



BURNSIDE

**2025 Biennial Groundwater Monitoring  
Report - Pinebush Well Field  
(P9, P15, P15A)**

**The Region of Waterloo**



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(P9, P15, P15A)**

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## 1.0 Introduction

The Regional Municipality of Waterloo (the Region) is unique in Ontario in that it is the largest urban municipality to rely almost exclusively on groundwater supplies for its drinking-water (Region of Waterloo, 2015). Figure 1 shows the location of municipal well fields within the Region.

A new consolidated Permit to Take Water (PTTW), P-300-6117976847 Version 2.0, was issued on October 10, 2025, combining the previously separate permits for Pinebush West wells (G5 and G5A; Permit P-300-6117976847 Version 1.0) and the Pinebush West wellfield wells (P9, P15, and P15A; Permit 7600-A27N5B). Version 2.0 brings all five production wells under a single permit and carries forward the established maximum daily rates, wellfield caps, monitoring requirements, and biennial reporting obligations from the earlier permits. Since most of the current reporting period (2024-2025) fell under the original, separate permits, Burnside has prepared two reports to ensure full compliance with the terms and conditions of Permit P-300-6117976847 Version 1.0 and Permit 7600-A27N5B. All required monitoring and reporting obligations under both permits have been fully addressed. The next biennial report (2026-2027) will consolidate the required data from the two wellfields into a single document in accordance with the Conditions of P-300-6117976847 Version 2.0.

PTTW 7600-A27N5B for the Pinebush Well Field requires submission of a well field specific biennial report to the Ministry of Environment, Conservation and Parks (MECP) which documents well pumping volumes and water levels in specific monitoring wells during 2024 and 2025. This report has been prepared to meet the reporting conditions of the PTTW for 2024 and 2025. A copy of the PTTW is included in Appendix A.

The location of the Pinebush Well Field is shown in Figure 1 and the production wells in Cambridge are shown in Figure 2 with the monitoring network for P9, P15 and P15A shown in Figure 3. Well records for the production and monitoring wells are found in Appendix B.

### 1.1 Scope of Work

The Region records water levels on a regular basis in a nearby monitoring well nest to satisfy requirements of their PTTW and to confirm that water taking is sustainable in the long term. The monitoring well nest is located near the production wells. The data from the well nest and regular measurements of pumping volume obtained from the production wells are used to evaluate the impact of Region pumping on aquifers and potential impacts to private wells, other water takers and the natural environment.

The Region has developed a monitoring program for the Pinebush Well Field (P9, P15, P15A) in accordance with PTTW 7600-A27N5B which consists of the following activities:

- Measuring the daily volume pumped from the P9, P15 and P15A production wells (Condition 4.1 of the PTTW);
- Measuring the water levels in monitoring wells C-PB-OW1-13-ABC (Condition 4.2 of the PTTW);
- Review of precipitation data from the nearest GRCA / Environment Canada weather station (Condition 4.3 of the PTTW); and
- Completion of a biennial report (every 2 years) that presents data in compliance with condition 4.3 of the PTTW.

The Monitoring data (pumped volumes and hydrographs) are found in Appendix C with precipitation data in Appendix D. The monitoring program procedures and methodology are included in Appendix E.

## 2.0 Site Setting

### 2.1 Well Field Description

Wells P9, P15 and P15A (Figure 3) are located on the south side of Pinebush Road, south of the Highway 401 corridor in the City of Cambridge. The Pinebush Well Field includes: the G5 / G5A site about 600 m to the west ("Pinebush West"), the P19 site about 1.1 km to the east, the P10 / P10A / P10B site about 1.1 km to the east, and the P11 / P17 site about 1.4 km to the southeast (collectively "Pinebush East"). The Clemens Mill Well Field is located 1.6 km south of the Pinebush Wellfield P9, P15 and P15A site and the Hespeler Well Field is located 1.5 km to the north (Figure 2). The Pinebush wells are in an urban area that is municipally serviced. The closest surface water feature to the P9, P15 and P15A site is a 1.1 ha storm water management pond located 1.2 km to the east south of Pinebush Road, west of Fleming Road and beside production well P10.

#### 2.1.1 Pumping Wells

Well records for the production wells are found in Appendix B.

A summary of the production well construction details is provided in Table 1 below.

**Table 1: Production Well Construction Details**

Well Name	Year Built	Casing Diameter (mm)	Open Hole Diameter (mm)	Open Hole interval (mbgs)	Aquifer
P9	1959	200 (liner)	250	54.3 -80.2	Goat Island / Gasport Formation

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Well Name	Year Built	Casing Diameter (mm)	Open Hole Diameter (mm)	Open Hole interval (mbgs)	Aquifer
P15	1959	254	254	37.2-78.9	Guelph / Goat Island
P15A	2013	324	279 & 152	49.0-135.0	Guelph / Goat Island / Gasport Formation

The water taking volumes for the Pinebush P9, P15 and P15A well field are regulated by Condition 3.2 of the PTTW and are summarized in Table 2 below.

**Table 2: Annual Water Taking 2024 / 2025**

Well	PTTW Details	2024			2025		
	Permitted Max. Daily Water Taking (m <sup>3</sup> )	Avg. Daily Water Taking (m <sup>3</sup> )	Max Taken per Day (m <sup>3</sup> )	Total Volume Pumped (m <sup>3</sup> )	Avg. Daily Water Taking (m <sup>3</sup> )	Max Taken per Day (m <sup>3</sup> )	Total Volume Pumped (m <sup>3</sup> )
P9	4,229*	1,549	1,601	565,372	1,552	1,620	566,309
P15	4,229*	Decommissioned			Decommissioned		
P15A	4,229*	1,323	1,728	483,061	1,279	1,434	466,729
Combined P9, P15 and P15A	4,229*	2,872	3,284 <sup>1</sup>	1,048,433	2,830	2,989 <sup>2</sup>	1,033,038

Note: :\* the Max Taken per Day of 4,229 m<sup>3</sup>/day is based on a combined Max taken per minute of 2.937 (m<sup>3</sup>)

<sup>1</sup> Daily maximum water taking in 2024 of 3,284 m<sup>3</sup> was recorded on May 25<sup>th</sup> and May 30<sup>th</sup>.

<sup>2</sup> Daily maximum water taking in 2025 of 2,989 m<sup>3</sup> was recorded on May 31<sup>st</sup>.

Notwithstanding the maximum taken per day specified in Table A of Condition 3.2, the combined daily taking from the well field shall not exceed an annual daily average of 3,628.8 m<sup>3</sup>/day. As shown in Table 2, this requirement was met in both 2024 and 2025.

Daily pumping data from the Region indicates that prior to October 2021 production wells P9 and P15 were typically pumped on the same day. During the end of 2021 P15A was brought online and daily pumping at P15 ceased. P15 was decommissioned

on February 15, 2022. The pumping volumes are based on the total daily volumes as recorded by the Region’s SCADA system and are presented in Appendix C as total monthly volumes. Pumping volumes from the well field ranged from 84,598 m<sup>3</sup>/month to 94,485 m<sup>3</sup>/month in 2024, and from 85,433 m<sup>3</sup>/month to 88,319 m<sup>3</sup>/month in 2025. In total, 1,048,433 m<sup>3</sup> was produced at this well field in 2024 and 1,033,038 m<sup>3</sup> was produced in 2025. These volumes are higher than the previous 2021 and 2022 and below 2023 and the permitted volume of 1,324,512 m<sup>3</sup> per year (Table C-1).

**2.1.2 Monitoring Wells**

The Region updated their well naming protocol in 2017 and as a result, the well names in EQulS may vary from the names listed on the PTTW. The well names on the PTTW are shown below along with the updated name that is used by the Region. The updated Region names will be used throughout this report.

**Table 3: Well Nomenclature**

Monitoring well names as they appear on the PTTW	Revised well names consistent with Region nomenclature
C-PB-OW1ABC-13	C-PB-OW1-13-ABC

Observation wells C-PB-OW1-13-ABC are located adjacent to wells P9, P15 and P15A (Figure 3). Construction and monitoring details of C-PB-OW1-13-ABC are described in the table below. Well records for the monitoring wells are provided in Appendix B.

**Table 4: Monitoring Well Construction Details**

Monitoring Well ID	Year Built	Screened Depth (mbgs)	Screened Formation	Distance to P9 (m)	Distance to P15 (m)	Distance to P15A (m)
C-PB-OW1-13-A	2013	120.4-123.4	Middle Gasport	40.3	42.0	43.9
C-PB-OW1-13-B	2013	107.4-110.5	Upper Gasport	40.3	42.0	43.9
C-PB-OW1-13-C	2013	75.6-78.6	Goat Island	40.3	42.0	43.9

**2.2 Regional Geology and Hydrostratigraphy**

The following sections provide a brief overview of the regional geology and hydrogeology of the Pinebush Well Field. The surficial geology based on regional OGS mapping is provided in Figure 4. Representative cross-sections showing the stratigraphy in the vicinity of the Pinebush Well Field (P9, P15, P15A) are included as Figures 5, 6 and 7 to visualize the stratigraphy described in this section. The cross-section locations are provided in Figure 3. The cross-sections are provided as a

visual aid and do not necessarily contain all wells in the monitoring program for the Pinebush Well Field.

