSP (2024) similarly interprets a northeast–southwest trending bedrock valley across the SE Site, with water well record 6706408 (Old Clubhouse Well) indicating a bedrock depth of at least 79 m. Therefore, the lower bedrock elevations encountered in some sites and nearby wells are interpreted to reflect the buried bedrock valley system rather than a uniform regional bedrock surface.

3.3.5 Bedrock Hydrogeology

The bedrock aquifer beneath the Site is associated with Silurian carbonate bedrock, including the Guelph Formation and locally the underlying Eramosa Formation. WSP (2024) describes the bedrock as an aquifer, formerly referred to as the Guelph-Amabel Aquifer, with groundwater production controlled by fractures, fissures, and their interconnection. Groundwater flow in the bedrock aquifer is interpreted to be generally southerly to southwesterly toward the Grand River (WSP, 2024). On the other hand, GEMTEC (2024) describes the groundwater elevations on March 11-12, 2024, creating contours that describe that groundwater follows topography towards the southeastern portion of the SE Site, towards Belwood Lake. However, it was observed that in the NW Site, the groundwater flows towards the south-southwest (Figure B8 – Bedrock Groundwater Flow [May 26, 2026], Appendix B).

Regionally, Burt and Dodge (2016) identify Paleozoic bedrock as the basal hydrostratigraphic unit and describe overlying aquitards that can confine the bedrock aquifer, including the Pre-Canning aquitard (ATG1), which locally confines the Guelph Formation bedrock aquifer in the northwest part of the area, and the Catfish Creek Till aquitard (ATC1), which forms an important regional confining layer. The nearby Elora buried-bedrock valley may influence bedrock hydrogeology, although Burt and Dodge (2016) note that additional hydrogeological testing is required to confirm the direction and nature of hydraulic interaction between buried-valley deposits and bedrock.

3.3.6 Site Geology Summary

The geology summary is presented and discussed in Section 5.7.1 - Site Conceptual Model. Table 5.4 summarizes previously reported findings and the new findings presented by GEMTEC

in this report, including overburden and bedrock geology and hydrogeology, based on both reference information and field observations.

3.4 Groundwater Users

3.4.1 MECP Water Well Records

A review of the Ministry of the Environment, Conservation, and Parks (MECP) water well records (WWR) (MECP, 2021) indicated that there are 72 WWR reported within approximately 500 m of the Site (Figure B6 - MECP Well Records within 500 metres, Appendix B), including 62 domestic supply wells, one public supply well, seven abandoned, and two wells of unknown use.

According to the WWR, overburden ranges from 21.3 m to 74.7 m with an average thickness of 33.96 m, and generally consists of clay, loam, sand, and gravel/stones. The underlying bedrock consists of shale and limestone.

Static groundwater level ranged from approximately 1.2 to 23.8 metres below ground surface (mbgs). A summary of information from the WWR is presented in Table D.1 in Appendix D. A summary of the data from the water well records that were reviewed is presented in Table 3.2 below.

Table 3.2 – Summary of MECP Water Well Records

Category	Overburden	Bedrock	Well Depth (m)		
			Min.	Max.	Avg.
Domestic/Livestock/ Cooling and A/C	15	47	6.4	92.0	44.1
Public	1	0	25.6	25.6	25.6
Abandoned	7 records		-	-	-
Records with Poor or No Information	2 records		-	-	-

3.5 Registered Water Takings

The Environmental Site Registry online database maintained by the MECP (Access Environment) was reviewed and the following Environmental Activity Sector Registry (EASR) and Permit to Take Water (PTTW) entries were found within 500m of the Site for water taking:

On-site

- PTTW 5817-8JQN3B – Registered to 883890 Ontario Limited on May 31, 2022, for golf course irrigation with an expected end date of December 31, 2031. The site is not currently operating as a golf course; therefore, this permit is not expected to be active at present.
- PTTW 4164-DJ8JM2 – Registered to Fergus Development Inc. on July 7, 2025, for construction dewatering with an expected end date of July 7, 2026. GEMTEC submitted this permit for approval, which was signed by Kimberly Gilder, for the proposed residential development onsite. This PTTW was intended for construction related to a series of onsite ponds. This work process has since changed and this PTTW was never used nor is it expected to be used.

Off-site

- There are no active EASR or PTTW mapped within 500 m of the Site.

3.6 Source Water Protection

The MECP Source Protection Information Atlas (MECP, 2023) was reviewed for the presence of source water protection areas within 500 m of the site including Wellhead Protection Areas (WHPA) associated with municipal groundwater supplies, Intake Protection Zones (IPZ) associated with municipal surface water supplies, Significant Groundwater Recharge Areas (SGRA), and Highly Vulnerable Aquifers (HVA).

The nearest HVA is located approximately 2 km southeast of the SE Site. Much of the NW and SE Site is within a WHPA-D and SGRA. Portions of the SE Site and NW Site are located within IPZ-3s associated with the Black Creek Drain and a tributary of Irvine Creek, and a portion NW and SE Sites are located within the 25-year WHPA and touching the WHPA-Q1 boundary for the Fergus water supply system. The extent of the WHPA and WHPA-Q is shown on Figure B1- Site Location Map, Appendix B.

4.0 SUBSURFACE INVESTIGATION AND TEST WELL CONSTRUCTION – METHODS AND FINDINGS

4.1 Borehole Drilling and Monitoring Well Construction

Three new wells were added to the Fergus monitoring network: MW25-1, TW25-2, and TW25-3. The locations of these wells are shown in Figure B1, Appendix B.

4.1.1 2025 Drilling Program

Test wells TW25-2 and TW25-3 were drilled on the northwestern portion of the Site, approximately 133 m south and 135 m southeast, respectively, of existing production well PW21-1, which is located near the northwestern corner of the Site. In contrast, monitoring well MW25-1 was drilled

off-site along 2nd Line Road, near its crossing with Irvine Creek, approximately 650 m east of the northwestern corner of the Site.

The well drilling target locations were selected following recommendations from the Fergus Golf Club Water Supply Investigation (WSP, 2024), which advised locating the backup supply well at least 100 m from agricultural lands and 200 m from private water supplies to reduce potential groundwater quality impacts and well interference. These recommended setbacks were adopted as hydrogeological best practices and are greater than the minimum separation distance of 15 m from potential contaminant sources required for drilled wells under Ontario Regulation 903 (Wells) (Government of Ontario, 1990).

Additionally, the proposed well locations are situated within a Wellhead Protection Area D (WHPA-D) of the Grand River Source Protection Area (Grand River Conservation Authority, 2022), where well construction is permitted under the Clean Water Act (Government of Ontario, 2006). Table 4.1 presents a summary of the 2025 drilling program.

Table 4.1 – Summary of Wells Drilled in 2025 Included in Testing Program

Name Well Tag	Date of Completion	Borehole depth (mbgs)	Open Hole Diameter (mm)	Lithology Summary
TW25-2 A424007	May 2025	81.4	203	• 0 - 30.3 m: Silty clay and silty gravel (OB) • 30.3 - 81.5 m: Limestone (BR)
TW25-3 A423956	November 2025	79.2	152	• 0 - 29.6 m: Clay, gravelly clay, gravel (OB) • 29.6 - 79.2 m: Limestone (BR)
MW25-1 A447784	December 2025	6.1	203	• 0 - 3.0 m: Brown silt with gravel (OB) • 3.0 - 6.1 m: Grey silty clay (OB)

Notes: mbgs = metres below ground surface. mm = millimetres. OB = Overburden. BR = Bedrock

All three wells were advanced using a track-mounted rotary core drilling rig supplied and operated by Aardvark Drilling Inc., a specialist drilling contractor (Well Contractor's Licence #7675) subcontracted by GEMTEC. Drilling was completed through overburden and bedrock materials using methods appropriate for groundwater investigations while maintaining borehole stability and protecting groundwater quality. Soil and bedrock samples were collected at regular intervals by the drilling contractor and logged by GEMTEC personnel to characterize subsurface conditions and support the hydrogeological assessment.

4.1.2 Subsurface Conditions

The 2025 drilling program confirmed the presence of glacial overburden deposits overlying fractured carbonate bedrock beneath the Site. Overburden thickness varied across the study area, ranging from approximately 26.5 m at TW25-3 to 30.3 m at TW25-2, and consisted predominantly of clay-rich glacial deposits with localized gravel horizons near the bedrock surface. These conditions are consistent with the regional surficial geology described by OGS mapping (Ontario Geological Survey, 2010) and previous investigations completed within the Fergus area (WSP, 2024).

Bedrock encountered in the test wells consisted of limestone assigned to the Guelph Formation, with TW25-2 extending into the underlying Eramosa Formation. Numerous fractures and a water-bearing void were encountered within TW25-2, whereas fewer discrete fractures were identified within TW25-3. Table 4.2 summarizes the subsurface conditions encountered during the 2025 drilling program.

Table 4.2 – Summary of Wells Drilled in 2025 Included in Testing Program

Geological Feature	TW25-2 (mbgs)	TW25-3 (mbgs)
Overburden Description	• 0.0 - 0.3: Topsoil • 0.3 - 2.4: Clay, some sand • 2.4 - 29.6: Gravel, some clay	• 0.0 – 0.6: Topsoil • 0.6 – 2.1: Clay • 2.1 – 4.6: Clay, some gravel • 4.6 – 25.9: Gravel, some clay • 25.9 – 26.5: Gravel
Bedrock Description	• 29.6 - 30.3: Weathered limestone • 30.3 - 81.5: Competent limestone (Guelph Formation)	• 26.5 - 79.2: Competent limestone with (Guelph Formation)
Fractures	• Water-bearing void at 31.7 • 37.5, 41.8, 48.5, 50.6, 52.1, 53.0, 54.3, 55.2, 56.4, 57.6 to 58.2, 58.8 to 59.1, 62.8, 64.9, 65.8, 76.5, 77.1 to 77.3, and 78.3	• 35.4 and 57.3

Notes: mbgs = metres below ground surface.

4.2 Staff Gauge and Piezometer Pair Installation

SG26-1 was installed in Irving Creek on the east side of 2nd Line, just northwest of the site, and SG26-2 was installed in the east pond on the site. It was installed on the same day of the test, with no logger. SG-2 was used to measure the water levels of the west pond where pumped groundwater was discharged. SG-2 was installed to replace a previously installed SG that had been missing, and it was resurveyed.

4.3 Single Well Response Tests

Previously reported hydraulic conductivity results for shallow (WSP, 2023; GEMTEC, 2024) are summarized in Table E3, Appendix E.

On September 26, 2025, GEMTEC performed rising tests in overburden wells BH23-02 in the SE Site, and BH23-N1, BH23-N2 in the NW Site. Additionally, hydraulic conductivity was also tested in three deep overburden wells (MW24-01 through MW24-03) located in the NW Site. The estimated hydraulic conductivity results are shown in Table E3, Appendix E, and are summarized in the following Table 4.3:

Table 4.3 – Overburden Hydraulic Conductivity Estimates

Soil Type	No. of Tests	Est. Hydraulic Conductivity (m/s)		
		Minimum	Maximum	Geomean
(CL) Silty clay	4	8×10^{-9}	8×10^{-8}	1.79×10^{-8}
(SM) Silty sand; (ML) Sandy silt; (ML) Clayey silt	1	6×10^{-8}	6×10^{-8}	6×10^{-8}
(ML) Clayey silt	1	3×10^{-7}	3×10^{-7}	3×10^{-7}
Grouped by depth				
Shallow Till	3	8×10^{-9}	8×10^{-8}	1.72×10^{-8}
Deep Till	3	2×10^{-8}	3×10^{-7}	6.69×10^{-8}

Notes: Est. – estimated. m/s = metres per second

According to the hydraulic conductivity ranges for unconsolidated sediments (Domenico & Schwartz, 1990), the results are consistent with typical values for till and silt intervals, with the shallow till values generally approaching the lower hydraulic conductivity range associated with clay-rich materials.

4.4 Test Well Construction and Logging

4.4.1 Drilling and Well Construction

The three previously described boreholes were incorporated into the testing program to support the assessment of the expected water demand for future residential development.

MW25-1 was initially drilled as a shallow monitoring well on December 2, 2025; however, it was damaged by snowplows over the winter and was replaced by MW25-1-R on April 2, 2026. The replacement well was completed to approximately 6.1 m bgs and screened within the overburden.

Nominal casing diameter of 51 mm, and casing depth of 3 m bgs. The replacement monitoring well was developed prior to instrumentation with a datalogger to support the pumping test work.

TW25-2 and TW25-3 were completed in February and June 2025, respectively, as deep bedrock test wells. The construction details for the three new wells are presented in Table E1 in Appendix E, and the Water Well Records are included in Appendix D.

For hydrogeological testing, these wells are being evaluated together with the existing North Irrigation Well and PW21-1. The North Irrigation Well was drilled in 1998 and tested in 1999 (Morrison Environmental Ltd, 1999) and PW21-1 was drilled and tested in 2021 (WSP, 2024). Copies of the previous reports are provided in Appendix G, and the Water Well Records are provided in Appendix D. A well construction summary for the wells included in the hydrogeological testing program is presented in Table 4.2, below the cement bond log, plumbness and alignment, optical log, and vertical flow profile subsections. Additionally, well construction details for all the wells included in the monitoring network are summarized in Table E1, Appendix E.

4.4.2 Cement Bond Log (CBL)

Cement Bond Logs (CBLs) evaluate the bond between the steel casing, cement grout, and surrounding formation. CBLs were completed by Lotowater Technical Services Inc. Copies of the CBLs reports are provided in Appendix H, and a summary of the results are described below:

- TW25-2 and TW25-3 CBLs were completed on June 9, 2025. Some variation in bond response was observed, particularly near the lower portion of the casing, which is commonly associated with changes near the casing shoe or transition to the open-hole interval. Overall, the CBL for both wells does not indicate an obvious significant deficiency in the cemented casing interval.

4.4.3 Plumbness and Alignment (P&A)

The plumbness and alignment (P&A) were completed to assess the verticality and alignment of the wells. The P&A logs include measurements of tilt, azimuth, northing/easting deviation, closure distance, closure angle, and the National Ground Water Association (NGWA) allowable drift. Copies of the P&A reports are provided in Appendix H, and a summary of the results are described below:

- TW25-2 and TW25-3 P&A were completed on June 9, 2025. The NGWA allowable drift shown on the logs is presented on a 0 to 0.5 m scale. Based on the logs, the measured closure distance for both TW25-2 and TW25-3 remained below the NGWA allowable drift, with maximum closure distance visually estimated at approximately 0.35 to 0.40 m near the bottom of the logged interval. Therefore, both wells appear to be sufficiently aligned for the proposed downhole logging and hydrogeological testing program.

4.4.4 Optical Log (OL)

Optical/geophysical Logs (OLs) were completed by Lotowater Technical Services Ltd. The OLs were used to visually inspect the casing and open bedrock interval. Copies of the optical logs are provided in Appendix H, and a summary of the results are described below:

- TW25-2: The OL was completed on November 17, 2025. The OL shows the transition from the cased interval to the open bedrock section at approximately 35.1 m bgs. The open bedrock interval includes bedding, vugs, fractures, and other secondary porosity features.
- TW25-3: The OL was completed on November 13, 2025. The OL shows the transition from the cased interval to the open bedrock section at approximately 29.6 to 30 m bgs. The open bedrock interval includes fractured, vuggy, and bedding-related features.
- PW21-1: The OL was completed on November 18, 2025. The OL shows the transition from the cased interval to the open bedrock section at approximately 33.6 m bgs. The open bedrock interval includes bedding-plane openings, fractures, vugs, and locally enlarged features.