The recently completed Tier Three Assessment Update Project (Aqua Insight et al, 2023) has revised the stratigraphic interpretation of the bedrock lithology at the Pinebush Well field with the most significant changes in the area of production wells P10A and P15A. Based on an updated interpretation of geophysical logs in the vicinity of Well P10A and C-PB-OW1-09, the Guelph Formation is interpreted to be thicker and the tops of the Reformatory Quarry, Goat Island and Gasport Formations are interpreted to occur at a deeper depth. In the vicinity of Well P15A, the tops of the Reformatory Quarry, Goat Island and Gasport are all interpreted to be shallower, with the Reformatory Quarry slightly thicker than previously interpreted (Aqua Insight et al, 2023). New boreholes (C-PB-OW1-22 and C-PB-OW2-22) are located well to the east of the production wells where there was previously a lack of hydrostratigraphic information (Figure 3). In general, the data from these wells shows some small changes relative to the original Tier 3 conceptualization, including the top of Reformatory Quarry located approximately 5 m shallower at C-PB-OW2-22, a thicker Vinemount Formation (3 to 6 m) at both wells and the top of Gasport Formation encountered at a shallower depth (3 to 5 m) at both of the new wells (Aqua Insight et al, 2023).

The lithological layers were updated in accordance with documentation provided in the Numerical Model Surface Transfer memorandum (Aqua Insight Inc, 2026).

### **2.2.1 Surficial Geology and Conceptual Hydrostratigraphy**

The surficial geology of the Study Area has been mapped and described by Karrow (1987). Along the eastern side of the Grand River and the south side of the Speed River, the surficial geology (Figure 4) largely consists of sand and gravel outwash deposits (Units 7a and 7b in Figure 4). Ice-contact kame stratified sands and gravels (Unit 6 in Figure 4) are present east of the outwash deposits and extend towards Puslinch Lake.

The thickness of overburden deposits generally ranges from approximately 5 to 10 m in areas of outwash deposits, however, can be up to approximately 30 to 40 m thick in areas of the Paris and Galt moraines to the east of Cambridge. In the vicinity of the Shades Mill, Clemens Mill and Pinebush Well Fields, the overburden thickness is generally 20 to 40 m. In the Hespeler Well Field area in northern Cambridge adjacent to the Speed River, overburden thickness is generally less than 20 m and the overburden is thin or absent in the Speed River valley.

The Quaternary Geology of the Cambridge area includes the following units (Lotowater 1997, Karrow 1987 and Bajc and Shirota, 2007) described in more detail below.

### **Aquitard ATA2 - Wentworth Till**

The Wentworth Till was deposited by the last glacier to advance in the area. It is described as a stony, sandy silt to sand textured till, and is often inter-bedded with sand and gravel. In the Cambridge area, the Wentworth Till is generally less than 10 m thick. Due to the loose, coarse-grained nature of the till, the unit behaves as a leaky aquitard or poor aquifer that is readily recharged from precipitation.

### **Aquifer AFA2 - Outwash Deposits**

The outwash sand and gravel sediments of AFA2 are present within the Grand River valley and vicinity, however extensive deposits have also been identified underlying the Wentworth Till in the Paris and Galt moraines. These outwash deposits are interpreted as the main production aquifer for the Shade's Mills municipal wells.

### **Aquitard ATB1 - Port Stanley Till**

The Port Stanley Till is a sandy silt to silty sand till, with occasional stony texture. The Port Stanley Till was deposited by ice advancing from the Erie-Ontario ice lobe. In other parts of the Region, Bajc and Shirota (2007) have also used unit ATB1 to represent Tavistock, Mornington and Upper Maryhill Tills. In the Grand River and Speed River valleys this unit has been largely removed by erosion. This unit is generally finer grained than the Wentworth Till and behaves as an aquitard.

### **Aquifer AFB1 - Upper Waterloo Moraine Stratified Sediments and Equivalents**

Significant thicknesses of aquifer AFB1 are interpreted to occur southeast of the Speed River and west of Puslinch Lake and generally corresponds with mapped surficial ice-contact sands and gravels. AFB1 is generally fine sand with some gravel and is often slightly finer grained than unit AFA2, which typically contains greater amounts of gravel. Since AFB1 and AFA2 both behave as aquifers, differentiation of these units is not critical from a hydraulic perspective, although it is necessary to represent AFB1 separately from AFA2 to allow sequential layers for aquifer units both above and below the Port Stanley Till (ATB1), where this situation occurs. Where AFB1 is not present, Port Stanley Till may directly overlie Maryhill Till and Catfish Creek Till (described below), forming a single combined aquitard unit composed of these tills.

### **Aquitard ATB3 - Lower Maryhill Till**

Fine grained till and glaciolacustrine deposits of the Lower Maryhill Till ATB3 generally separate AFB1 from the underlying Catfish Creek Till. The Lower Maryhill Till is described as a dense, dark brown, clayey silt to silty clay till and is interpreted to be

present in the Fountain Street (Well P16) well field area above the Catfish Creek and below the Port Stanley Till. Aquitard ATB3 can be difficult to distinguish from ATB1 throughout most of the study area due to the similar lithologies of these units. Lotowater (1997) grouped the Port Stanley and Maryhill Tills as a single aquitard hydrostratigraphic unit, which is a reasonable approach where no significant thickness of sand and gravel separate these units.

### **Aquitard ATC1 – Upper / Main Catfish Creek Till**

The Catfish Creek Till was deposited by a major glacial advance from the north to northeast that covered all of southern Ontario. The Catfish Creek Till is a dense, stony, sandy silt to silty sand till with little clay content. Although originally deposited over the entire Cambridge area, erosion, glaciations and meltwater events have removed areas of the Catfish Creek Till and it is now discontinuous. In the Cambridge Area, the thickness of this unit ranges from approximately 5 m in areas east of the Grand River, to approximately 20 m west of the Grand River, and is usually found immediately overlying bedrock and beneath clayey sediments. The hydrogeologic properties of the Catfish Creek Till are variable, ranging from a good aquitard to a poor aquifer, depending on local lithology, degree of compaction, and the presence of overlying aquitard units.

### **2.2.2 Bedrock Geology and Conceptual Hydrostratigraphy**

The stratigraphy discussed below is consistent with the revised stratigraphic framework described by the OGS (Brunton, 2009) and is also used in the Tier 3 Study of the area (Golder, 2011). A brief description (from Stantec, 2013) of each bedrock formation and conceptual hydrostratigraphic units typically present in Cambridge is provided below (from youngest to oldest). The formations present in the vicinity of P9 / P15 / P15A are shown on the cross sections in Figures 5 to 7.

#### **Guelph Formation**

The Guelph Formation is a cream-coloured fossiliferous dolostone that represents an important aquifer in the Cambridge and Guelph area, where it is most often the uppermost bedrock unit.

#### **Eramosa Formation**

The Upper Eramosa Formation is described by Brunton (2009) as light brown to cream coloured, pseudonodular, thickly bedded and coarsely crystalline dolostone. The formation consists of the Reformatory Quarry Member, and the Vinemount Member.

The Reformatory Quarry Member is susceptible to karstification due to its uniform fine dolomite crystallinity (Brunton, 2009), and also often contains mud-rich and microbial mat-bearing lithofacies. As a result, this unit generally represents a poor aquifer or poor

aquitard. This unit was described as either the Guelph Formation or Eramosa Member in previous studies within the Region.

The Vinemount Member is comprised of thinly bedded, fine crystalline dolostone with shaley beds that give off a distinctive petroliferous odour when broken (Brunton, 2009). This unit represents an aquitard when present within the Cambridge and Guelph areas.

### **Goat Island Formation**

The Goat Island Formation consists of the upper Ancaster Member and lower Niagara Falls Member. The Ancaster Member is a chert rich, finely crystalline dolostone that is medium to ash grey in colour. The Niagara Falls Member is a finely crystalline and cross laminated crinoidal grainstone with small reef mounds. The finely crystalline nature of these Members results in a lower hydraulic conductivity and transmissivity compared to the underlying Gasport Formation (Brunton, 2009). Conceptually, the two members of the Goat Island Formation are treated as a single hydrostratigraphic unit.

### **Gasport (Amabel) Formation**

The Gasport Formation is a cross-bedded crinoidal grainstone-packstone with sequences of reef mound and coquina (shell bed) lithofacies. This unit has commonly been referred to as the Amabel Formation in previous studies in the Region. Upper, middle and lower hydrostratigraphic units of the Gasport have been defined to allow for general representation of the vertical distribution of the more transmissive reef mound and coquina bed lithofacies. Highly transmissive reef mounds, crinoidal grainstones and coquina beds are generally present in the upper and middle portions of the formation, and are largely absent from the lower 10 m to 20 m.

The lower portion of the Gasport Formation has been grouped with the Rochester, Irondequoit, Rockway, and Merriton Formations due to the difficulty in distinguishing the various units from available borehole data and geophysical logs. All four formations, as well as the base of the Gasport Formation, are relatively less permeable than the upper sections of the Gasport Formation.

## **2.3 Local Geology**

Figure 3 displays the Pinebush Well Field well plan and cross-section locations. Representative cross-sections are included as Figures 5 to 7 to visualize the stratigraphy described in this section.

Detailed lithological sampling and geophysical logging (Stantec, 2015) indicated that the overburden on the P9 / P15 / P15A site consists of layers of coarse grained sand and gravel as well as finer grained till deposits. The overburden was found to be 36.6 m thick at P15A, consisting of 22 m of predominantly sand, gravel, and silty sand to sandy silt deposits consistent with the Upper Waterloo Moraine Sediments and Equivalents (AFB1). This correlates to the ice-contact stratified glacial deposits indicated on the

surficial geology map for the area (Figure 4). The AFB1 aquifer is underlain by about 5 m of silty clay interpreted to be associated to the Lower Maryhill Till (ATB3) and approximately 9 m of silty sand to sand with gravel interpreted to be part of the AFD1 aquifer (Stantec, 2015).

### **2.3.1 Bedrock Geology**

The bedrock surface (Stantec, 2015) is encountered at in the production wells (Appendix B) depths between about 31 and metres below ground surface (mbgs). The borehole logs for P15A and C-PB-OW1-13 identify the Guelph Formation between 36.6-44.2 mbgs, the Eramosa Formation between 44.2-53.3 mbgs, the Goat Island Formation between 53.4-76.2 mbgs, the Upper and Middle Gasport between 76.2-146.3 mbgs, the Lower Gasport between 146.3-153 mbgs and the Cabot Head formation begins at 153 mbgs (Stantec, 2015).

P15 obtains its water from the Guelph and Goat Island. P9 obtains water from the Guelph / Goat Island Formations and P15A obtains water from the Guelph / Goat Island / Gasport Formations (Stantec, 2015).

## **3.0 2024 / 2025 Results**

### **3.1 Precipitation**

Longer term precipitation trends can have an impact on water levels in the supply aquifer. To assess the potential influence, monthly precipitation is plotted for comparison to water levels and pumping and presented in Appendix C.

Since variations in precipitation totals can occur throughout the Region due to localized events, monthly precipitation data from the GRCA and Environment Canada station located closest to the production wells are used. The closest GRCA weather station relative to the Pinebush P9, P15 and P15A well field is the Shades Mills Dam station located 4.2 km southeast. The closest Environment Canada station is the Waterloo International Airport (WIA) located 7.9 km to the northwest. The locations of the meteorological stations are shown in Figure 1.

Annual precipitation data from the past 10 years for all stations are compared with long term averages in Table D.1, Appendix D. At Shades Mills Dam, the long-term average was calculated from when measurements started until the end of 2025. The WIA has "Climate Normals" calculated by Environment Canada for 1971 to 2000.

Annual 2024 / 2025 precipitation data for all the meteorological stations closest to the Pinebush P9, P15 and P15A well field are presented in Table 5 below. WIA was missing 6 days of data in 2024 and 6 days in 2025. As a result, the precipitation totals may be under reported.

**Table 5: Summary of Precipitation Data**

Station	2024 Precipitation (mm)	2024 Deviation (mm)	Long-Term Average (mm)	2025 Precipitation (mm)	2025 Deviation (mm)
Region of Waterloo International Airport <sup>(A)</sup>	874	+23	851 <sup>o</sup>	723	-128
Shades Mills Dam <sup>(C)</sup>	976	+67	909 <sup>A</sup>	895	-14

**Sources:** Environment Canada (1), GRCA (2)  
<sup>A</sup> 1991 to 2020 Normal <sup>B</sup> 1998-2024 data  
<sup>P</sup> Average annual precipitation since monitoring began to the end of 2025

Water levels typically follow a seasonal trend with highest levels occurring in the spring with the depth and water content of the snowpack having a significant influence on water levels. Lowest levels occurring in July / August. Widespread synoptic rainfall events can also result in Region-wide water level responses. Summer thunderstorms tend to be short lived and occur over a smaller area resulting in short term, localized water level rises not typically seen in the monitoring wells.

The 2024 total precipitation at Shades Mills station was 976 mm, which is 67 mm above the long-term average, indicating 2024 was wetter-than-average at the well field. A similar above long-term average trend is noted at the WIA station. The March 1 GRCA snow survey indicated a snowpack across the Region that was low compared to normal. In 2025, the total precipitation was 895 mm, which is 14 mm below the long-term average. The 2025 total precipitation at the WIA station was 128 mm below the long-term average, indicating 2025 was a drier-than-average year. However, WIA was missing 12 days of data in 2024 / 2025 and as a result, precipitation totals may be under reported. The snow survey conducted by the GRCA on March 15, 2025, showed that the stations in the Region had a high to very high measured snow water equivalent.

### 3.2 Monitoring Results

Hydrographs showing the results of water level monitoring over the past 10 years are provided in Appendix C. The method used to collect the water levels (manual or electronic) is indicated on the graphs in Appendix C.

#### C-PB-OW1-13

C-PB-OW1-13 is located about 40 m from P9, P15 and P15A near Pinebush Road (Figure 3). Water levels have been collected at this location since October 2015. Monthly manual water level monitoring is conducted at C-PB-OW1-13-AB (Middle and Upper Gasport), and water level monitoring is completed using an electronic data logger at C-PB-OW1-13-C (Goat Island formation). There are two hydrographs for C-PB-OW1-13-ABC in Appendix C. The first hydrograph is compared to monthly total pumped volumes from P9, P15, and P15A, and the second hydrograph is compared to

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monthly total pumped volumes from G5 and G5A (located about 700 m west of C-PB-OW1-13.

Water levels in all three screens show a similar pattern with continuous water level data from the C screen showing short term variations of up to 6.7 m. The short term variations in screen C are most likely occurring in screens A and B but do not appear because the levels are only measured monthly.

Water levels measured in 2024 / 2025 were consistent with those recorded in 2022 / 2023, reflecting the increased pumping at wells P9 and P15A. Additional drawdown is apparent between January and July 2024 and October 2024 and July 2025 when G5A is pumping. Water levels do not show any declining trends because of pumping.

A review of daily water levels and pumping rates indicate a response to pumping of P9 / P15 / P15A. P15A began pumping in late 2021 and water levels in C-PB-OW1-13-ABC decreased by approximately 5 m. It is important to note that there are numerous bedrock production wells in a small area which results in interference between well fields. For example, pumping at nearby G5A decreases water levels at C-PB-OW1-13-ABC by approximately 6 m which can be seen from November 2020 to April 2021 when G5A was pumping. Impact Assessment

### **3.3 Well Interference**

PTTW Condition 5.1 states, "The Permit Holder shall immediately notify the local District Office of any complaint arising from the taking of water authorized under this Permit and shall report any action which has been taken or is proposed with regard to such complaint. The Permit Holder shall immediately notify the local District Office if the taking of water is observed to have any significant impact on the surrounding waters. After hours, calls shall be directed to the Ministry's Spills Action Centre at 1-800-268-6060."

PTTW Condition 5.2 states: For Groundwater Takings - if the taking of water is observed to cause any negative impact to other water supplies obtained from any adequate sources that were in use prior to initial issuance of a Permit for this water taking, the Permit Holder shall take such action necessary to make available to those affected, a supply of water equivalent in quantity and quality to their normal takings, or shall compensate such persons for their reasonable costs of so doing, or shall reduce the rate and amount of taking to prevent or alleviate the observed negative impact. Pending permanent restoration of the affected supplies, the Permit Holder shall provide temporary water supplies adequate to meet their normal requirements or shall compensate such persons for their reasonable costs of doing so. If permanent interference is caused by the water taking, the Permit Holder shall restore the water supplies of those permanently affected.

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When a well interference complaint is received, the Region has a Well Interference Policy in place. A copy of the policy is presented in Appendix F of the 2019 Biennial Groundwater Monitoring Report – Multiple Well Fields (Burnside, 2020). There were no well interference complaints related to pumping of P9, P15 and P15A received in 2024 and 2025.

There are no other Groundwater takings registered in the MECP PTTW database within 2 km of the P9, P15 and P15A wells other than Region production wells.

### **3.4 Aquifer Impacts to Pumping and Precipitation**

PTTW Condition 4.3 states: " The Permit Holder shall prepare and submit a report every two years by June 30, that presents the results of the well field water level monitoring for the two preceding calendar years, assesses changes in water levels in the supply aquifer(s) in relation to precipitation and water taking from the aquifer(s)".

Water levels in the Middle, Upper Gasport and Goat Island Aquifers were monitored using monitoring well screens A, B, and C, and are located in close proximity to the supply well allowing for the assessment of aquifer levels near the supply wells. Based on monitoring results, the water levels in the Middle and Upper Gasport and Goat Island Formations indicate a clear response to pumping at wells P9, P15 and P15A. When only P9 and P15 were pumping prior to 2022 (up to 60,000 m<sup>3</sup>/month), water levels ranged between about 285 and 290 masl with lowest levels seen when G5A was also pumping. P15A began pumping in October 2021, the pumping at P9 was also increased (total well field pumping near 90,000 m<sup>3</sup>/month) and G5A also began pumping. Water levels in all 3 screens declined about 10 m in response. Water levels then rose between 2 to 3 m during periods when G5A was offline (May 2023 to December 2023, May 2024 to December 2024 and July 2025 to December 2025).