4.4.5 Vertical Flow Profile (VFP)

Vertical flow profile was completed by Lotowater Technical Services Inc. The VFP was completed under pumping conditions at approximately 1 L/s to identify the relative contribution of discrete water-producing intervals within the open bedrock section. Copies of the optical logs are provided in Appendix H, and a summary of the results are described below:

- TW25-2: The VFP was completed on November 17, 2025, at a pumping rate of approximately 1 L/s. The VFP shows the largest interpreted flow contributions between approximately 54.88 and 55.22 m bgs, representing 86.7% of the measured flow, or approximately 0.9 L/s, and between approximately 58.28 and 59.80 m bgs, representing 47.7% of the measured flow, or approximately 0.5 L/s. Additional smaller flow contributions were shown at approximately 41.37 to 42.49 m bgs, 43.59 to 44.33 m bgs, 44.97 to 45.89 m bgs, 56.69 to 57.89 m bgs, 59.94 to 60.69 m bgs, 62.65 to 65.01 m bgs, and 72.70 to 73.78 m bgs. The VFP also shows a negative flow interval between approximately 53.95 and 54.86 m bgs; therefore, the flow percentages should be interpreted cautiously as relative flow contributions under the test conditions.
- TW25-3: The VFP was completed on November 13, 2025, at a pumping rate of approximately 2.5 L/s. The largest interpreted flow contribution occurs between approximately 30.30 and 32.00 m bgs, representing 40.8% of the measured flow, or approximately 1.0 L/s. Additional flow contributions were shown at approximately 32.66 to 34.65 m bgs, 37.79 to 39.78 m bgs, 49.66 to 53.68 m bgs, 59.46 to 64.98 m bgs, 74.38 to 76.77 m bgs, and 77.27 to 79.58 m bgs. The VFP notes that some data were missing and interpolated, and that flow above 32 m was assessed from the surface flow meter while

flow below 32 m was measured using the flow tool below the pump; therefore, the results should be considered interpreted relative contributions.

- PW21-1: The VFP was completed on November 18, 2025, at a pumping rate of approximately 6.75 L/s. The largest interpreted flow contribution occurs between approximately 39.90 and 41.79 m bgs, representing 30.1% of the measured flow, or approximately 2.0 L/s. Additional flow contributions were shown at approximately 33.58 to 33.86 m bgs, 34.95 to 35.86 m bgs, 36.76 to 39.12 m bgs, 43.74 to 44.93 m bgs, 47.11 to 47.82 m bgs, 48.29 to 50.58 m bgs, 51.42 to 52.18 m bgs, 54.50 to 56.08 m bgs, 56.72 to 57.41 m bgs, 58.19 to 59.16 m bgs, 71.54 to 72.04 m bgs, and 73.20 to 80.88 m bgs. A negative flow contribution was also shown between approximately 71.24 and 71.52 m bgs, which should be interpreted with caution.

Table 4.4 – Summary of the 2025 Well Construction Details Included in Testing Program

Name	Nom. Casing Dia. (mm)	OB-BR Contact (m bgs)	Base of Casing (m bgs)	Well Bottom (m bgs)	CBL	P&A	OL	VFP
PW21-1	152	29.9	32.9	85.3	-	-	yes	yes
NIW	152	32	32.5	86.9	-	-	yes	yes
TW25-2	203	30.3	35.1	81.5	yes	yes	yes	yes
TW25-3	152	26.5	29.6	79.2	yes	yes	yes	yes

Notes: NIM = North Irrigation Well. Nom. = nominal. mm = millimetres. m bgs = metres below ground surface. OB = overburden. BR = bedrock. CBL = cement bond log. P&A = plumbness and alignment test. OL = optical log. VFP = vertical flow profile. NE = Not Encountered

4.5 Private Well Monitoring

GEMTEC has conducted multiple door-to-door private well surveys in the past for various reasons, with long-term monitoring already being conducted in several residences on 3rd Line for an extended period of time. These other private well survey methodologies and results are documented in other reports by GEMTEC.

Ahead of the planned pumping tests in December 2025, GEMTEC approached the residences on 2nd and 3rd Lines that weren't already being monitored to obtain permission to monitor for the duration of the pumping test work.

GEMTEC personnel hand-delivered letters directly to property owners within 500 meters of the Fergus Golf Course property. The distributed letters included general information about the proposed development, contact information to direct any questions to, well information survey forms for property owners to provide information about their onsite private domestic wells, and consent forms to declare interest in participating in the well monitoring program (i.e., logger

installation and manual water level measurements). Two attempts were made to speak with local well owners and obtain permission.

Additional residences on 2nd Line and 3rd Line agreed to participate. Locations of all participating residences are included in Figure B-1, Appendix B.

Lotowater assisted with accessing these wells, installing stilling wells and data loggers into each one. These residents will continue to be monitored for the duration of the onsite pumping test work.

5.0 PUMPING TESTS – ANALYSIS AND INTERPRETATIONS

The hydrogeological testing program was completed in several stages between November 2025 and May 2026. Initial step testing, downhole logging, and well development activities were completed to assess individual well performance and identify practical pumping rates. Longer-duration testing with different well combinations was performed in December 2025 and January 2026, followed by the May 2026 combined pumping test. A summary of the testing sequence is provided in Table 5.1.

Table 5.1 – Summary of the 2025 Hydrogeological Testing Program Sequence

Name	Step Test	Constant Rate Test Limitations
PW21-1	Step Test 1 - Nov 18, 2025.	
	Rate = 6.75 L/s	72- hour constant Rate Test
	-	May 26-28, 2026.
	Step Test 2 - May 22, 2026	Rate = 8 L/s
	Rates = 4 - 6 - 8 L/s	
NIW	Step Test 1 - May 21, 2026	
	Rate = 0.24 L/s	72- hour constant Rate Test
	-	May 26-28, 2026.
	Step Test 2 - May 25-26, 2026	Rate = 1.0 – 0.8 L/s
	Rates = 0.25 – 0.5 – 0.75 – 1.0 L/s	

Name	Step Test	Constant Rate Test Limitations
	Step Test 1 - Nov 18, 2025. Rate= 1 L/s for 30 min	
TW25-2	Acid Well Enhancement - Dec 3-8, 2025,	72-hr Constant Rate Test - Dec 17-19, 2025 Rate = 2.5 L/s
	Step Test 2 - Dec 9, 2025 Rate = 2 L/s for 45 min	
	Step Test 1 - Nov 13, 2025. Rate = 2.5	
TW25-3	Acid Well Enhancement - Nov 24-27, 2025,	72- hour constant Rate Test - May 26-28, 2026 Rate = 6.5 L/s (6.2 – 6.8 L/s)
	Step Test 2 - Dec 2, 2025 Rate = 2 – 4 – 6 - 7.5 – 8 L/s	

Notes: NIM = North Irrigation Well. Nom. = nominal. mm = millimetres. m bgs = metres below ground surface. OB = overburden. BR = bedrock. CBL = cement bond log. P&A = plumbness and alignment test. OL = optical log. VFP = vertical flow profile. NE = Not Encountered

5.1 Monitoring Network

A monitoring network was established to evaluate the response of the bedrock aquifer, shallow overburden, surface water features, and selected nearby private wells during the pumping test program. The monitoring network included pumping wells, other on-Site bedrock wells, selected private wells, overburden monitoring wells, staff gauges, and piezometers. The monitoring locations are summarized in Table 5.2 and shown in Figure B1, Appendix B.

Table 5.2 – Summary of Monitoring Network

Category	Name	Rationale
Pumping Wells	PW21-1	subdivision water supply
	TW25-3	subdivision water supply
	NIW	golf course irrigation

Category	Name	Rationale
Other On-Site Bedrock Wells	Clubhouse Well	bedrock aquifer response
	TW25-2	bedrock aquifer response, back-up water supply well
	MW101	bedrock aquifer response
	MW102	bedrock aquifer response
	MW103	bedrock aquifer response
	South Irrigation Well	bedrock aquifer response in bedrock valley
	Old Clubhouse Well	bedrock aquifer response in bedrock valley
Private Wells	6607 2 nd Line	bedrock aquifer response in nearby private wells
	6617 2 nd Line	bedrock aquifer response in nearby private wells
	6617 3 rd Line	bedrock aquifer response in nearby private wells
	6622 3 rd Line	bedrock aquifer response in nearby private wells
	6635 3 rd Line	bedrock aquifer response in nearby private wells
Monitoring Wells	BH21-14	radial aquifer response
	BH21-15	radial aquifer response
	BH23-02	radial aquifer response
	BH24-01	deep overburden response
	BH24-02	deep overburden response
	BH24-03	deep overburden response
	MW23-N1	radial aquifer response
	MW23-N2	radial aquifer response
	MW25-01	shallow overburden response adjacent to Irvine Cr.

Category	Name	Rationale
Staff Gauges	SG-1	Onsite irrigation pond response/connection
	SG-2	Onsite irrigation pond response/connection
	SG26-1	Response from Irvine Creek response/connection
	SG26-2	Onsite East pond
Piezometers	MP-1	Onsite irrigation pond response/connection
	MP-2	Onsite irrigation pond response/connection

5.2 Pumping Rate Measurement

Pumping rates during the testing program were measured using a McCrometer Model MT103 fixed flow meter, which displays the instantaneous flow rate in L/s and the total volume pumped in cubic metres. The flow meter was calibrated on December 9, 2025, and the calibration record is provided in Appendix I. Instantaneous flow rates and total volumes pumped at the beginning and end of each test were manually recorded by LTS. Pumping rates were adjusted by LTS using a gate valve, as required. Constant pumping rates were checked by dividing the total volume pumped by the pumping duration, and these calculated rates were used in the pumping test analyses.

Target pumping rates were selected based on observed well performance, operational constraints, the revised water demand assessment, and available information from previous pumping tests at the Site. WSP (2024) reported a step test of PW21-1 on August 30, 2021, at 3.2, 6.3, and 9.5 L/s, followed by a 72-hour constant-rate test from August 31 to September 3, 2021, at 8.8 L/s. Historical information also indicates that the North Irrigation Well was tested on May 18, 1999, at 3.0 L/s (Morrison Environmental Ltd., 1999). Based on this information, the target rates for TW25-2 and TW25-3 were generally selected within the approximate range of 3 to 8 L/s. Subsequently, step tests for TW25-2 and TW25-3 confirmed the selected pumping rate for the 72-hour constant-rate test.

5.3 Water Level Measurements

Water levels were monitored before, during, and after pumping in the pumping wells, selected observation wells, overburden monitoring wells, private wells, staff gauges, and piezometers. The water level data were used to evaluate drawdown, recovery, well interference, and hydraulic responses within the bedrock aquifer and overlying overburden units. Historical water levels were

also reviewed as part of the background data analysis to identify larger seasonal fluctuations across the monitoring network during spring and dry-season conditions. A table summarizing the historical groundwater level measurements is provided in Appendix E2 of Appendix E.

Solinst® Levelloggers®, Solinst® Barologgers®, and confirmatory manual water level measurements using a water level tape were all employed during hydrogeological testing. A summary of the water level data collected during hydrogeological testing is given in Appendix I – Step Test and Pumping Test Data.

All loggers were installed at least 5 days before the commencement of hydrogeological testing to provide background data, except in the NIW. The loggers were also left in place until the pumping wells fully recovered following the completion of the pumping tests, typically at least 3 days following the shutoff of the pumps.

While manual water levels were measured multiple times during daylight hours throughout the testing, the data loggers were not downloaded until after the recovery post-pumping test. All loggers remained within their manufacturer-indicated pressure/depth ranges and manual levels were found to match well with the logger data retrieved.

5.4 Other Pumping Sources

Other pumping sources were considered during the testing program because they may influence water levels in the bedrock aquifer. The North Irrigation Well is an existing irrigation supply well and was included in the May 2026 pumping test to evaluate potential interference to the proposed water supply wells as this well would be operational seasonally during the spring through fall months while the golf course would be operational.

All private wells surrounding the site continued to operate as normal, with those who opted into voluntary monitoring during the testing instrumented and monitored by GEMTEC.

TW25-2 was not pumped during the May 2026 combined test; however, it was tested during the earlier December 2025 and January 2026 program and is expected to provide supplemental supply as required. Based on the current interpretation, PW21-1 and TW25-3 provide most of the required supply, while TW25-2 is expected to supplement the system to reach the target combined demand.

5.5 Pumped Water Discharge

The pumped groundwater was directed to the ground surface on-site, where discharge will flow overland and ultimately into the central irrigation pond, with the option for it to flow into the creek that flows off the site if overflow of the pond were to happen, which was especially possible due to spring high conditions still being in place at the time of testing.

The irrigation pond is an artificial surface water feature constructed during the golf course development and does not reflect natural groundwater conditions. It is inferred to have been constructed with a low-permeability clay liner to minimize infiltration and reduce interaction with the underlying groundwater table.

Considering that the pond has historically been used to store pumped groundwater from the existing bedrock irrigation wells on the Fergus Golf Course property, it was considered a suitable and established receptor for any pumping test water.

Conditions were checked regularly by onsite staff to ensure that there were no erosional challenges or other issues arising from the discharge of the pumped water. No issues were observed for the duration of the pumping test.

5.6 Stepped Rate Pumping Test

The preliminary step testing, downhole logging, and well development activities were completed in November 2025 to May 2026 to assess the performance of TW25-2, TW25-3, PW21-1, and the North Irrigation Well before the longer-duration pumping tests.

5.6.1 TW25-3 Step Test

TW25-3 was tested and logged on November 13, 2025. The preliminary testing indicated that TW25-3 could pump at approximately 2.5 L/s at that time, and the logging results supported acid development over selected water-producing zones. Acid development was subsequently completed between November 24 to 27, 2025, and post-development testing indicated improved performance. The Step Test data for both tests and the acid well enhancement plan are presented in Appendix I.

A new step-drawdown pumping test was completed at TW25-3 on December 2, 2025. Water levels were measured from the top of the casing, which was reported to be 0.62 m above the ground surface (mags). The static water level before pumping was 6.33 m below top of casing (mbtoc), equivalent to 5.71 mbgs. The test was completed using increasing pumping rates of 2, 4, 6, 7.5 and 8 L/s. The water level response during the test is shown in Figure J1 in Appendix J.

Based on Figure J1, the interpreted top of the aquifer/bedrock is 26.52 mbgs, and the available drawdown above this elevation is 20.81 m. The 6 L/s step used approximately 70% of the available drawdown, while the 8 L/s step used approximately 119% of the available drawdown. Therefore, the 8 L/s step represents the highest pumping stress tested and produced the largest drawdown response. Following completion of the step-drawdown test, approximately 91% recovery was observed within 30 minutes after pumping stopped.

The Step Test values used for the step-test interpretation are summarized in Table 5.3 below.