The groundwater levels in the Middle, Upper Gasport and Goat Island Aquifers adjacent to the P9 / P15 / P15A wells did not display a correlation with precipitation events.

## **4.0 Conclusions**

Impacts from pumping the municipal wells at the Pinebush Well Field (P9, P15, P15A) were evaluated through implementation of the Groundwater Monitoring Program. Based on the information contained in the report, Burnside offers the following conclusions:

- The information presented in this report satisfies condition 4.3 of PTTW 7600-A27N5B.
- 2024 and 2025 pumping volumes were within the permitted range.
- There were no reported well interference complaints arising from water taking at the Pinebush P9, P15, P15A well field.

2025 Biennial Groundwater Monitoring Report - Pinebush Well Field (P9, P15, P15A)  
June 2026

- Water levels in wells screened in the Goat Island Formation and the Upper and Middle Gasport Formation show an almost identical response to pumping of P9 and P15A.
- Water levels also respond to pumping of G5A.
- Water levels do not appear to respond to seasonal patterns.

## 5.0 References

Aqua Insight Inc., Technical Memorandum Numerical Model Surface Transfer, March 2026.

Aqua Insight Inc., Stantec Consulting Ltd, S.S. Papadopoulos and Associates Inc. and WSP Canada Inc., 2023. Hydrogeologic Characterization and Conceptual Model Updates, Region of Waterloo Tier Three Update Project. Final Report, June 2023.

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AquaResource Inc., 2012. Region of Waterloo Tier Three Water Budget and Local Area Risk Assessment Rural Well Fields Characterization Report

Bajc, A.F. and Shirota J., 2007. Three-dimensional mapping of surficial deposits in the Regional Municipality of Waterloo, southwestern Ontario; report in Ontario Geological Survey, Groundwater Resources Study 3, p. 42.

Brunton, F.R., Preliminary Revisions to the Early Silurian Stratigraphy of Niagara Escarpment: Integration of Sequence Stratigraphy, Sedimentology and Hydrogeology to Delineate Hydrogeologic Units., Summary of Field Work and Other Activities 2008, Ontario Geological Survey, Open File Report 6226, P31-1 to 31-18.

Golder Associates, October 2009; Revised November 2011. Tier 3 Water Budget and Local Area Risk Assessment: Cambridge East Well Field Characterization.

Karrow 1987, Quaternary geology of the Hamilton-Cambridge Area, Southern Ontario. Ontario Geological Survey, Report 255, 94 p.

Lotowater Ltd. 1997, Study of the Hydrogeology of the Cambridge Area, The Regional Municipality of Waterloo, 93p.

Matrix Solutions Inc., 2015. Technical Memorandum: Numerical Model Surfaces Data Transfer. Region of Waterloo, June 5, 2015.

R.J. Burnside & Associates Limited, 2024. 2023 Biennial Groundwater Monitoring Report – Pinebush Well Field (P9, P15, P15A), Region of Waterloo R.J. Burnside & Associates Limited, 2025. Seasonal Water Level Report, Region of Waterloo, April 24, 2025.

R.J. Burnside & Associates Limited, 2010. Production Well G5A Construction and Testing Report Regional Municipality of Waterloo.

2025 Biennial Groundwater Monitoring Report - Pinebush Well Field (P9, P15, P15A)  
June 2026

Stantec Consulting Ltd, 2013. Pinebush Road Well Field Construction and Testing of Test Wells P10A, P10B, TW1-10, and Production Wells P11 and P17

Stantec Consulting Ltd, 2015. Test Production Well C-PB-TW2-13 Pumping Test, Pinebush Road Well Field, Region of Waterloo, July 24, 2015.

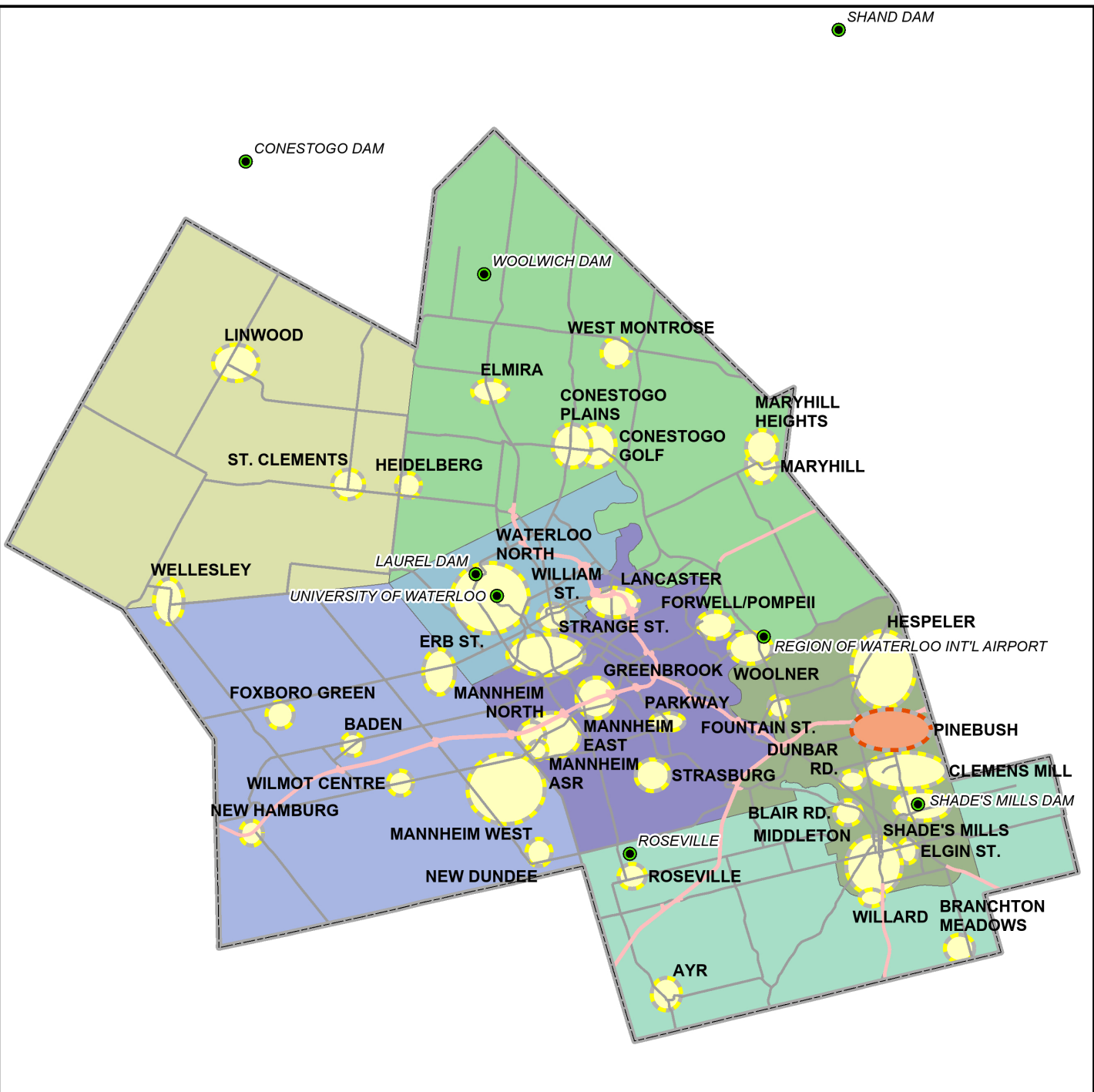


# BURNSIDE

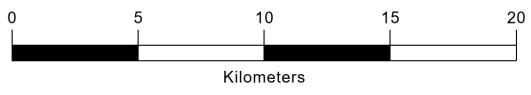
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**Figures**



Data Source:  
Region of Waterloo; Includes material © 2012 of the Queen's  
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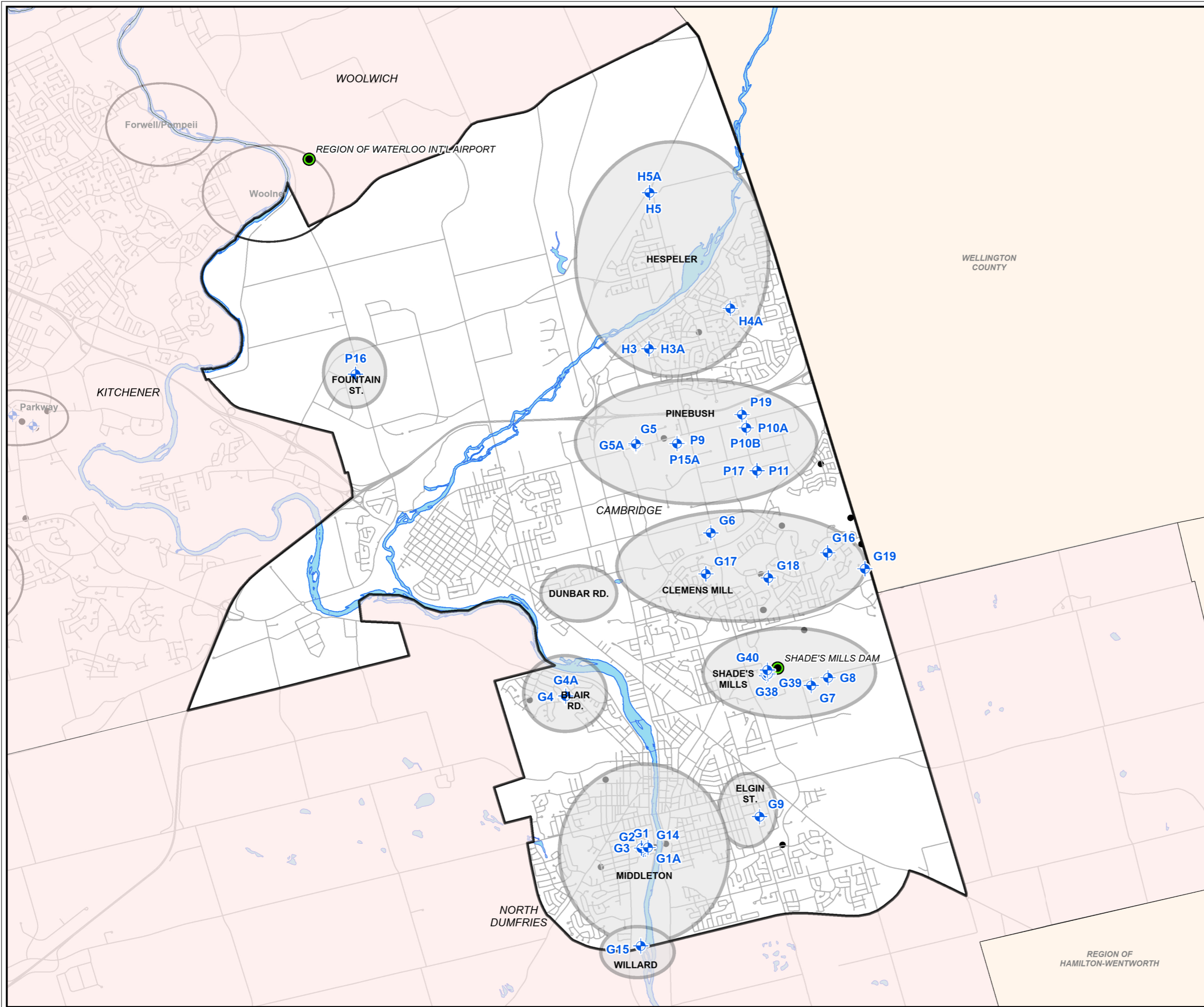
- Well Field Location
- Well Fields
- Regional Municipal Boundaries
- City of Cambridge
- City of Kitchener
- City of Waterloo
- Township of North Dumfries
- Township of Wellesley
- Township of Wilmot
- Township of Woolwich
- Meteorological Monitoring Locations



Map Title  
**2025 GROUNDWATER MONITORING REPORT -  
PINEBUSH (P9/P15/P15A) WELL FIELD**  
**WELL FIELD LOCATION MAP**

Client  
**REGION OF WATERLOO**

Drawn	Checked	Date	Figure No. <b>1</b>
HN	SQ	February 2026	
Scale	Project No.		
1:300,000		HA0464020	



**LEGEND**

- Production Well Location
- Monitoring Well Location
- Well Fields
- Cambridge Municipal Boundary
- Meteorological Monitoring Locations

Sources:

1. Ministry of Natural Resources, © Queen's Printer for Ontario
2. Natural Resources Canada © Her Majesty the Queen in Right of Canada.

Datum: North American 1983 CSRS  
 Coord. System: NAD 1983 CSRS UTM Zone 17N

Client

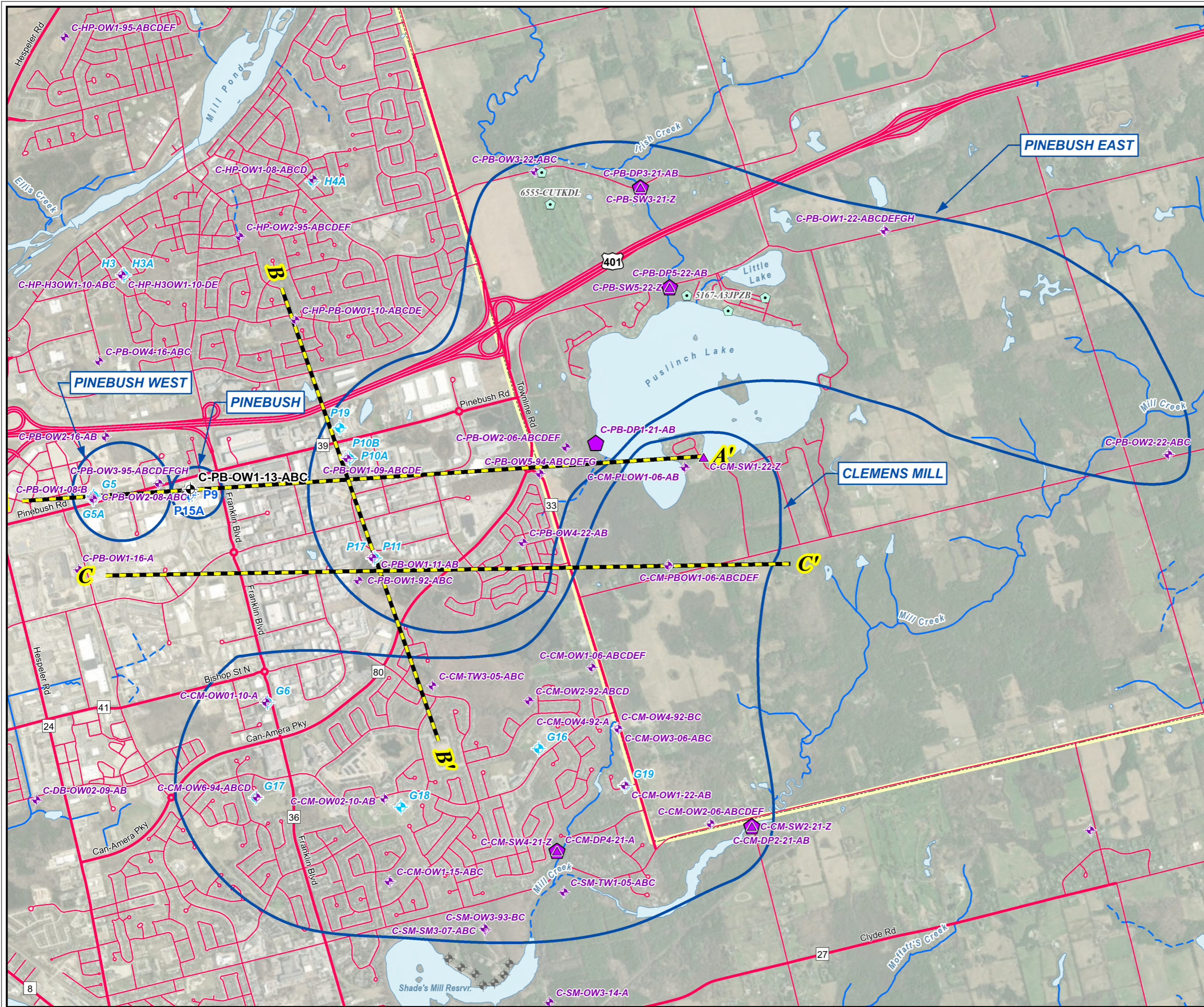
**REGION OF WATERLOO**

Figure Title

**2025 GROUNDWATER MONITORING REPORT -  
 PINEBUSH (P9/P15/P15A) WELL FIELD**

**CAMBRIDGE WELL FIELDS AND  
 MONITORING NETWORK**

Drawn	Checked	Date	Figure No. <b>2</b>
HN	SQ	February 2026	
Scale	Project No.		
1:65,000		HA0464020	



**Legend**

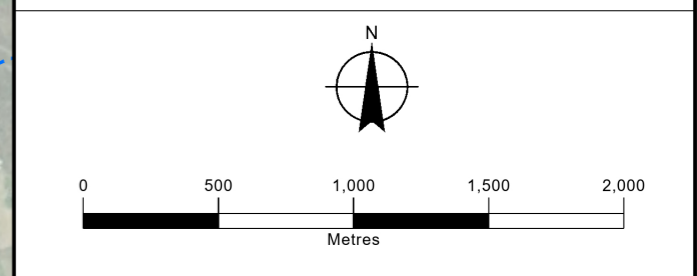
- PTTW Monitoring Well Location
- Production Well Location
- Nearby Monitoring Well Location
- Nearby Production Well Location
- Decommissioned Production Well Location
- Nearby Piezometer Location
- Nearby Surface Water Location

**Additional MECP PTTW Locations**

- Groundwater
- Cross Section Orientation
- Well Fields
- Provincial Highway
- Municipal Roads
- Local Roads
- Stream: Permanent (OHN)
- Stream: Intermittent (OHN)
- Waterbody: Permanent (OHN)
- Region of Waterloo Municipal Boundary

**Sources:**  
 Region of Waterloo GIS Data; Background 2020 Air Photo: ArcGIS Image Service Region of Waterloo; Ministry of Natural Resources, © Queen's Printer for Ontario, Natural Resources Canada © Her Majesty the Queen in Right of Canada.