Table 5.3 – TW25-3 Step Test Summary

Pumping Step	Average Pumping Rate (L/s)	Drawdown [s_w] at end of step (m)	Specific Capacity [Q/s_w] (L/s/m)	Specific Drawdown [s_w/Q] (days/m ²)
1	2	3.35	0.597	0.01939
2	4	7.17	0.558	0.02075
3	6	14.60	0.411	0.02816
4	7.5 - 8	24.74	0.323	0.03579

Data analysis for TW25-3 Step Test showed that specific capacity decreased from 0.597 L/s/m at 2 L/s to 0.323 L/s/m at 8 L/s, indicating that the well became less efficient as the pumping rate increased. Specific drawdown was evaluated using the Hantush-Bierschenk Arithmetic Plot (Figure J2, Appendix J) (S. S. Papadopoulos & Associates, Inc., 2012). The graph shows increasing specific drawdown with increasing pumping rate. The increasing specific drawdown indicates that non-linear well losses (turbulent flow) became more significant at higher pumping rates.

The drawdown vs pumping rate plot (Figure J3, Appendix J) shows the calculated drawdown components from the Jacob step-test model. At 8 L/s, the calculated total drawdown was approximately 23.32 m, including approximately 8.37 m of linear head losses and 14.95 m of non-linear well losses. The non-linear component represented approximately 64% of the calculated drawdown at 8 L/s. In the limestone/dolostone bedrock setting, this response may reflect increased high-velocity flow through fractures, bedding-plane openings, solution-enhanced features, near-borehole openings, and/or within the well as the pumping rate increased. This indicates that well losses became significant at the highest tested pumping rate.

Based on the step-drawdown test results, a constant-rate pumping rate of 7 L/s was selected because it falls between the highest tested rate of 8 L/s and the last stable step of 6 L/s. This rate was considered conservative while still allowing the expected well performance to be tested. Although non-linear well losses increased at this pumping rate, the observed drawdown remained within the available drawdown, unlike the drawdown observed at 8 L/ (Figure J1 – Appendix J).

5.6.2 PW21-1 Step Test

A preliminary step-test was completed at PW21-1 on November 18, 2025. The testing indicated that PW21-1 could pump at approximately 6.8 L/s at that time, with a drawdown of 5.56 m during 30 min of pumping. On May 22, 2026, a new step test was completed using increasing pumping rates of 4, 6, and 8 L/s. Water levels were measured from the top of the casing, which was reported to be 0.57 mags. The static water level before pumping was 7.27 mbtoc, equivalent to 6.70 mbgs. The Step Test data for both tests are presented in Appendix I.

The water level response during the test is shown in Figure J4 in Appendix J. Based on Figure J4, the interpreted top of the aquifer/bedrock is 29.9 mbgs, and the available drawdown above this elevation is approximately 23.2 m. At 8 L/s, the measured drawdown at the end of the step was 7.61 m, equivalent to approximately 33% of the available drawdown. The pumping water level at the end of the 8 L/s step was approximately 14.31 mbgs, remaining above the interpreted top of the aquifer/bedrock. Therefore, the 8 L/s step represents the highest pumping stress tested and produced the largest drawdown response while maintaining available drawdown above the aquifer/bedrock. Following completion of the step-drawdown test, approximately 90% recovery was observed within 30 minutes after pumping stopped.

The Step Test values used for the step-test interpretation are summarized in Table 5.4 below.

Table 5.4 – PW21-1 Step Test Summary

Pumping Step	Average Pumping Rate (L/s)	Drawdown [s_w] at end of step (m)	Specific Capacity [Q/s_w] (L/s/m)	Specific Drawdown [s_w/Q] (days/m ²)
1	4	2.64	1.515	0.00764
2	6	4.80	1.250	0.00926
3	8	7.61	1.051	0.01101

Data analysis for the PW21-1 step test showed that specific capacity decreased from 1.515 L/s/m at 4 L/s to 1.051 L/s/m at 8 L/s, indicating that the well became less efficient as the pumping rate increased. Specific drawdown was evaluated using the Hantush-Bierschenk Arithmetic Plot (Figure J5, Appendix J) (S. S. Papadopoulos & Associates, Inc., 2012). The graph shows increasing specific drawdown with increasing pumping rate. The increasing specific drawdown indicates that non-linear well losses (turbulent flow) became more significant at higher pumping rates.

The drawdown vs pumping rate plot (Figure J6, Appendix J) shows the calculated drawdown components from the Jacob step-test model (1947) (S. S. Papadopoulos & Associates, Inc., 2012). At 8 L/s, the calculated total drawdown was approximately 7.14 m, including approximately 3.32 m of linear head losses and 3.82 m of non-linear well losses. The non-linear component represented approximately 54% of the calculated drawdown at 8 L/s. In the limestone/dolostone bedrock setting, this response may reflect increased high-velocity flow through fractures near-borehole openings as the pumping rate increased. This indicates that well losses became significant at the highest tested pumping rate.

Based on the step-drawdown test, a constant-rate pumping rate of 8 L/s was selected because it was the highest tested rate, produced a strong measurable response, and maintained the pumping water level above the interpreted top of the aquifer/bedrock. Although non-linear well

losses increased at this rate, the observed drawdown was reasonably represented by the Hantush-Bierschenk relationship, suggesting that the response was suitable for the constant-rate test. Additionally, WSP completed a step test on PW21-1 on August 30, 2021, at pumping rates of 3.2, 6.3, and 9.5 L/s (WSP, 2024), with a selected pumping rate of 8.8 L/s for the subsequent 72-hour constant-rate test.

5.6.3 North Irrigation Well

A preliminary step test was conducted at the North Irrigation Well (NIW) on May 21, 2026. The testing indicated that NIW could pump at approximately 0.24 L/s at that time, with a drawdown of 6.68 m. On May 25, 2026, a new step test was conducted at pumping rates of 0.25, 0.5, and 0.75 L/s. Water levels were measured from the top of the casing (top of the concrete tile), which was reported to be 0.27 mags. The static water level before pumping was 7.14 mbtoc, equivalent to 6.87 mbgs. The Step Test data for both tests are presented in Appendix I.

The water level response during the test is shown in Figure J7 in Appendix J. Based on Figure J7, the interpreted top of the aquifer/bedrock is 32.0 mbgs, and the available drawdown above this elevation is approximately 25.13 m. At 0.75 L/s, the measured drawdown at the end of the step was 16.23 m, equivalent to approximately 64.6 % of the available drawdown. The pumping water level at the end of the 0.75 L/s step was approximately 23.10 mbgs, remaining above the interpreted top of the aquifer/bedrock. Therefore, the 0.75 L/s step represents the highest pumping stress tested and produced the largest drawdown response while maintaining available drawdown above the aquifer/bedrock. Following completion of the step-drawdown test, approximately 95% recovery was observed within the next few minutes after pumping stopped.

The Step Test values used for the step-test interpretation are summarized in Table 5.5 below.

Table 5.5 – NIW Step Test Summary

Pumping Step	Average Pumping Rate (L/s)	Drawdown [s_w] at end of step (m)	Specific Capacity [Q/s_w] (L/s/m)	Specific Drawdown [s_w/Q] (days/m ²)
1	0.25	1.80	0.14	0.0833
2	0.5	8.28	0.06	0.1894
3	0.75	16.23	0.05	0.2332

Data analysis for the NIW step test showed that specific capacity decreased from 0.14 L/s/m at 0.25 L/s to 0.05 L/s/m at 0.75 L/s, indicating that the well became less efficient as the pumping rate increased. Specific drawdown was evaluated using the Hantush-Bierschenk Arithmetic Plot (Figure J8, Appendix J) (S. S. Papadopoulos & Associates, Inc., 2012). The graph shows increasing specific drawdown with increasing pumping rate. The increasing specific drawdown indicates that non-linear well losses (turbulent flow) became more significant at higher pumping rates.

The drawdown vs pumping rate plot (Figure J9, Appendix J) shows the calculated drawdown components from the Jacob step-test model (1947) (S. S. Papadopoulos & Associates, Inc., 2012). At 0.75 L/s, the calculated total drawdown was approximately 15.91 m, including approximately 1.21 m of linear head losses and 14.7 m of non-linear well losses. The non-linear component represented approximately 92.4 % of the calculated drawdown at 0.75 L/s. In the limestone/dolostone bedrock setting, this response may reflect increased high-velocity flow through fractures near-borehole openings as the pumping rate increased. This indicates that well losses became significant at the highest tested pumping rate.

Based on the step-drawdown test, an average constant-rate pumping rate of 0.8 L/s was selected because it is close to the highest tested rate, produced a strong measurable response, and maintained the pumping water level above the interpreted top of the aquifer/bedrock. Additionally, according to available records, a previous step test was performed at NIW on May 18, 1999, at pumping rates of 1.5, 2.3, and 3 L/s (Appendix I). An attempt was made to achieve the same maximum pumping rate during the 2026 step test; however, this rate could not be reached. Nevertheless, the 1999 results indicate that the well may be capable of producing more than 0.75 L/s under certain conditions. To GEMTEC's knowledge, this well has never undergone rehabilitation and that rehabilitation may return this well to or close to previous productivity. Additionally, the actual operating pumping rates of this well (when the golf course was still in operation) were not available for reference.

5.7 Constant Rate Pumping Test

The 72-hour pumping test was completed with simultaneous pumping from PW21-1, TW25-3, and the North Irrigation Well. The test initiated on May 26, 2026, at 11:00 AM for PW21-1, 11:30 AM for TW25-3, and 12:00 PM for the North Irrigation Well (NIW). As discussed previously, the pumping rates were selected based on the step-test analysis: 8 L/s for PW21-1, 7.0 L/s for TW25-3, and 1.0 L/s for NIW. Flows were monitored at a similar frequency to water levels.

PW21-1 and TW25-3 were set as nominally pumping at 8 L/s and 7 L/s, respectively, however a review of the totalizer-derived flow rates indicated that there was some variation in the overall pumping rates during the test.

- For PW21-1, the calculated totalizer-derived rates varied generally around 7 to 8 L/s.
- For TW25-3, the calculated pumping rates generally averaged 6.2 to 6.8 L/s.
- The North Irrigation Well was initially operated at approximately 1 L/s; however, following 2 hours of pumping, the well pump was replaced from a Grundfos 30SQ to a Grundfos 10SQ, and the pumping rate was reduced and later maintained more consistently at approximately 0.8 L/s.

Due to some observed flow-rate variations during the test, the analysis was completed as a multi-well variable-rate pumping test. Pumping schedules based on the totalizer-derived flow rates were

used to better represent the actual pumping stresses applied during the test. The water-level records still show a measurable aquifer response to pumping; however, the variable discharge conditions were considered in the interpretation of the test results.

Observation wells were monitored to evaluate the response to the combined pumping test. All monitored bedrock wells were considered in the analysis, including the five private wells identified in the monitoring network. These private wells were operating intermittently and at variable pumping rates during the combined pumping test. In addition, overburden wells and piezometer/staff gauge pairs were evaluated to assess the response of the overburden system. A summary of the water level data collected during hydrogeological testing and responses for all monitored wells is summarized in Table 5.6.

Table 5.6 – Drawdown at End of 72-Hour Pumping Test

Category	Name	Static Water Level (masl)	Open Borehole / Screen Interval (masl)	Drawdown at End of Test (m)	Recovery Monitoring 24 hours after
Pumping Wells	PW21-1	423.28	397.08 - 345.88	13.02	99.4%
	TW25-3	422.99	394.94 - 355.04	27.01*	98.7%**
	NIW	423.02	397.42 - 342.95	22.37	99.4%
Other On-Site Bedrock Wells	Clubhouse Well	422.93	399.26 - 357.50	5.51	99.3%
	TW25-2	422.79	394.94 - 355.04	6.75	99.5%
	MW101	422.21	396.56 - 369.36	3.69	99.4%
	MW102	421.98	402.96 - 372.56	4.68	99.3%
	MW103	422.97	395.66 - 365.46	5.36	99.5%
	SIW	416.48	399.38 - 332.93	0.54	99.9%
	Old Clubhouse Well	413.28	352.89 - 323.69	0.55	99.9%

Category	Name	Static Water Level (masl)	Open Borehole / Screen Interval (masl)	Drawdown at End of Test (m)	Recovery Monitoring 24 hours after
Private Wells	6607 2 nd Line	422.76	NA	4.92	99.4%
	6617 2 nd Line	422.73	NA	2.60	99.8%
	6617 3 rd Line	421.35	NA	4.06	99.4%
	6622 3 rd Line	421.69	NA	5.94	99.4%
	6635 3 rd Line	421.50	NA	5.86	99.4%

Notes: * = Drawdown may be greater than indicated, as the Levellogger was dewatered.

** = Groundwater level recovery value measured 2 hours after the end of the pumping test.

5.7.1 Groundwater Level Analysis

Site hydrographs and groundwater data show a seasonal decline beginning around May 6, 2026, when groundwater elevations were approximately 422.79 masl. By the start of hydrogeological testing on May 26, 2026, levels had decreased to approximately 422.18 masl. This pattern is consistent with previous monitoring years (e.g., MW101, MW102, and MW103, with historical data from 2021 to 2026), where groundwater levels generally rise from March to early May and then decline toward the summer months. Based on this trend, the observed decrease of approximately 0.6 m is interpreted as a natural seasonal fluctuation rather than a response to the pumping test. During the five days before testing, groundwater levels had already decreased by approximately 0.3 to 0.6 m.

The responses summarized in Table 5.6 support this interpretation. The shallow and deep overburden monitoring wells, stage gauges, piezometers, and southeastern bedrock wells, including the South Irrigation Well and Old Clubhouse Well, showed water level decreases of approximately 0.6 m or less. This change is consistent with the seasonal decline observed in the background hydrographs and is not interpreted as a direct response to the pumping test.

Figure K3 in Appendix K also shows no clear pumping-related response in the overburden wells. The southeastern bedrock wells are interpreted to be hydraulically separated from the northwestern pumping area by the Elora buried-bedrock valley (Figure K1, Appendix K). The main exceptions were MP-2 and SG-2, which are located near the West Pond, where pumped groundwater was discharged during testing.

5.7.2 Conceptual Site Model

The conceptual site model is summarized in the Table G1 provided in Appendix G, which compiles the overburden and bedrock geology, hydrogeologic interpretations, and hydraulic parameters, based on the current and previous investigations (WSP, 2024; GEMTEC, 2024).

Based on the compiled well network, and excluding boreholes, the overburden thickness averages approximately 36.9 m, and the reported bedrock thickness averages approximately 35.1 m. The Site is generally underlain by an overburden sequence consisting of clay, silt, sand, gravel, and till units over fractured carbonate bedrock of the Guelph Formation. The overburden is interpreted primarily as an aquitard sequence, although localized sand and gravel units may act as discontinuous aquifer zones.

Overburden thickness varies across the Site, with greater thicknesses reported in wells interpreted to be associated with the Elora buried-bedrock valley. These include the Old Clubhouse Well, with approximately 78.9 m of overburden, and the South Irrigation Well, with approximately 57.3 m of overburden. In comparison, overburden thicknesses at other wells, including TW25-3, TW25-2, NIW, Clubhouse Well, MW101, MW102, MW103, and PW21-1, generally range from approximately 26.7 to 32.6 m. The variable overburden thickness indicates spatial variability in the bedrock surface and hydrostratigraphic conditions across the Site.