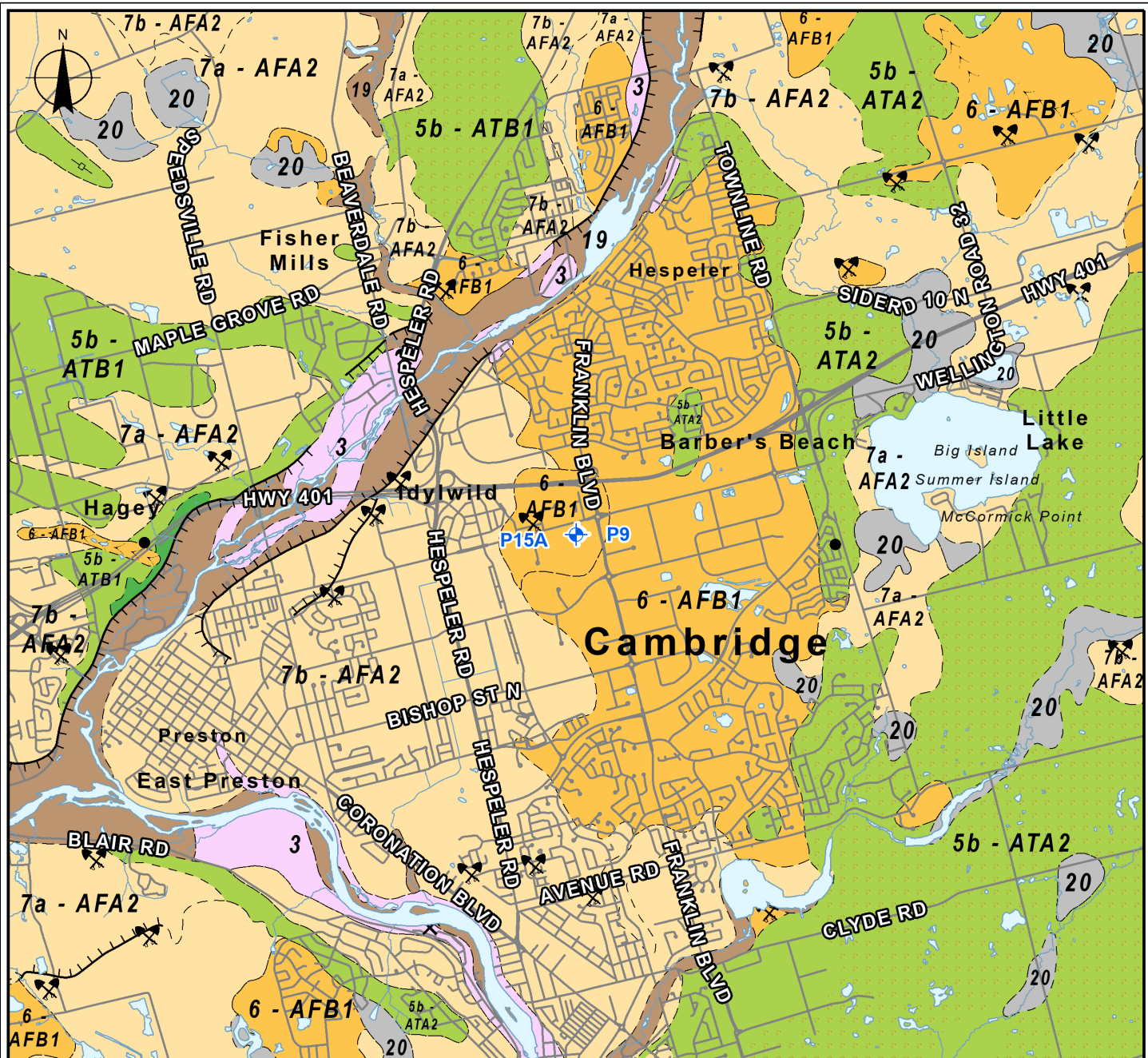
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Client  
**REGION OF WATERLOO**

Figure Title  
**2025 GROUNDWATER MONITORING REPORT**  
**PINEBUSH (P9/P15/P15A) WELL PLAN AND CROSS SECTION LOCATIONS**

Drawn	Checked	Date	Figure No.
HN	SQ	February 2026	
Scale	Project No.		3
1:28,000	HA0464020		



Data Source:  
 1. Ontario Geological Survey 2003. Surficial Geology of Southern Ontario; Ontario Geological Survey, Miscellaneous Release--Data 128.  
 2. Region of Waterloo GIS



- |  |   |  |  |
|--|---|--|--|
| <ul style="list-style-type: none"> <li> RMOV Supply Well</li> <li> Watercourse</li> <li> Waterbody</li> <li><b>Surficial Geology</b></li> <li> 3: Paleozoic bedrock</li> </ul> | <ul style="list-style-type: none"> <li> 5b: Stone-poor, carbonate-derived silty to sandy till (ATA2/ATB1 - Aquitard)</li> <li> 5d: Glaciolacustrine-derived silty to clayey till (ATB1 - Aquitard)</li> <li> 6: Ice-contact stratified deposits (AFB1 - Aquifer)</li> </ul> | <ul style="list-style-type: none"> <li> 7a: Glaciofluvial deposits: Sandy deposits (AFA2 - Aquifer)</li> <li> 7b: Glaciofluvial deposits: Gravelly deposits (AFA2 - Aquifer)</li> <li> 19: Modern alluvial deposits</li> </ul> | <ul style="list-style-type: none"> <li> 20: Organic deposits</li> <li> Sample Location</li> <li> Quarry (Point)</li> <li> Sand and Gravel Pit</li> <li> Esker: Direction of Flow Known</li> <li> Terrace</li> <li> Drumlin or drumlinoid ridges (point)</li> <li> Hummocky Topography</li> <li> Unit Contact</li> <li> Boundary</li> </ul> |
|--|---|--|--|



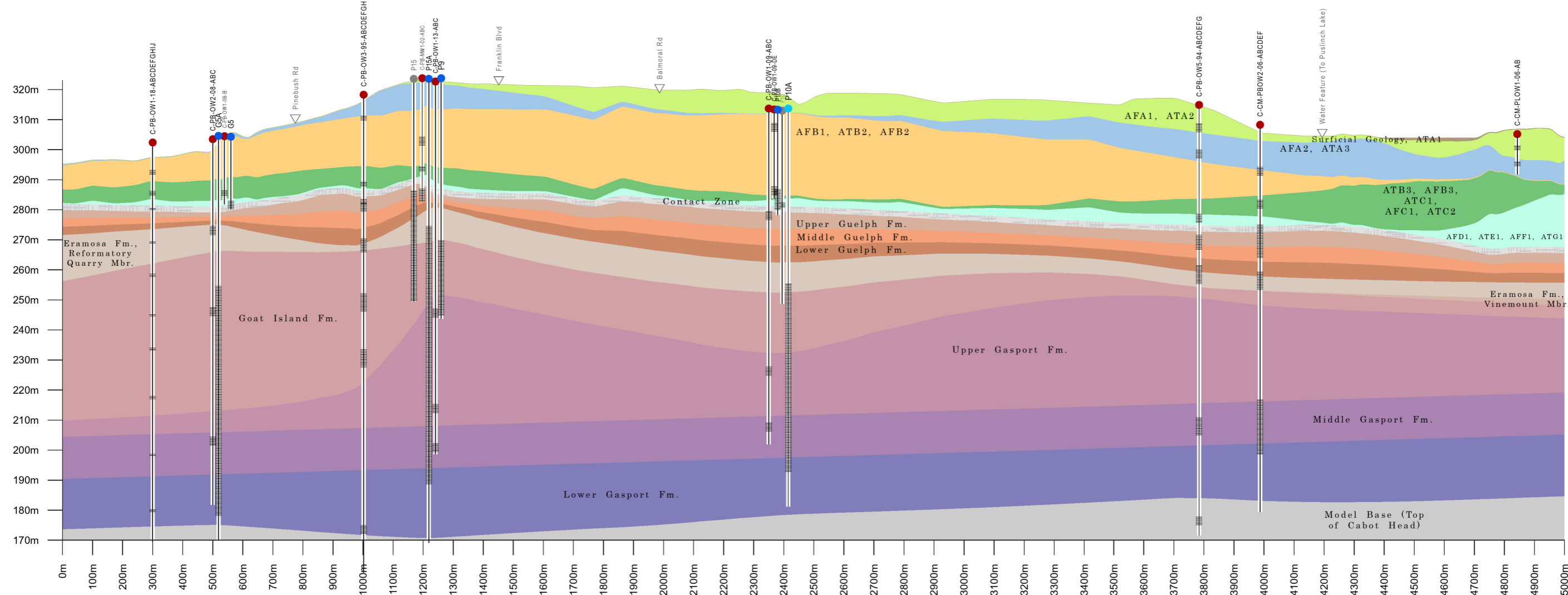
Map Title  
**2025 GROUNDWATER MONITORING REPORT - PINEBUSH (P9/P15/P15A) WELL FIELD**  
**SURFICIAL GEOLOGY**