For the AQTESOLV analysis, PW21-1, TW25-3, and the North Irrigation Well were considered pumping wells. All other wells included in the conceptual site model table were considered observation wells, where applicable. The underlying limestone and dolostone bedrock is interpreted as the primary aquifer, with confinement provided by the overlying low-permeability overburden units, as shown in Figure B9 – Cross-sections, Appendix B.

5.7.3 Aquifer Parameters Determination

AQTESOLV® software was used to estimate aquifer parameters for the bedrock aquifer system (HydroSOLVE, Inc, 2007).

As an initial step, groundwater elevation diagnostic plots were prepared for PW21-1, TW25-3, and the North Irrigation Well (NIW) for the full testing period, including the pre-test background monitoring period, step-drawdown testing, constant-rate testing, and recovery. The plots incorporated Solinst® Levellogger data and manual water level measurements, which showed good agreement. The diagnostic plots are provided as Figure K1 in Appendix K.

The preliminary review indicated that bedrock wells within the northwestern portion of the Site monitoring network responded to the hydrogeological testing, with clear decreases in groundwater elevation observed during pumping. In contrast, bedrock wells located in the southeastern portion of the Site, including the Old Clubhouse Well and South Irrigation Well, did not show an apparent response to the pumping tests.

The five private wells included in the monitoring network were plotted separately, as shown on Figure K2 in Appendix K. These wells were active during portions of the hydrogeological testing, and their water level records contained pumping-related fluctuations that obscured the response observed in the other monitoring wells. Overall, the private wells showed decreases in groundwater elevation during the hydrogeological testing period. The smallest groundwater

elevation decreases were observed at private wells 6607 2nd Line and 6617 2nd Line, which are the farthest away to the west of the Site.

To support a preliminary assessment of confined versus unconfined aquifer behaviour, the pumped bedrock wells were compared with overburden wells, boreholes, piezometers, and stage gauges included in the monitoring network. These data are shown in Figure K3 in Appendix K. None of the monitored overburden wells showed a corresponding decrease in groundwater elevation during the hydrogeological testing period. This response supports the interpretation that the tested bedrock aquifer is hydraulically separated from the monitored overburden units over the duration of the testing.

AQTESOLV® was used to obtain estimates of aquifer parameters of the Site. Bedrock monitoring wells were included in the drawdown displacement versus time evaluation, as shown on Figure K4 in Appendix K. Private well datasets were also reviewed and, where possible, adjusted to remove water level fluctuations associated with local pumping. The dataset for private well 6635 3rd Line was not used in the AQTESOLV® analysis because frequent pumping-related noise was interpreted to interfere with the reliability of the response curve.

For this analysis, transmissivity was estimated for each pumped well individually to evaluate well-specific aquifer response and relative well performance. A combined-well assessment was also completed to compare the interpreted aquifer response under multi-well pumping conditions. In addition, transmissivity and storativity values were estimated from selected observation well responses, where appropriate. AQTESOLV® analysis plots are provided as Figures K5 to K14 in Appendix K, and the interpreted aquifer parameter results are summarized in Table 5.7.

Table 5.7 – Summary of Aquifer Parameter Estimates

Well or Group of Wells	Transmissivity (m ² /sec)		Storativity (unitless)	
	Theis (1935); confined	Cooper-Jacob (1946); Distance-Drawdown; confined	Theis (1935); confined	Cooper-Jacob (1946); Distance-Drawdown; confined
PW21-1	64.03	42.05	-	-
TW25-3	18.67	68.86	-	-
NIW	2.2	72.98	-	-
Geometric Mean		31.36	Not determined for pumped wells	

Well or Group of Wells	Transmissivity (m ² /sec)		Storativity (unitless)	
	Theis (1935); confined	Cooper-Jacob (1946); Distance-Drawdown; confined	Theis (1935); confined	Cooper-Jacob (1946); Distance-Drawdown; confined
Combined pumping Wells	75.17	36.68	-	-
Combined Observation Wells	60.52	36.46	6.09 x 10 ⁻⁵	2.76 x 10 ⁻⁵
Geometric Mean		49.68		4.10 x 10⁻⁵

The individual transmissivity estimates showed variability between wells and analytical methods. This variability is expected given the complexity of the testing conditions, the assumptions inherent to the Theis and Cooper-Jacob analytical solutions, and the simplified representation of the fractured bedrock aquifer as an equivalent porous medium. Although the bedrock aquifer is interpreted to be fractured, the available data were not sufficient to characterize discrete fracture geometry, connectivity, aperture, or fracture-specific storage. Therefore, the aquifer was evaluated using an equivalent porous medium approach to estimate representative bulk aquifer parameters. Zhang et al. (2023) noted that the equivalent porous medium method is an efficient approximation for groundwater-yield analysis in fractured geologic media and is widely used in practical hydrogeologic applications from local to regional scales, although its suitability should be evaluated based on site-specific conditions (Zhang, et al., 2023).

As discussed by Gomo (2019), the Cooper-Jacob method is widely used for the interpretation of multi-well aquifer-pumping tests because of its simplicity; however, it requires caution, particularly where well interference and variable pumping rates may influence the observed drawdown response. Therefore, for this Site, the combined multi-well analysis was selected over the individual well analysis because it better represents the overall Site-scale aquifer response under the actual testing conditions, where drawdown was influenced by simultaneous pumping and well interference (Gomo, 2019). The individual well analyses were retained as supporting checks on well-specific performance and method sensitivity, and to confirm that the values are within the same order of magnitude as the combined analysis.

Based on this review, the preferred aquifer parameter estimates were taken from the combined pumping well analysis and the observation well analysis. The interpreted transmissivity and storativity values for the limestone aquifer at the Site are approximately 49.68 m²/day and 4.1 × 10⁻⁵, respectively. These values are close to those previously reported aquifer parameter estimates for the Site area, including transmissivity values of 38 m²/day for the North Irrigation Well (Morrison Environmental Ltd., 1999) and 63 m²/day for PW21-1 (WSP, 2024).

A transmissivity value of 49.68 m²/day is interpreted as an intermediate-magnitude value based on the classification of transmissivity magnitude (Krásný, 1993), and is generally consistent with aquifer conditions suitable for local water supply withdrawals. This interpretation is also generally consistent with the moderate groundwater potential classification presented by Gheorghe reference (Gheorghe, 1978). The estimated storativity value of 4.1×10^{-5} is within the typical range expected for confined aquifers (Freeze & Cherry, 1979), supporting the interpretation that the tested limestone aquifer behaves as a confined bedrock aquifer beneath the Site.

5.7.4 Well Interference

Current data indicate well interference between the bedrock monitoring wells located in the NW Site (Figures K1 and K2, Appendix K). Distance vs. drawdown plots were prepared for the 72-hour hydrogeological testing conducted at PW21-1, TW25-3, and NIW and are presented in Figures K15, K16, and K17, respectively, in Appendix K. The plots show that pumping produced measurable responses in the bedrock wells within the NW Site, indicating hydraulic connection within portions of the monitored bedrock well network. Drawdown values were evaluated at approximately 4,340 minutes for the three pumping tests.

The closest monitored responses within the NW Site were observed at distances of approximately 128 m from PW21-1, 153 m from TW25-3, and 145 m from NIW, with estimated drawdowns of 6.8 m, 6.7 m, and 5.5 m, respectively. The closest private well to both PW21-1 and TW25-3 was 6622 3rd Line Well, located approximately 496 m and 389 m away, with estimated drawdowns of approximately 6.0 m and 5.6 m, respectively. The closest private well to NIW was 6617 3rd Line Well, located approximately 497 m away, with an estimated drawdown of approximately 4.0 m. These results indicate that private wells were within the broader area of measurable hydraulic response; however, the interference pattern was variable and did not decrease uniformly with distance, suggesting that drawdown response is influenced by bedrock fracture connectivity and local aquifer heterogeneity.

Overall, the results indicate that well interference occurs within the monitored bedrock well network. However, the magnitude of response is spatially variable and appears to diminish or become less consistent at greater distances from the pumping wells. This was evident in the surrounding monitoring wells and nearby private wells.

5.7.5 Long-Term Safe Well Yield Assessment

A long-term drawdown assessment was completed for PW21-1, TW25-3, and NIW using the Q20 drawdown-time plots developed from the May 26 - 29, 2026, hydrogeological testing. The assessment was completed by extending the interpreted semi-logarithmic drawdown trends to a 20-year pumping duration of approximately 10,512,000 minutes. This approach is consistent with conventional pumping-test interpretation methods, where drawdown-time data are evaluated on semi-log plots to estimate aquifer response and support longer-term drawdown projections (Theis, 1935) (Kruseman & de Ridder, 2000).

- For PW21-1, the projected 20-year drawdown is approximately 24.4 m (Figure K18, Appendix K), which remains above the interpreted top of bedrock and first flow-zone elevations shown on the plot. As such, 8 L/s is considered an appropriate rate for this well.
- For TW25-3, the projected 20-year drawdown is approximately 33.9 m (Figure K19, Appendix K); however, the Levellogger was dewatered during the test, and the recorded drawdown therefore represents a minimum response. The projection exceeds the plotted casing depth and is above the interpreted top of bedrock/flow-zone reference elevations, indicating that TW25-3 has limited available long-term drawdown at the tested pumping rate (6.8 L/s, approximately). GEMTEC calculated a sustainable pumping rate for this well based on the pumping test results and a factor of safety. This involved calculating the available drawdown (24.28 m) (using the major water producing fracture (top at 30.3 m) and the average recorded static water level between November 2025 and June 2026 (6.02 m)), calculating the specific capacity from the tested pumping rate and recorded drawdown (0.27 L/s/m), and applying a factor of safety of 80% to obtain a sustainable pumping rate of 5.2 L/s.
- For NIW, the projected 20-year drawdown is approximately 29.8 m (Figure K20, Appendix K), which remains below the plotted casing depth/top of bedrock reference elevation (~32 mbgs), but is relatively close to the available drawdown limit.
- For TW25-2, this well was tested in December 2025 at a rate of 2.5 L/s and was able to stabilize above the while pumping at this rate with a significant available drawdown still possible. This well is anticipated to be able to supplement PW21-1 and TW25-3 in operation to obtain and maintain the required 14.4 L/s.

Based on the long-term projections, PW21-1 continues to provide a favourable long-term response at the tested rate. The projected rate for TW25-3 is considered more constrained due to the dewatering of the Levellogger and the projected drawdown approaching or exceeding key well construction and hydrostratigraphic reference elevations.

NIW may be suitable for continued use provided that pumping is managed conservatively and water levels are monitored (additionally, well rehabilitation could be considered to improve the yields). Interference Effects

Past water level monitoring at the site during times when the golf course was still in operation (and the irrigation wells were in operation) indicated a connection and response in surrounding wells in the bedrock aquifer. This was also noted during the pumping test, the overall well yields were likely affected by the operation of the North Irrigation Well. It should be noted that this well will not be in operation year-round and will likely also be operated intermittently during regular use.

Private wells (all in bedrock) also showed some response, although to differing degrees. At least two of the residences monitored showed little to no response to the pumping, while the remainder showed a pumping response, but no individual residence ran out of water during the testing.

Overburden wells and surface monitors showed no response to pumping at any of the monitored locations.

5.8 Groundwater Quality Monitoring and Sampling

5.8.1 Field Parameters and Measurements

Prior to the collection of groundwater samples, field parameters were measured on multiple occasions in the field to confirm whether the water being collected was consistent and would be representative of the aquifer being sampled. Field parameters were only measured at each of the pumping wells included in this testing, PW21-1 and TW25-3.

Field parameters measured included pH, electrical conductivity, temperature, turbidity, residual chlorine, with visual observations also recorded for colour, clarity, presence of sediment, odour, sheen and presence of gas. The field parameters are summarized in the table below.

Table 5.7 – Pumping Test Field Parameters

		Time after pump start				
		Hour 1	Hour 2	Hour 4	Hour 6	Hour 72
PW21-1	pH	7.59		8.11	7.71	7.63
	Electrolytic Conductivity (mS/cm)	0.438		0.492	0.503	0.568
	Temperature (°C)	10.1		9.5	9.5	10.6
	Turbidity (NTU)	1.82		0.88	2.84	1.19
	Residual Chlorine (mg/L)	0.05		0	0.02	0
	Colour	colourless		colourless	colourless	colourless
	Clarity	clear		clear	clear	clear
	Sediment	no sediment		no sediment	no sediment	no sediment
	Odour	no odour		no odour	no odour	no odour
	Sheen	no sheen		no sheen	no sheen	no sheen
	Gas	no gas		no gas	no gas	no gas
TW25-3	pH	7.9	7.76	7.73	7.89	7.66
	Electrolytic Conductivity (mS/cm)	0.574	0.586	0.561	0.566	0.57
	Temperature (°C)	10.3	10.6	9.8	9.5	11
	Turbidity (NTU)	0.64	1.18	1.17	0.45	4.25
	Residual Chlorine (mg/L)	0.01	0	0	0	0
	Colour	colourless	colourless	colourless	colourless	colourless
	Clarity	clear	clear	clear	clear	clear
	Sediment	no sediment	no sediment	no sediment	no sediment	no sediment
	Odour	no odour	no odour	no odour	no odour	no odour
	Sheen	no sheen	no sheen	no sheen	no sheen	no sheen
	Gas	no gas	no gas	no gas	no gas	no gas

5.8.2 Sampling Method

During the constant rate testing, samples were collected only at the two future water supply wells, PW21-1 and TW25-3. These wells were each sampled from a sampling port that was supplied for each well. These samples were collected at 2 hours into the start of the constant rate testing, again after 24 hours of pumping and finally at 72 hours after the start of pumping.

Additionally, a sample of 10L of water was collected into a jug from each sampling port to be submitted for analysis for MPA to support a GUDI evaluation. Each sample was collected incrementally in the final 4 hours of the pumping test.

5.8.3 Laboratory and Analytical Parameters

Parameters selected for analysis consisted of a general inorganics package plus bacteria (total coliforms and E.coli), which were the same parameters sampled by WSP during the original testing conducted at PW21-1.

All results were compared to the Ontario Drinking Water Quality Standards (ODWQS). Results are summarized in the table included in Appendix L. Certificates of analysis provided by the laboratory are also provided in Appendix L.

The samples obtained during this investigation were packed into coolers with ice for transit to the analytical laboratory. The samples were hand delivered on the days of collection to Bureau Veritas Laboratories (BV Labs) of Mississauga, Ontario.

Samples collected for Microscopic particulate analysis (MPA) (including *Cryptosporidium* and *Giardia*) were collected submitted within the 96-hour holding time to the York-Durham Regional Environmental lab for filtration and analysis. The Certificate of Analysis for this analysis is also included in Appendix L.

It should be noted that future testing (firm capacity) will include sampling for the full ODWQS suite of parameters from all pumping wells.

5.8.4 Water Quality Results

None of the parameters tested indicated exceedances of the ODWQS, with the exception of AO (aesthetic objective) parameter for hardness in both wells and the OG (operational guideline) total dissolved solids in both wells.