Client  
**REGION OF WATERLOO**

Drawn	Checked	Date	Figure No. <b>4</b>
HN	SQ	February 2026	
Scale	Project No.		
1:60,000	HA0464020		

A

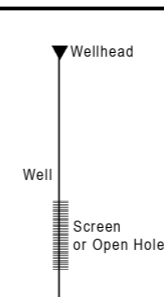
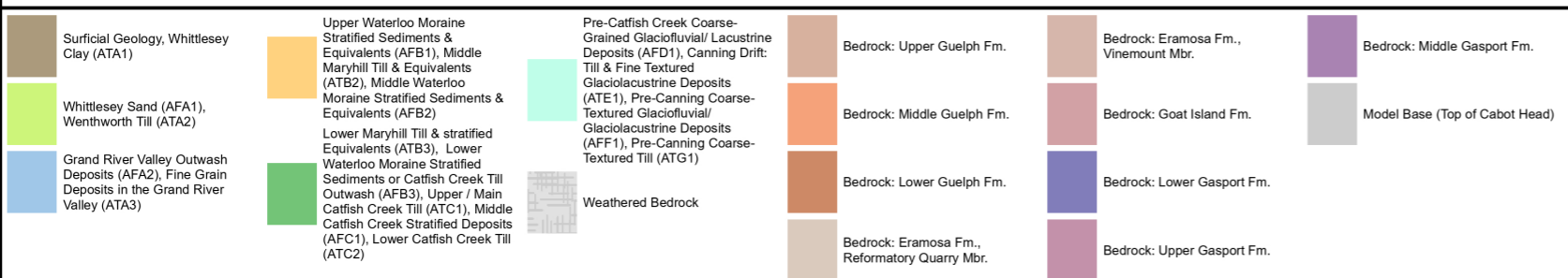
A'



Wells

- Production Well (Active)
- Production Well (Inactive)
- Production Well (Decommissioned)
- Monitoring Well

Cambridge Model 2026



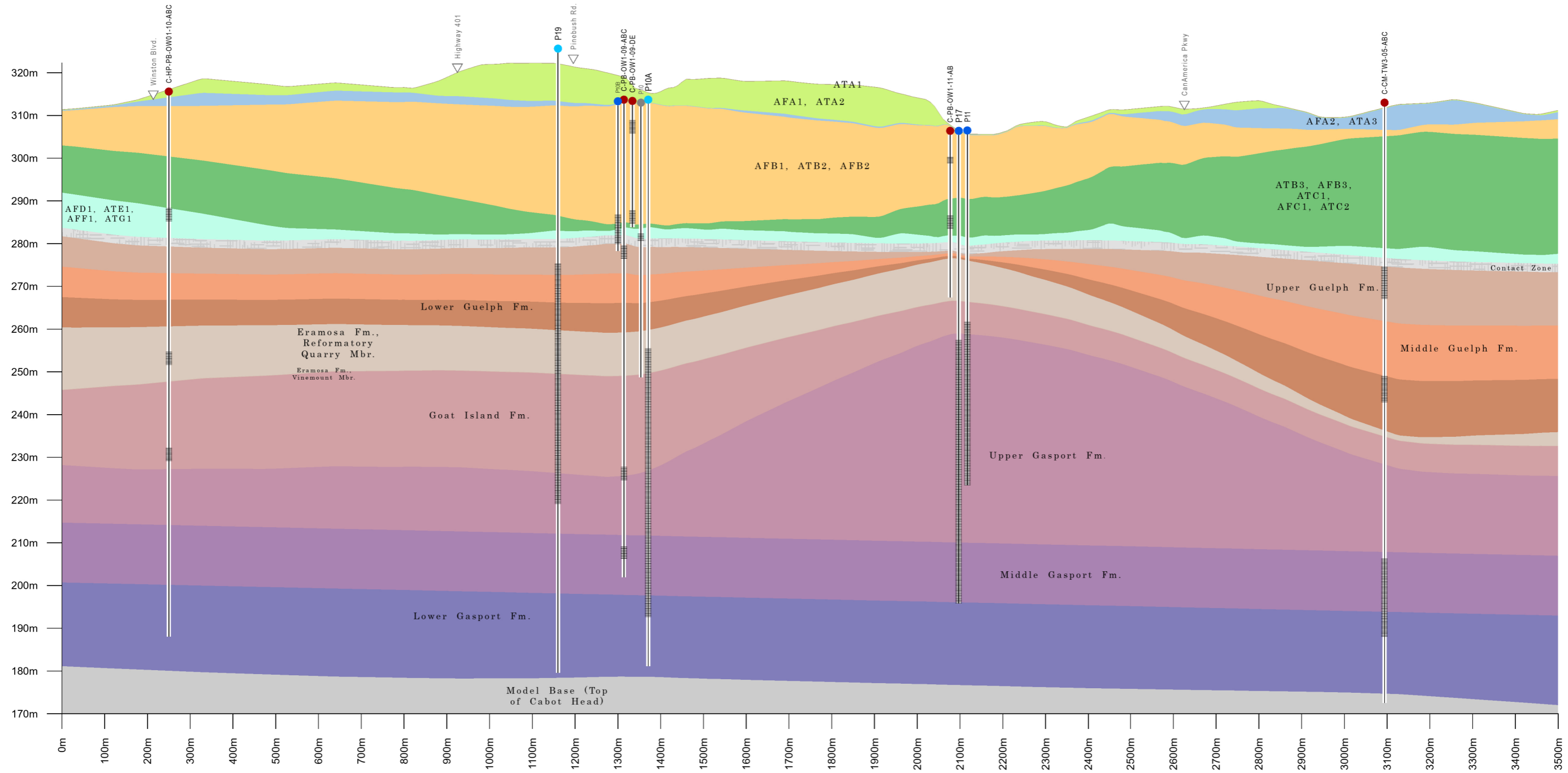
**BURNSIDE**

Client  
**REGION OF WATERLOO**

<p>Figure Title <b>GEOLOGIC CROSS SECTION REGION OF WATERLOO</b> Pinebush Cross Section A - A'</p>			
Drawn PS	Checked DH	Date 2026/06/25	Figure No. 5
Horizontal Scale 1:14,000		Project No. HA046402	
Vertical Ex.:10x			

B

B'

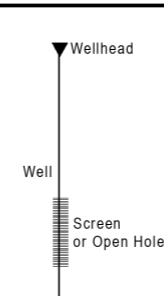


Wells

- Production Well (Active)
- Production Well (Inactive)
- Production Well (Decommissioned)
- Monitoring Well

Cambridge Model 2026

Surficial Geology, Whittlesey Clay (ATA1)	Upper Waterloo Moraine Stratified Sediments & Equivalents (AFB1), Middle Maryhill Till & Equivalents (ATB2), Middle Waterloo Moraine Stratified Sediments & Equivalents (AFB2)	Pre-Catfish Creek Coarse-Grained Glaciofluvial/ Lacustrine Deposits (AFD1), Canning Drift: Till & Fine Textured Glaciolacustrine Deposits (ATE1), Pre-Canning Coarse-Textured Glaciofluvial/ Glaciolacustrine Deposits (AFF1), Pre-Canning Coarse-Textured Till (ATG1)	Bedrock: Upper Guelph Fm.	Bedrock: Eramosa Fm., Vinemount Mbr.	Bedrock: Middle Gasport Fm.
Whittlesey Sand (AFA1), Wenthworth Till (ATA2)	Lower Maryhill Till & stratified Equivalents (ATB3), Lower Waterloo Moraine Stratified Sediments or Catfish Creek Till Outwash (AFB3), Upper / Main Catfish Creek Till (ATC1), Middle Catfish Creek Stratified Deposits (AFC1), Lower Catfish Creek Till (ATC2)	Weathered Bedrock	Bedrock: Middle Guelph Fm.	Bedrock: Goat Island Fm.	Model Base (Top of Cabot Head)
Grand River Valley Outwash Deposits (AFA2), Fine Grain Deposits in the Grand River Valley (ATA3)			Bedrock: Lower Guelph Fm.	Bedrock: Lower Gasport Fm.	
			Bedrock: Eramosa Fm., Reformatory Quarry Mbr.	Bedrock: Upper Gasport Fm.	