Summary tables of the results from all sampling events for each of the wells are provided in Appendix L.

5.8.5 MPA Results and GUDI

The MPA analysis indicated relative risk factors of 0 and relative risk scores for surface water contamination of 0 (Low Risk) for both PW21-1 and TW25-3. These assessments were calculated by the laboratory and are included in the Certificate of Analysis (Appendix L).

This result, combined with little to no response observed in the monitored overburden wells and surface water features for the duration of the recent pumping test, suggests that the wells at this site would not be GUDI.

6.0 CONCLUSIONS

The objective of the pumping test was to evaluate the potential to obtain 14.4 L/s sustainably (at the maximum day demand) for the onsite wells to support the proposed residential development and proposed clubhouse, without negatively impacting surrounding well and surface water users.

This objective was achieved through a combined testing of PW21-1 and TW25-3, to be supplemented with additional pumping from TW25-2, even including continuous pumping from the North Irrigation Well. Recommended rates to achieve this are 8.0 L/s (PW21-1), 5.2 L/s (TW25-3), and up to 2.5 L/s (TW25-2).

The testing program included the North Irrigation Well to evaluate cumulative groundwater system responses under extreme operating conditions (the North Irrigation Well would operate intermittently during its operational season, not continuously and not likely during times of peak operational demand) and concluded no lasting negative impacts, either to the pumping wells or the surrounding private wells.

Testing indicated connectivity with surrounding bedrock wells and it could be possible to use data obtained from this testing to project future impacts to surrounding bedrock wells. Overburden wells and shallow/surface water monitors showed no response to pumping and at least locally, the wells appear to be confined and isolated from ground surface.

7.0 ANTICIPATED NEXT STEPS

Next steps at the site include the drilling and testing of TW26-4. This well will be constructed in a similar manner to the other onsite wells and is targeted to produce up to 6.5 L/s to supplement the system at 14.4 L/s should one of PW21-1 or TW25-3 need to be taken offline for any reason. Drilling of this well is anticipated to be completed in June 2026.

Following the construction of this well, assuming it is able to produce sufficient water as indicated, additional testing scenarios including all 4 wells (differing combinations of PW21-1, TW25-2, TW25-3 and TW26-4 at a combined rate of 14.4 L/s) will be conducted onsite to confirm firm capacity. This testing will also include monitoring locations, to be sited in consultation with the Township, between this well site and the Fergus municipal wells. Additionally, firm capacity testing will include pumping of the North Irrigation Well which is anticipated to be used for needs of the re-designed north golf course. This testing is anticipated to be completed in July and August 2026.

Following completion of the firm capacity testing, the data will be provided to the Township of Centre Wellington for incorporation into its wellhead protection area updates. This will result in wellhead protection areas (WHPAs) being delineated for each of the pumping wells.

This work will be included in measures to bring these wells online in the future as municipal supply wells, to be maintained by the Township.

8.0 CLOSURE

We trust this report provides sufficient information for your present purposes. If you have any questions concerning this report, please contact our office.

Regards

GEMTEC Consulting Engineers and Scientists Limited

Kim Gilder



Kimberly Gilder, P.Geol.
Senior Hydrogeologist



APPENDIX A

Conditions and Limitations of this Report

CONDITIONS AND LIMITATIONS OF THIS REPORT

1. **Standard of Care:** GEMTEC has prepared this report in a manner consistent with generally accepted engineering or environmental consulting practice in the jurisdiction in which the services are provided at the time of the report. No other warranty, expressed or implied is made.
2. **Copyright:** The contents of this report are subject to copyright owned by GEMTEC, save to the extent that copyright has been legally assigned by us to another party or is used by GEMTEC under license. To the extent that GEMTEC owns the copyright in this report, it may not be copied without our prior written agreement for any purpose other than the purpose indicated in this report. The methodology (if any) contained in this report is provided to the Client in confidence and must not be disclosed or copied to third parties without the prior written agreement of GEMTEC. Disclosure of that information may constitute an actionable breach of confidence or may otherwise prejudice our commercial interests.
3. **Complete Report:** This report is of a summary nature and is not intended to stand alone without reference to the instructions given to GEMTEC by the Client, communications between GEMTEC and the Client and to any other reports prepared by GEMTEC for the Client relative to the specific site described in the report. In order to properly understand the suggestions, recommendations and opinions expressed in this report, reference must be made to the whole of the report. GEMTEC cannot be responsible for use of portions of the report without reference to the entire report.
4. **Basis of Report:** This Report has been prepared for the specific site, development, design objectives and purposes that were described to GEMTEC by the Client. The factual data, interpretations and recommendations pertain to a specific project as described in this report and are not applicable to any other project or site location. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the document, subject to the limitations provided herein, are only valid to the extent that this report expressly addresses the proposed development, design objectives and purposes. Any change of site conditions, purpose or development plans may alter the validity of the report and GEMTEC cannot be responsible for use of this report, or portions thereof, unless GEMTEC is requested to review any changes and, if necessary, revise the report.
5. **Time Dependence:** If the proposed project is not undertaken by the Client within 18 months following the issuance of this report, or within the timeframe understood by GEMTEC to be contemplated by the Client, the guidance and recommendations within the report should not be considered valid unless reviewed and amended or validated by GEMTEC in writing.
6. **Use of This Report:** The information, recommendations and opinions expressed in this report are for the sole benefit of the Client. No other party may use or rely on this report or any portion thereof without GEMTEC's express written consent. If the report was prepared to be included for a specific permit application process, then upon the reasonable request of the client, GEMTEC may authorize in writing the use of this report by the regulatory agency as an Approved User for the specific and identified purpose of the applicable permit review process.

Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual data presented in the report, as to how subsurface conditions may affect their work, including but not limited to proposed construction techniques, schedule, safety and equipment capabilities.
7. **No Legal Representations:** GEMTEC makes no representations whatsoever concerning the legal significance of its findings, or as to other legal matters touched on in this report, including but not limited to, ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issues, regulatory statutes are subject to interpretation and change. Such interpretations and regulatory changes should be reviewed with legal counsel.
8. **Decrease in Property Value:** GEMTEC shall not be responsible for any decrease, real or perceived, of the property or site's value or failure to complete a transaction, as a consequence of the information contained in this report.
9. **Reliance on Provided Information:** The evaluation and conclusions contained in this report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to us. We have relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, we cannot accept responsibility for any deficiency, misstatement or inaccuracy contained in this report as a result of misstatements, omissions,

misrepresentations, or fraudulent acts of the Client or other persons providing information relied on by us. We are entitled to rely on such representations, information and instructions and are not required to carry out investigations to determine the truth or accuracy of such representations, information and instructions.

10. **Investigation Limitations:** Site investigation programs are a professional estimate of the scope of investigation required to provide a general profile of subsurface conditions but even a comprehensive investigation, sampling and testing program may fail to detect all or certain subsurface conditions.

The data derived from the site investigation program and subsequent laboratory testing are interpreted by trained personnel and extrapolated across the site to form an inferred geological representation and an engineering opinion is rendered about overall subsurface conditions and their likely behaviour with regard to the proposed development. Conditions between and beyond the borehole/test hole locations may differ from those encountered at the borehole/test hole locations and the actual conditions at the site might differ from those inferred to exist, since no subsurface exploration program, no matter how comprehensive, can reveal all subsurface details and anomalies. Accordingly, GEMTEC does not warrant or guarantee the exactness of the subsurface descriptions.

Soil and groundwater conditions shown in the factual data and described in the report are the observed conditions at the time of their determination or measurement. Unless otherwise noted, those conditions form the basis of the recommendations in the report. Groundwater conditions may vary between and beyond reported locations and can be affected by annual, seasonal and meteorological conditions. The condition of the soil, rock and groundwater may be significantly altered by construction activities (traffic, excavation, groundwater level lowering, pile driving, blasting, etc.) on the site or on adjacent sites. Excavation may expose the soils to changes due to wetting, drying or frost. Unless otherwise indicated the soil must be protected from these changes during construction.

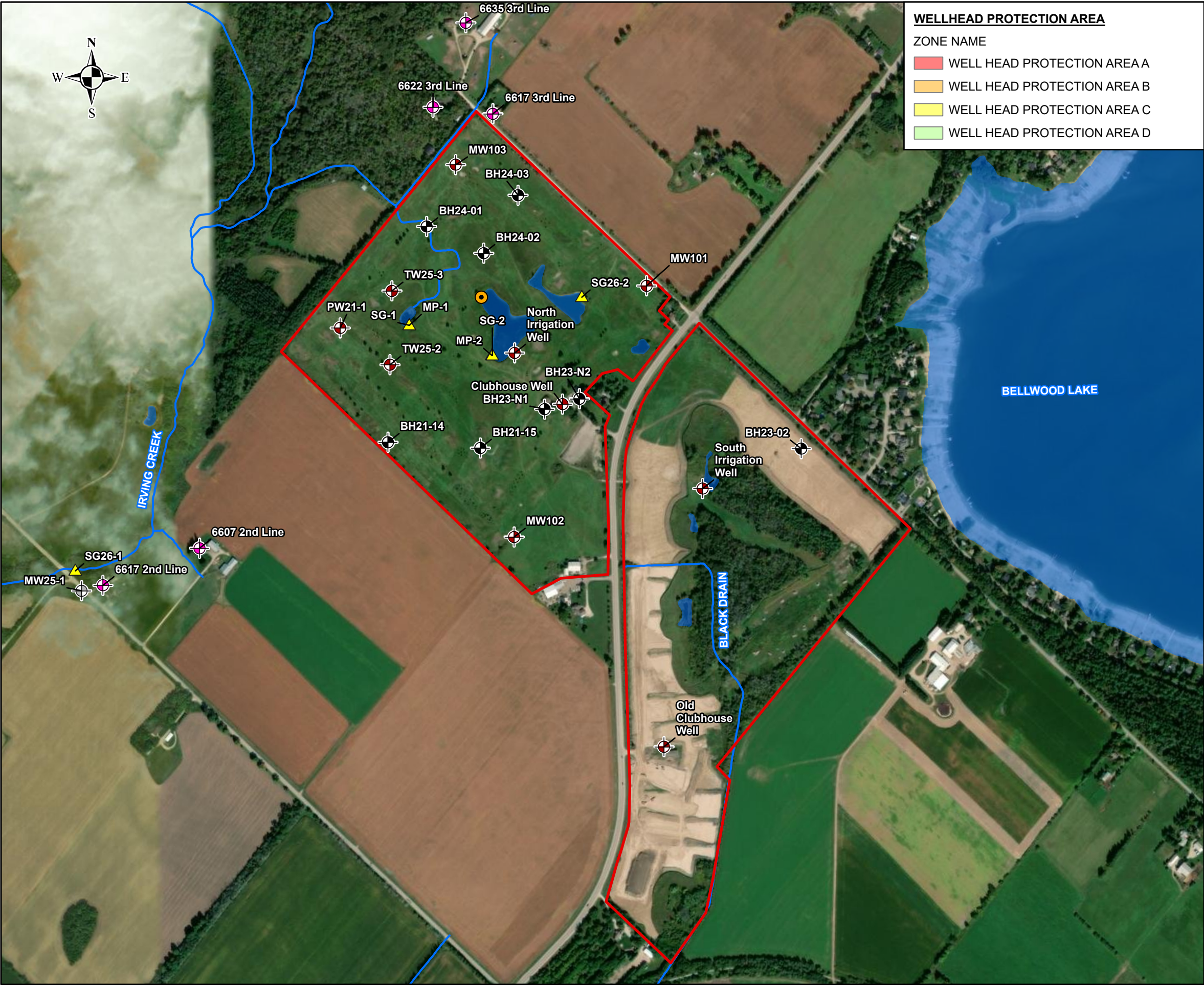
In addition, fill of variable physical and chemical composition can be present over portions of the site or on adjacent properties. The professional services retained for this project include only the geotechnical aspects of the subsurface conditions at the site, unless otherwise specifically stated and identified in the report. The presence or implication(s) of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources are outside the terms of reference for this project and have not been investigated or addressed.

11. **Sample Disposal:** GEMTEC will dispose of all uncontaminated soil and/or rock samples 60 days following issue of this report or, upon written request of the Client, will store uncontaminated samples and materials at the Client's expense. In the event that actual contaminated soils, fill materials or groundwater are encountered or are inferred to be present, all contaminated samples shall remain the property and responsibility of the Client for proper disposal.
12. **Follow-Up and Construction Services:** All details of the design were not known at the time of submission of GEMTEC's report. GEMTEC should be retained to review the final design, project plans and documents prior to construction, to confirm that they are consistent with the intent of GEMTEC's report.
During construction, GEMTEC should be retained to perform sufficient and timely observations of encountered conditions to confirm and document that the subsurface conditions do not materially differ from those interpreted conditions considered in the preparation of GEMTEC's report and to confirm and document that construction activities do not adversely affect the suggestions, recommendations and opinions contained in GEMTEC's report. Adequate field review, observation and testing during construction are necessary for GEMTEC to be able to provide letters of assurance, in accordance with the requirements of many regulatory authorities. In cases where this recommendation is not followed, GEMTEC's responsibility is limited to interpreting accurately the information encountered at the borehole locations, at the time of their initial determination or measurement during the preparation of the Report.
13. **Changed Conditions:** Where conditions encountered at the site differ significantly from those anticipated in this report, either due to natural variability of subsurface conditions or construction activities, it is a condition of this report that GEMTEC be notified of any changes and be provided with an opportunity to review or revise the recommendations within this report. Recognition of changed soil and rock conditions requires experience and it is recommended that GEMTEC be employed to visit the site with sufficient frequency to detect if conditions have changed significantly.
14. **Drainage:** Drainage of subsurface water is commonly required either for temporary or permanent installations for the project. Improper design or construction of drainage or dewatering can have serious consequences. GEMTEC takes no responsibility for the effects of drainage unless specifically involved in the detailed design and construction monitoring of the system.



APPENDIX B

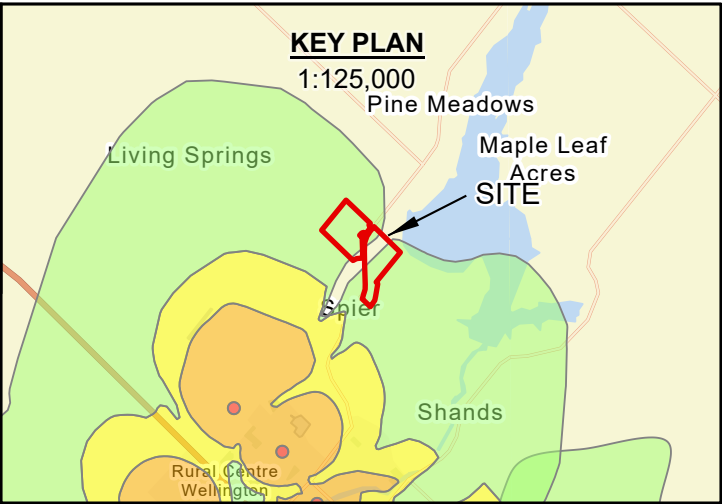
Figures



WELLHEAD PROTECTION AREA

ZONE NAME

- WELL HEAD PROTECTION AREA A
- WELL HEAD PROTECTION AREA B
- WELL HEAD PROTECTION AREA C
- WELL HEAD PROTECTION AREA D



Legend

BH # BOREHOLE ID

- BEDROCK WELLS (GEMTEC, 2025)
- BEDROCK WELLS (EXISTING PRODUCTION WELLS AND PREVIOUS STUDIES)
- BEDROCK (PRIVATE WELLS)
- OVERBURDEN MONITORING WELL (GEMTEC, 2026)
- OVERBURDEN MONITORING WELL (PREVIOUS STUDIES)
- PIEZOMETER STAFF GAUGE PAIRS
- DISCHARGE LOCATION
- WATERCOURSE
- WATERBODY
- SITE BOUNDARY

NOTES:

- All locations approximate.
- Coordinate system: NAD 1983 UTM Zone 17N.
- Geographic dataset source: Ontario GeoHub.
- Contains information licensed under the Open Government Licence – Ontario.
- Contains Information made available under Grand River Conservation Authority's Open Data Licence v2.0.
- Service Layer Credits: World Street Map: Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community
- Watercourse: <https://www.ontario.ca/page/open-government-licence-ontario>
- WATERBODY: <https://www.ontario.ca/page/open-government-licence-ontario>
- World Imagery: Vantor.

Scale:

1:8,000

0 100 200 400 600 Metres

Drawing

MONITORING NETWORK
SITE LOCATION PLAN

Client:

FERGUS DEVELOPMENT INC.

Project

HYDROGEOLOGICAL INVESTIGATION,
RESIDENTIAL SUBDIVISION WATER SUPPLY,
FERGUS GOLF COURSE REDEVELOPMENT, 8243
AND 8282 WELLINGTON ROAD 19, FERGUS, ONTARIO

Drwn By: S.J. Chkd By: K.G.

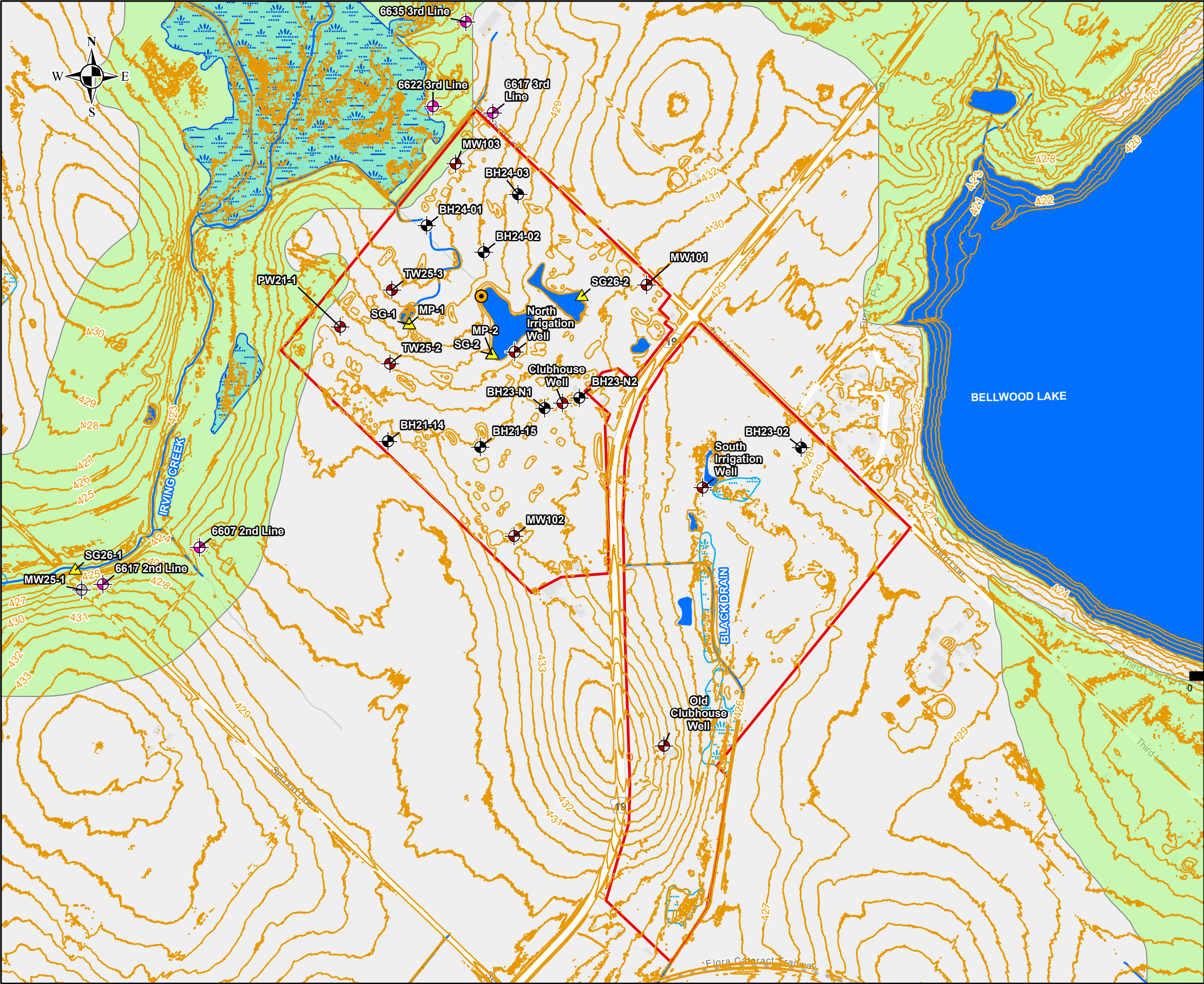
Project No. 101987.017 Revision No. 0

Date JUNE 2026

FIGURE B1

 **GEMTEC**
CONSULTING ENGINEERS
AND SCIENTISTS

6695 Millcreek DR #7,
Mississauga, ON L5N 5M4
T: (416) 347-7427
www.gemtec.ca



Legend

- BH # BOREHOLE ID
XX.XX GROUND SURFACE ELEVATIONS, (m)
- BEDROCK WELLS (GEMTEC, 2025)
 - BEDROCK WELLS (EXISTING PRODUCTION WELLS AND PREVIOUS STUDIES)
 - BEDROCK (PRIVATE WELLS)
 - OVERBURDEN MONITORING WELL (GEMTEC, 2026)
 - OVERBURDEN MONITORING WELL (PREVIOUS STUDIES)
 - PIEZOMETER STAFF GAUGE PAIRS
 - DISCHARGE LOCATION
 - ELEVATION CONTOUR (m)
 - WATERCOURSE
 - WATERBODY
 - UNEVALUATED WETLAND
 - PROvincially SIGNIFICANT WETLAND
 - NATURAL HERITAGE AREA
 - SITE BOUNDARY

NOTES:
1. All locations approximate.
2. Coordinate system: NAD 1983 UTM Zone 17N.
3. Geographic dataset source: Ontario GeoHub.
4. Contains information licensed under the Open Government Licence – Ontario.
5. Service Layer Credits: Light Grey Canvas Background: .



Drawing
PHYSIOGRAPHY AND DRAINAGE

Client:
FERGUS DEVELOPMENT INC.

Project
**HYDROGEOLOGICAL INVESTIGATION,
RESIDENTIAL SUBDIVISION WATER SUPPLY,
FERGUS GOLF COURSE REDEVELOPMENT, 8243
AND 8282 WELLINGTON ROAD 19, FERGUS, ONTARIO**

Drwn By: S.J. Chkd By: K.G.

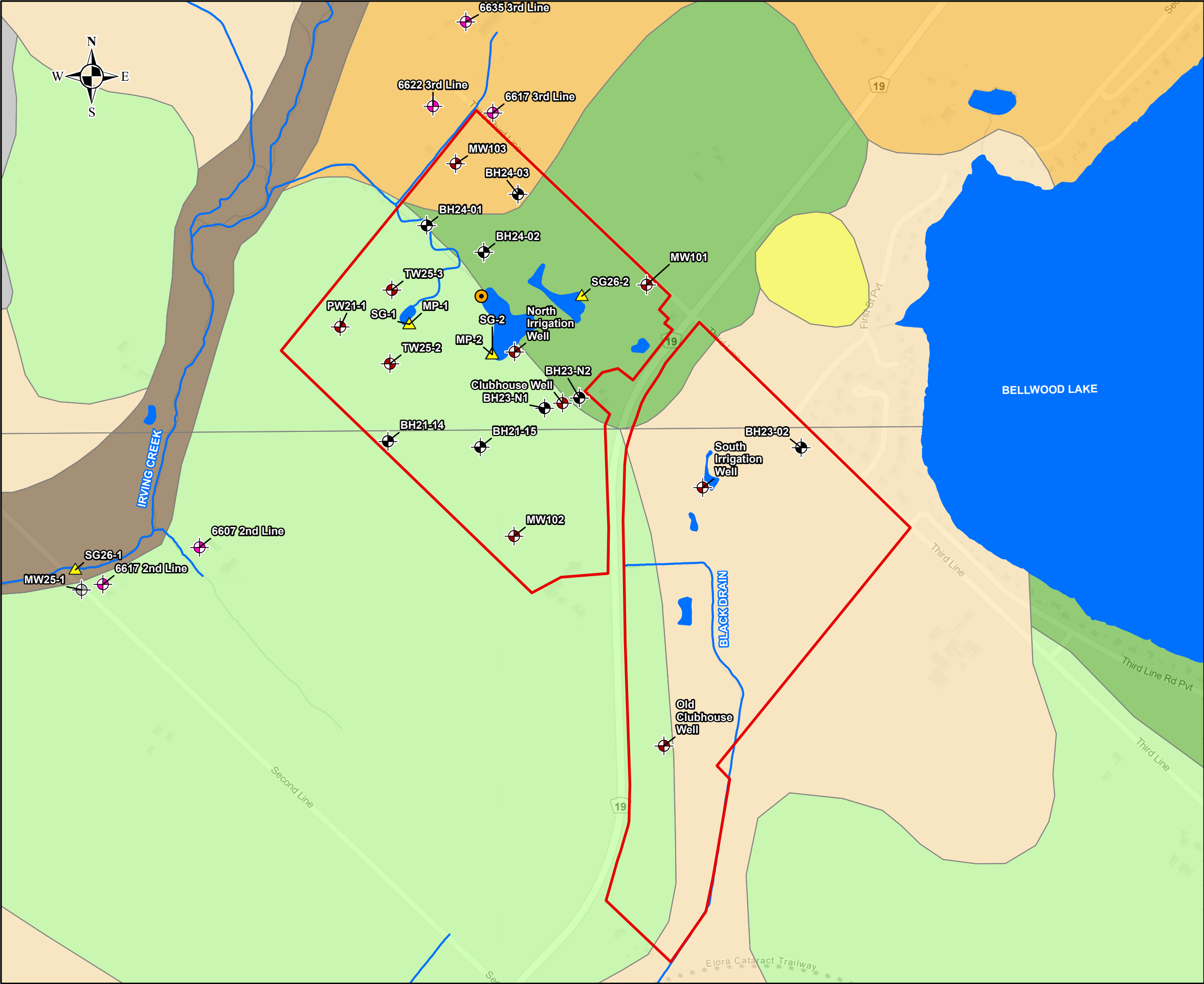
Project No. 101987.017 Revision No. 0

Date JUNE 2026 **FIGURE B3**



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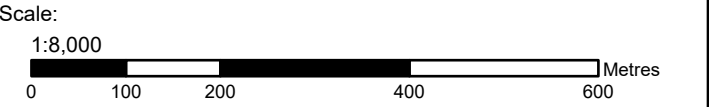
- BH # BOREHOLE ID
- BEDROCK WELLS (GEMTEC, 2025)
 - BEDROCK WELLS (EXISTING PRODUCTION WELLS AND PREVIOUS STUDIES)
 - BEDROCK (PRIVATE WELLS)
 - OVERBURDEN MONITORING WELL (GEMTEC, 2026)
 - OVERBURDEN MONITORING WELL (PREVIOUS STUDIES)
 - PIEZOMETER STAFF GAUGE PAIRS
 - DISCHARGE LOCATION
 - SITE BOUNDARY
 - WATERCOURSE
 - WATERBODY

SURFICIAL GEOLOGY

- PORT STANLEY TILL (STONE-POOR, SANDY SILT TO SILTY SAND-TEXTURED TILL ON PALEOZOIC TERRAIN)
- TAVISTOCK TILL (CLAY TO SILT-TEXTURED TILL [DERIVED FROM GLACIOLACUSTRINE DEPOSITS OR SHALE])
- GLACIOFLUVIAL DEPOSITS (RIVER DEPOSITS AND DELTA TOPSET FACIES)
- GLACIOFLUVIAL DEPOSITS (RIVER DEPOSITS AND DELTA TOPSET FACIES, SANDY DEPOSITS)
- COARSE-TEXTURED GLACIOLACUSTRINE DEPOSITS (SAND, GRAVEL, MINOR SILT AND CLAY, FORESHORE AND BASINAL DEPOSITS)
- MODERN ALLUVIAL DEPOSITS (CLAY, SILT, SAND, GRAVEL, MAY CONTAIN ORGANIC REMAINS)
- ORGANIC DEPOSITS (PEAT, MUCK, MARL)

NOTES:

1. All locations approximate.
2. Coordinate system: NAD 1983 UTM Zone 17N.
3. Geographic dataset source: Ontario GeoHub.
4. Contains information licensed under the Open Government Licence – Ontario.
5. Service Layer Credits: Watercourse: <https://www.ontario.ca/page/open-government-licence-ontario>
WATERBODY: <https://www.ontario.ca/page/open-government-licence-ontario>
Light Grey Canvas Background: .



Drawing

SURFICIAL GEOLOGY

Client:

FERGUS DEVELOPMENT INC.

Project

**HYDROGEOLOGICAL INVESTIGATION,
RESIDENTIAL SUBDIVISION WATER SUPPLY,
FERGUS GOLF COURSE REDEVELOPMENT, 8243
AND 8282 WELLINGTON ROAD 19, FERGUS, ONTARIO**

Drwn By: S.J. Chkd By: K.G.

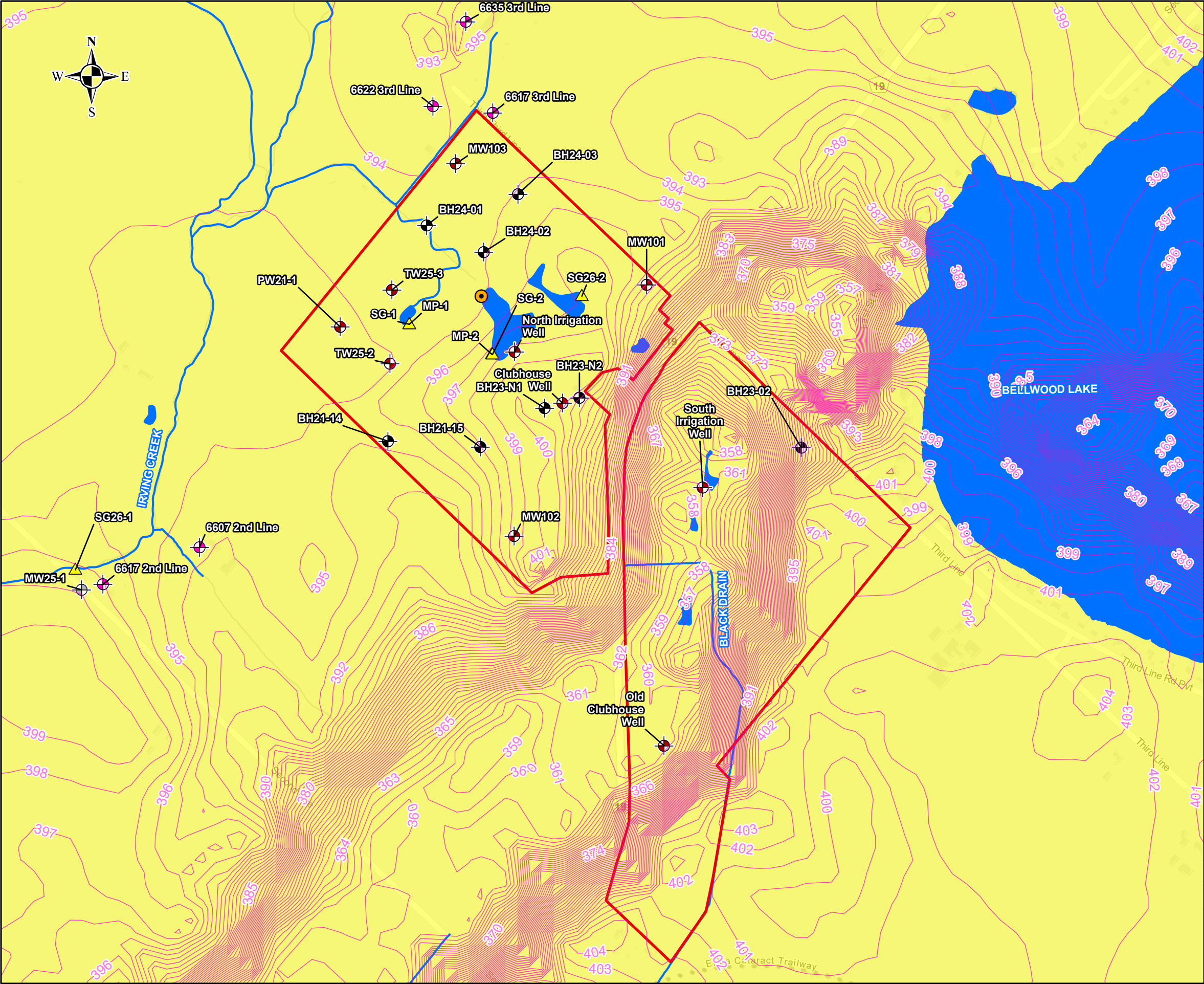
Project No. 101987.017 Revision No. 0

Date JUNE 2026 **FIGURE B4**



GEMTEC
CONSULTING ENGINEERS
AND SCIENTISTS

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Mississauga, ON L5N 5M4
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Legend

- BH # BOREHOLE ID
XX.XX BEDROCK SURFACE ELEVATIONS, (m amsl)
- BEDROCK WELLS (GEMTEC, 2025)
 - BEDROCK WELLS (EXISTING PRODUCTION WELLS AND PREVIOUS STUDIES)
 - BEDROCK (PRIVATE WELLS)
 - OVERBURDEN MONITORING WELL (GEMTEC, 2026)
 - OVERBURDEN MONITORING WELL (PREVIOUS STUDIES)
 - PIEZOMETER STAFF GAUGE PAIRS
 - DISCHARGE LOCATION
 - BEDROCK ELEVATION CONTOUR (m amsl)
 - WATERCOURSE
 - WATERBODY
 - GUELPH FORMATION
 - SITE BOUNDARY

NOTES:

1. All locations approximate.
2. Coordinate system: NAD 1983 UTM Zone 17N.
3. Geographic dataset source: Ontario GeoHub.
4. Contains information licensed under the Open Government Licence – Ontario.
5. m amsl = metres above mean sea level.
6. Burt, A.K. and Dodge, J.E.P. 2016. Three-dimensional modelling of surficial deposits in the Orangeville-Fergus area of southern Ontario; Ontario Geological Survey, Groundwater Resources Study 15.
7. Service Layer Credits: Watercourse: <https://www.ontario.ca/page/open-government-licence-ontario>
WATERBODY: <https://www.ontario.ca/page/open-government-licence-ontario>
Light Grey Canvas Background: .



Drawing

BEDROCK GEOLOGY

Client:

FERGUS DEVELOPMENT INC.

Project

**HYDROGEOLOGICAL INVESTIGATION,
RESIDENTIAL SUBDIVISION WATER SUPPLY,
FERGUS GOLF COURSE REDEVELOPMENT, 8243
AND 8282 WELLINGTON ROAD 19, FERGUS, ONTARIO**

Drwn By: S.J. Chkd By: K.G.

Project No. 101987.017 Revision No. 0

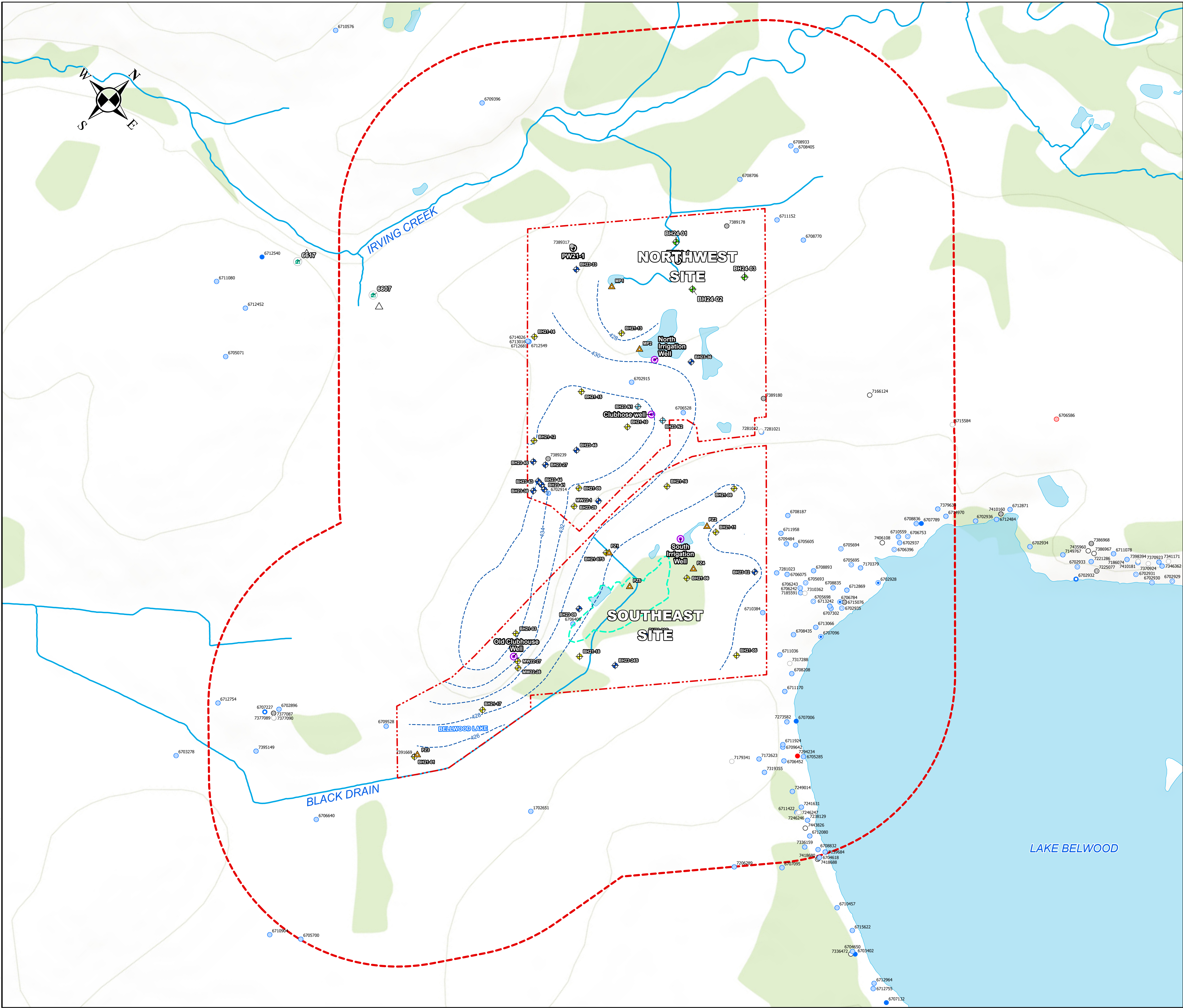
Date JUNE 2026 **FIGURE B5**



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AND SCIENTISTS

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LEGEND

BURNSIDE MONITORING WELL

MONITORING WELL - GEMTEC (GEOTECH STUDY)

MONITORING WELL - GEMTEC (PHASE TWO ENVIRONMENTAL SITE ASSESSMENT)

EXISTING MONITORING WELL - PREVIOUS STUDIES

PIEZOMETER

DATA LOGGER INSTALLATION

PRIVATE WELL LOCATION

INFERRED GROUNDWATER CONTOUR

PROTECTED FEATURES (WETLAND)

BEDROCK TEST WELL (GOLDER 2022)

EXISTING PRODUCTION WELL (GOLDER 2022)

ROADS

PROPERTY BOUNDARY

WELL TYPE

SHALLOW (<10M) DUG/BORED

DEEP (>10M) DUG/BORED

SHALLOW (<10M) DRILLED OVERBURDEN

DEEP (>10M) DRILLED OVERBURDEN

DRILLED BEDROCK

NO INFORMATION/ALTERATION

WATER USE

DOMESTIC, STOCK WATERING, A/C, WATER SUPPLY

MUNICIPAL, PUBLIC SUPPLY

ABANDONED

OTHER

GENERAL NOTES:

1. MECP - Ministry of the Environment, Conservation and Parks

2. WWR - Water Well Records

3. All locations are approximate

4. Coordinate system: NAD83/ UTM zone 17N.

5. Geographic dataset source: Ontario GeoHub.

6. Contains information licensed under the Open Government Licence – Ontario.

7. Service Layer Credits: OHN Watercourse: <https://www.ontario.ca/page/open-government-licence-ontario>, WATERBODY: <https://www.ontario.ca/page/open-government-licence-ontario>, World Topographic Canadian Style: , World Hillshade: Esri, NASA, NGA, USGS, FEMA

Scale:

1:5,250

0

150

300

600

900

Meters

Drawing

MECP WWR OF PRIVATE SUPPLY WELLS OFFSITE

Client:

FERGUS DEVELOPMENT INC.

Project

UPDATED HYDROGEOLOGICAL INVESTIGATION REPORT
FERGUS GOLF COURSE REDEVELOPMENT
RESIDENTIAL DEVELOPMENT
FERGUS, ONTARIO

Drwn By:

S.L. / S.J.

Chkd By:

J.B.

Project No.

101987.017

Revision No.

0

Date

JUNE 2026

FIGURE B6

GEMTEC
CONSULTING ENGINEERS
AND SCIENTISTS

850 Champlain Avenue, Unit 101
Oshawa, ON, L1J 8C3
www.gemtec.ca
gta@gemtec.ca



Legend

BH #

BOREHOLE ID

XX.XX

GROUNDWATER ELEVATIONS, (m amsl)

(MAY 26, 2026)

PIEZOMETER STAFF GAUGE PAIRS

OVERBURDEN WELL

OVERBURDEN GROUNDWATER CONTOUR

(m amsl)

INFERRED OVERBURDEN FLOW DIRECTION

WATERCOURSE

WATERBODY

SITE BOUNDARY

NOTES:

1. All locations approximate.

2. Coordinate system: NAD 1983 UTM Zone 17N.

3. Geographic dataset source: Ontario GeoHub.

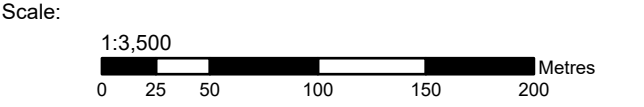
4. Contains information licensed under the Open Government Licence – Ontario.

5. m amsl = metres above mean sea level.

6. Service Layer Credits: Watercourse: <https://www.ontario.ca/page/open-government-licence-ontario>

WATERBODY: <https://www.ontario.ca/page/open-government-licence-ontario>

World Imagery: Microsoft, Vantor.



Drawing

OVERBURDEN GROUNDWATER FLOW

(MAY 26, 2026)

Client:

FERGUS DEVELOPMENT INC.

Project

HYDROGEOLOGICAL INVESTIGATION,
RESIDENTIAL SUBDIVISION WATER SUPPLY,
FERGUS GOLF COURSE REDEVELOPMENT, 8243
AND 8282 WELLINGTON ROAD 19, FERGUS, ONTARIO

Drwn By:

S.J.

Chkd By:

K.G.

Project No.

101987.017

Revision No.

0

Date

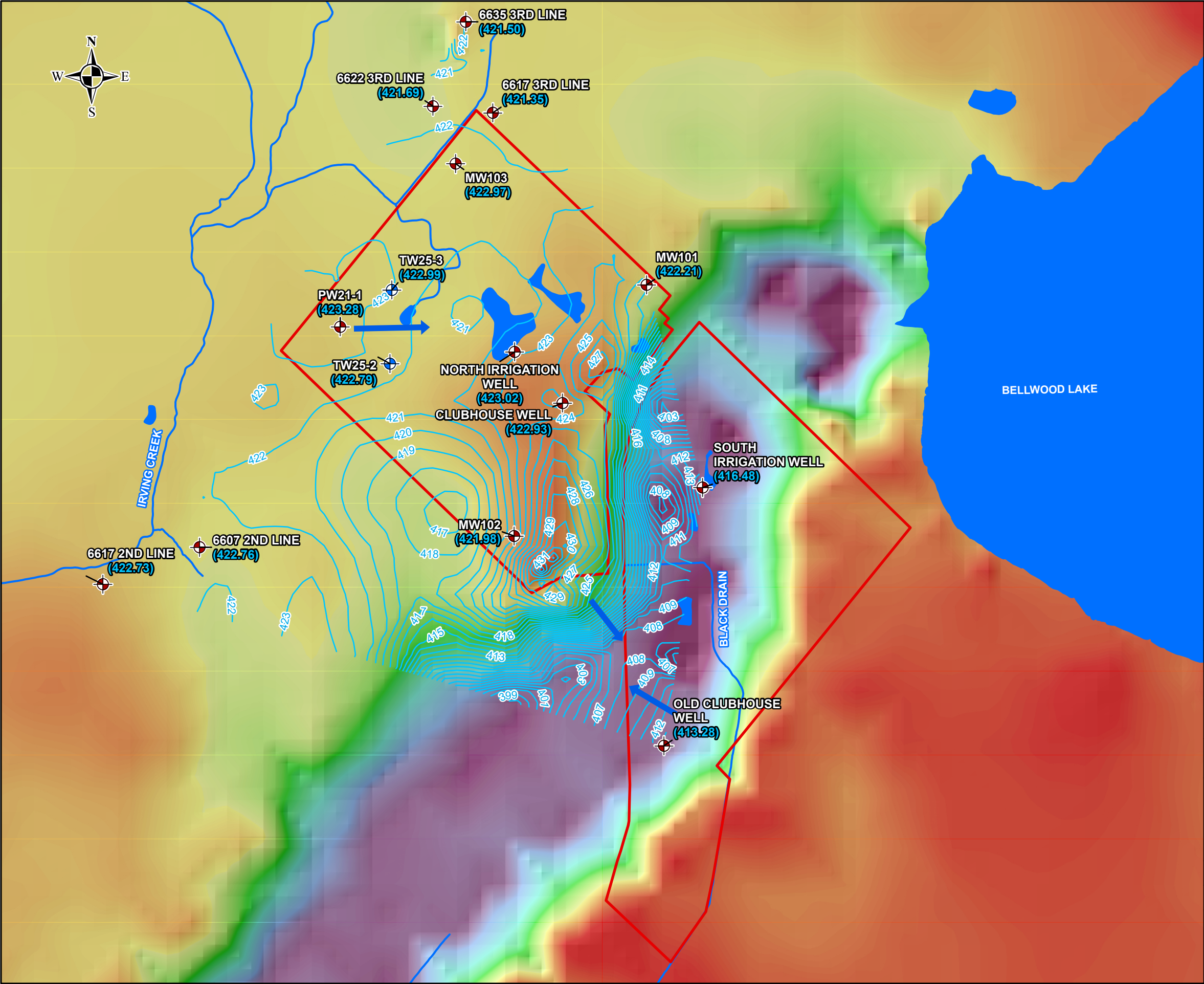
JUNE 2026

FIGURE B7

GEMTEC

CONSULTING ENGINEERS
AND SCIENTISTS

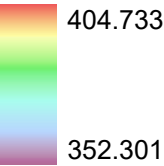
6695 Millcreek DR #7,
Mississauga, ON L5N 5M4
T: (416) 347-7427
www.gemtec.ca



Legend

- BH # BOREHOLE ID
XX.XX GROUNDWATER ELEVATIONS, (m amsl)
(MAY 26, 2026)
- BEDROCK WELL (GEMTEC, 2025)
 - BEDROCK WELL (PREVIOUS INVESTIGATIONS)
 - PRIVATE BEDROCK WELLS
 - BEDROCK GROUNDWATER CONTOUR (m amsl)
 - INFERRED BEDROCK FLOW DIRECTION
 - WATERCOURSE
 - WATERBODY
 - SITE BOUNDARY

BEDROCK TOPOGRAPHY (m amsl)



- NOTES:
1. All locations approximate.
 2. Coordinate system: NAD 1983 UTM Zone 17N.
 3. Geographic dataset source: Ontario GeoHub.
 4. Contains information licensed under the Open Government Licence – Ontario.
 5. Burt, A.K. and Dodge, J.E.P. 2016. Three-dimensional modelling of surficial deposits in the Orangeville–Fergus area of southern Ontario; Ontario Geological Survey, Groundwater Resources Study 15.
 6. m amsl = metres above mean sea level.
 7. Service Layer Credits: Watercourse: <https://www.ontario.ca/page/open-government-licence-ontario>
WATERBODY: <https://www.ontario.ca/page/open-government-licence-ontario>



Drawing **BEDROCK GROUNDWATER FLOW**
(MAY 26, 2026)

Client: **FERGUS DEVELOPMENT INC.**

Project **HYDROGEOLOGICAL INVESTIGATION,
RESIDENTIAL SUBDIVISION WATER SUPPLY,
FERGUS GOLF COURSE REDEVELOPMENT, 8243
AND 8282 WELLINGTON ROAD 19, FERGUS, ONTARIO**

Drwn By: **S.J.** Chkd By: **K.G.**

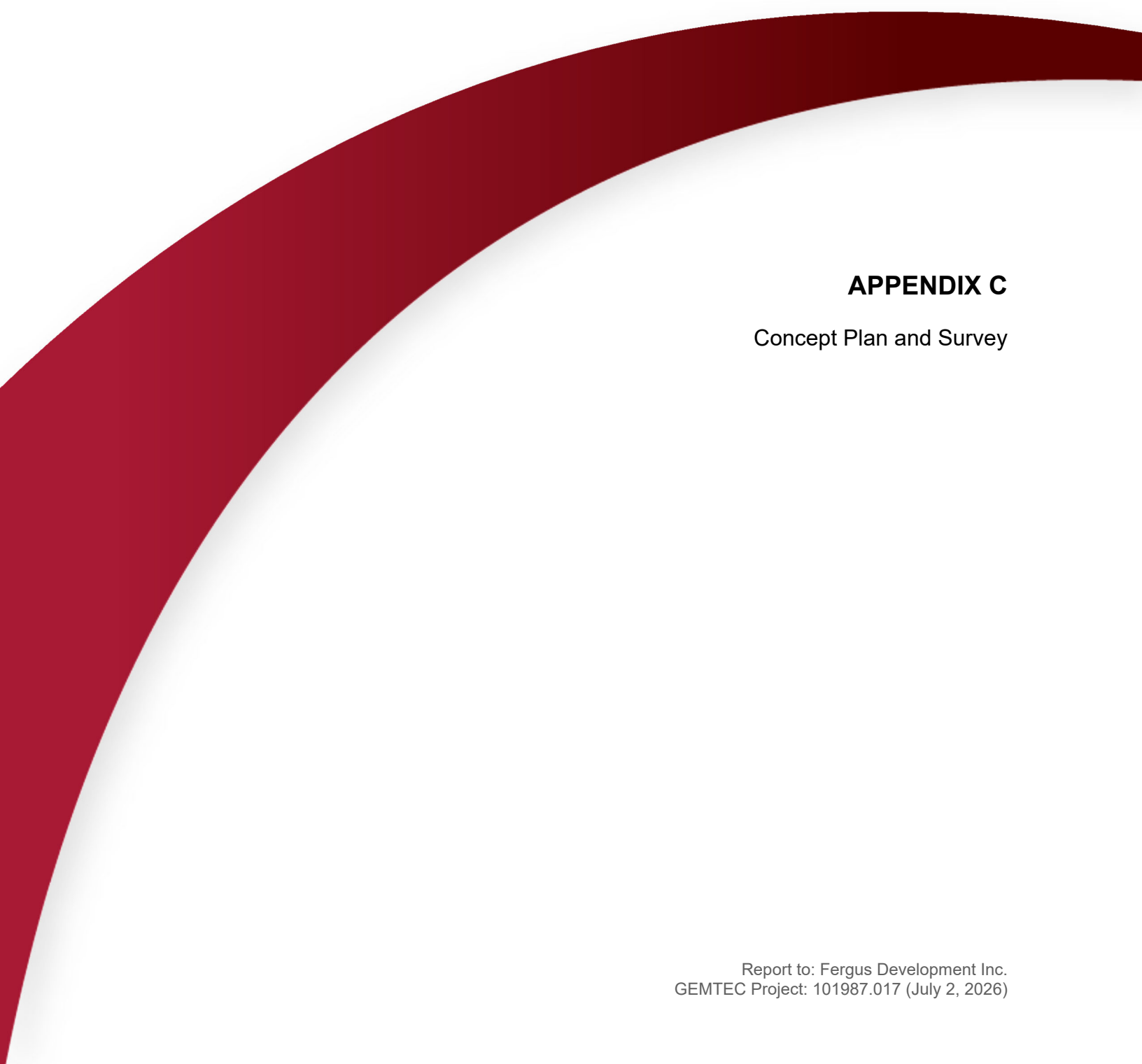
Project No. **101987.017** Revision No. **0**

Date **JUNE 2026** **FIGURE B8**



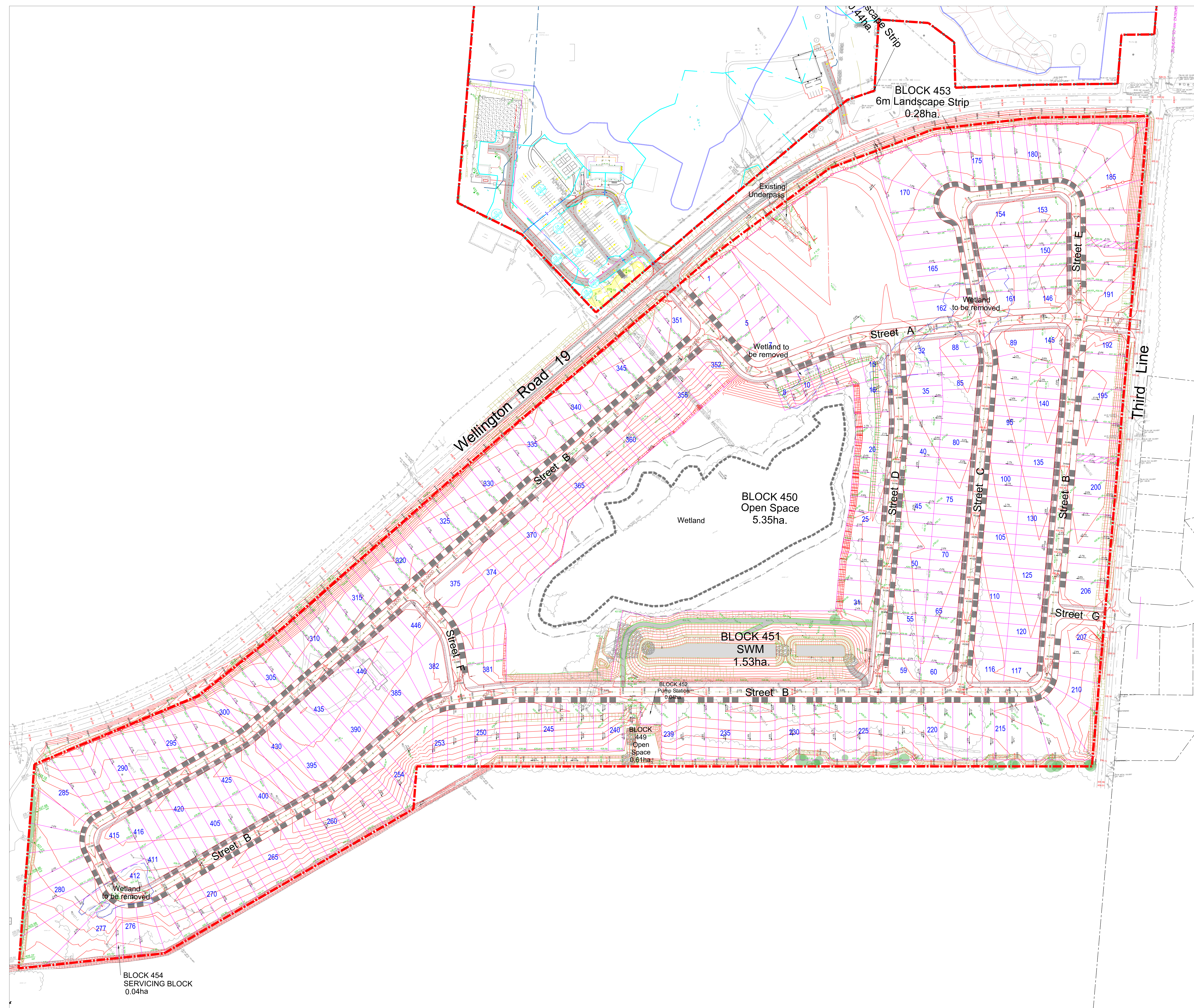
GEMTEC
CONSULTING ENGINEERS
AND SCIENTISTS

6695 Millcreek DR #7,
Mississauga, ON L5N 5M4
T: (416) 347-7427
www.gemtec.ca



APPENDIX C

Concept Plan and Survey





Fergus Golf Club
Site Plan

Scorecard

Hole	1	2	3	4	5	6	7	8	9	Out	10	11	12	13	14	15	16	17	18	In	Total
Par	4	3	4	3	4	3	4	3	5	33	4	3	4	3	4	3	4	3	5	33	66
Yards	415	120	390	160	325	200	340	130	505	2,585	400	145	380	185	305	170	335	210	515	2,645	5,230



December 4, 2023

SCALE 1:1000

R-PE SURVEYING LTD., O.L.S.

DISTANCES AND COORDINATES SHOWN ON THIS PLAN
ARE IN METRES AND CAN BE CONVERTED TO FEET BY
DIVIDING BY 0.3048.

SCALE 1:1000

R-PE SURVEYING LTD., O.L.S.

DISTANCES AND COORDINATES SHOWN ON THIS PLAN
ARE IN METRES AND CAN BE CONVERTED TO FEET BY
DIVIDING BY 0.3048.

BE	DENOTES	BELL BOX
CB	DENOTES	CATCH BASIN
CONC.	DENOTES	CONCRETE
FI	DENOTES	FIRE HYDRANT
GA	DENOTES	GARAGE BASE ELEVATION
P.I.N.	DENOTES	PROPERTY IDENTIFIER NUMBER
LS	DENOTES	LAMP STANDARD
MANH	DENOTES	MANHOLE
MHSAN	DENOTES	MANHOLE SANITARY
MHSTM	DENOTES	MANHOLE STORM
MHW	DENOTES	MANHOLE WATER
INV	DENOTES	CULVERT INVERT ELEVATION
OBV	DENOTES	CULVERT OVERT ELEVATION
PRC	DENOTES	TRUCK CATCH BASIN
UP	DENOTES	UTILITY POLE
WV	DENOTES	WATER VALVE
WV	DENOTES	OVERHEAD FIRE
Ø	DENOTES	DIAMETER
Ø	DENOTES	DECIDUOUS TREE
Ø	DENOTES	CONIFEROUS TREE
Ø	DENOTES	FENCE LINE
Ø	DENOTES	HYDRANT
Ø	DENOTES	ANCHOR

A) THIS IS NOT A PLAN OF SURVEY AND SHALL NOT BE USED EXCEPT FOR THE PURPOSE IN THE TITLE BLOCK.
B) THIS SKETCH IS PROTECTED BY COPYRIGHT ©

THIS IS NOT A PLAN OF SURVEY.
BOUNDARIES ARE NOT CERTIFIED BY THIS PLAN, AND ARE SUBJECT TO
CLARIFICATION UPON THE INCORPORATION OF ADDITIONAL
DOCUMENTARY AND FIELD SURVEY EVIDENCE.

ALL BOUNDARY INFORMATION HAS BEEN COMPILED USING VARIOUS PLANS AND HAS
NOT BEEN CONFIRMED.

ELEVATIONS ARE GEODEIC AND ARE REFERRED TO CAN-NET REAL TIME NETWORK
BASE STATION NUMBER 20120150081 HAVING AN ORTHOMETRIC ELEVATION OF
350.952 METRES. ELEVATIONS ARE REFERENCED TO THE CANADIAN GEODEIC
VERTICAL DATUM OF 1928, 1978 ADJUSTMENT (CGVD-1928/1978).

LOCATION DESCRIPTION: CANSEL CANNET RTK BASE STATION - GUELPH

THE FIELD OBSERVATIONS REPRESENTED ON THIS PLAN WERE COMPLETED ON
THE ____ DAY OF _____, 2021