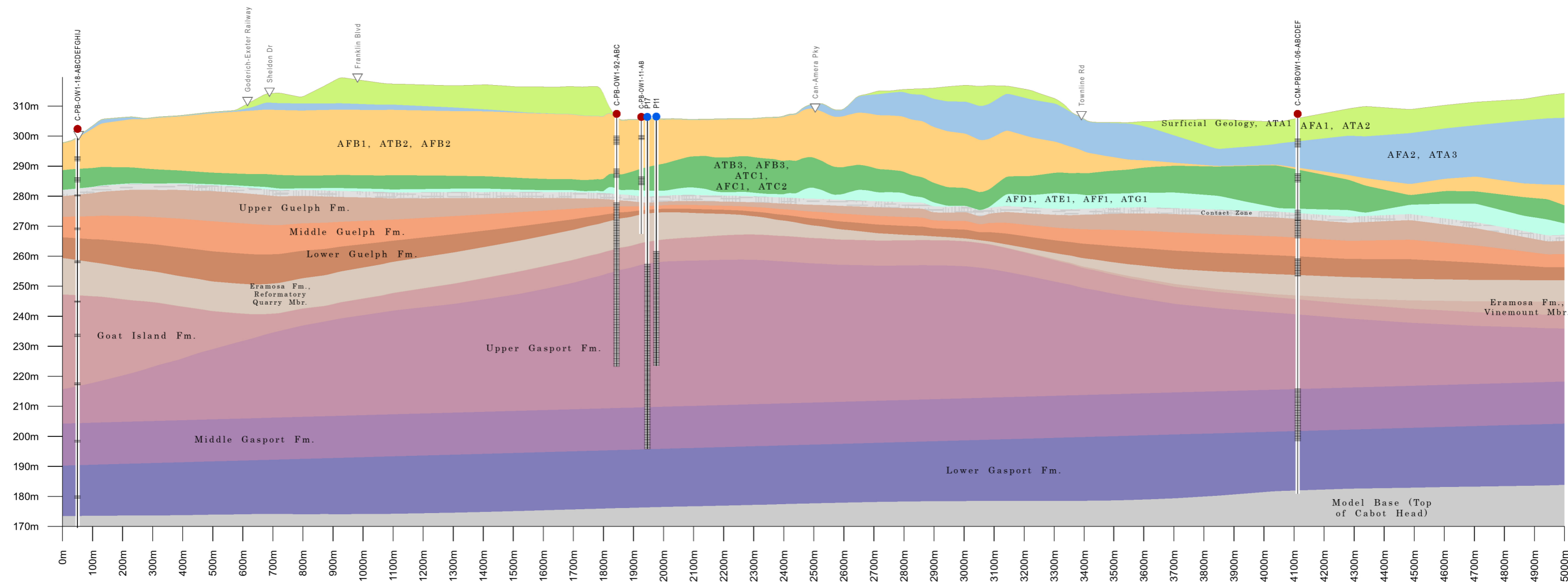
**BURNSIDE**

Client  
**REGION OF WATERLOO**

Figure Title <b>GEOLOGIC CROSS SECTION REGION OF WATERLOO Pinebush Cross Section B - B'</b>			
Drawn PS	Checked DH	Date 2026/06/25	Figure No. 6
Horizontal Scale 1:10,000		Project No. HA046402	
Vertical Ex.:10x			

C

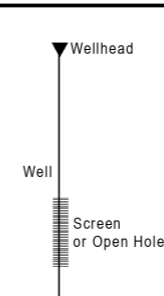
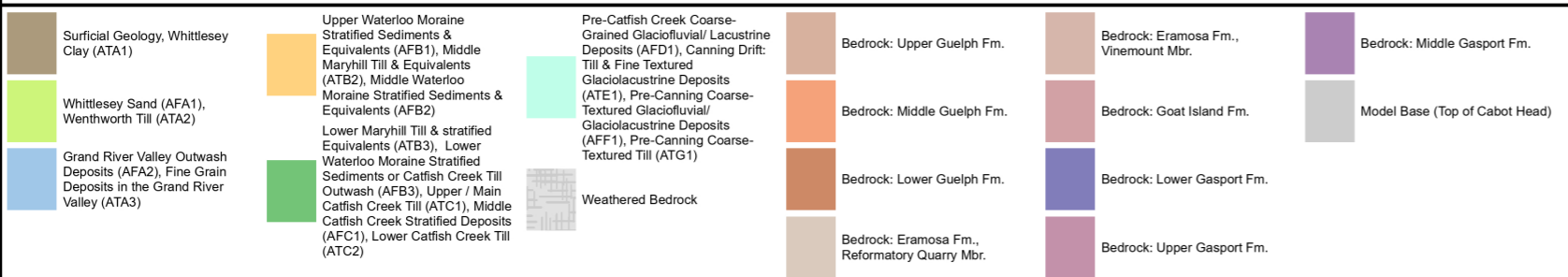
C'



Wells

- Production Well (Active)
- Monitoring Well

Cambridge Model 2026



**BURNSIDE**

Client  
**REGION OF WATERLOO**

Figure Title <b>GEOLOGIC CROSS SECTION REGION OF WATERLOO</b> Pinebush Cross Section C - C'			
Drawn PS	Checked DH	Date 2026/06/25	Figure No. 7
Horizontal Scale 1:14,000		Project No. HA046402	
Vertical Ex.:10x			



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**Appendix A**

**Permit To Take Water**

Appendix A

**PERMIT TO TAKE WATER**

Ground Water

NUMBER P-300-6117976847

Version: 2.0

Effective Date: October 10, 2025

Expiry Date: May 31, 2035

Pursuant to Section 34.1 of the *Ontario Water Resources Act*, Revised Statutes of Ontario (R.S.O.) 1990 this Permit To Take Water is hereby issued to:

REGIONAL MUNICIPALITY OF WATERLOO

150 Frederick Street

6th Floor

KITCHENER

ONTARIO

Canada

N2G 4J3

For the water taking from

G5

G5A

P9

P15A

Located at:

98 PINEBUSH Road , CAMBRIDGE, CAMBRIDGE, ONTARIO, CANADA,

N1R 8J8

191 Pinebush Road , Cambridge, CAMBRIDGE, ONTARIO, CANADA, N1R

7H8

This Permit cancels and replaces Permit Number P-300-6117976847 Version 1.0, issued on June 14, 2021.

## DEFINITIONS

---

For the purposes of this Permit, and the terms and conditions specified below, the following definitions apply:

- a. "Director" means any person appointed in writing as a director pursuant to section 5 of the OWRA for the purposes of section 34.1 of the OWRA.
- b. "Provincial Officer" means any person designated in writing by the Minister as a provincial officer pursuant to section 5 of the OWRA.
- c. "Ministry" means the ministry of the government of Ontario responsible for the administration of the OWRA, currently named the Ministry of the Environment, Conservation and Parks.
- d. "District Office" means the Guelph District Office  
Guelph District Office  
of the Ministry.
- e. "Permit" or "PTTW" means this Permit to Take Water No. P-300-6117976847 including its Schedules, if any, issued in accordance with Section 34.1 of the OWRA, as may amended.
- f. "Permit Holder" means REGIONAL MUNICIPALITY OF WATERLOO.
- g. "OWRA" means the *Ontario Water Resources Act*, R.S.O. 1990, c. O. 40.

## TERMS AND CONDITIONS

---

You are hereby notified that this Permit is issued subject to the terms and conditions outlined below:

### 1. Compliance with Permit

- 1.1. Except where modified by this Permit, the water taking shall be in accordance with the application for this Permit To Take Water, attested to by Frank Kosa, on June 19, 2025, and all Schedules included in this Permit.
- 1.2. The Permit Holder shall ensure that any person authorized by the Permit Holder to take water under this Permit is provided with a copy of this Permit and shall take all reasonable measures to ensure that any such person complies with the conditions of this Permit.
- 1.3. Any person authorized by the Permit Holder to take water under this Permit shall comply with the conditions of this Permit.
- 1.4. This Permit is not transferable to another person without the Director's written consent.

- 1.5. This Permit provides the Permit Holder with permission to take water in accordance with the conditions of this Permit, up to the date of the expiry of this Permit. This Permit does not constitute a legal right, vested or otherwise, to a water allocation, and the issuance of this Permit does not guarantee that, upon its expiry, it will be renewed.
- 1.6. The Permit Holder shall keep this Permit available at all times at or near the site of the taking, and shall produce this Permit immediately for inspection by a Provincial Officer upon his or her request.
- 1.7. The Permit Holder shall report any changes of address to the Director within thirty days of any such change. The Permit Holder shall report any change of ownership of the property for which this Permit is issued within thirty days of any such change.

## **2. General Conditions and Interpretation**

### **2.1. Inspections**

The Permit Holder must forthwith, upon presentation of credentials, permit a Provincial Officer to carry out any and all inspections authorized by the *OWRA*, the *Environmental Protection Act*, R.S.O. 1990, the *Pesticides Act*, R.S.O. 1990, or the *Safe Drinking Water Act*, S. O. 2002.

### **2.2. Other Approvals**

The issuance of, and compliance with this Permit, does not:

- (a) relieve the Permit Holder or any other person from any obligation to comply with any other applicable legal requirements, including the provisions of the *Ontario Water Resources Act*, and the *Environmental Protection Act*, and any regulations made thereunder; or
- (b) limit in any way any authority of the Ministry, a Director, or a Provincial Officer, including the authority to require certain steps be taken or to require the Permit Holder to furnish any further information related to this Permit.

### **2.3. Information**

The receipt of any information by the Ministry, the failure of the Ministry to take any action or require any person to take any action in relation to the information, or the failure of a Provincial Officer to prosecute any person in relation to the information, shall not be construed as:

- (a) an approval, waiver or justification by the Ministry of any act or omission of any person that contravenes this Permit or other legal requirement; or
- (b) acceptance by the Ministry of the information's completeness or accuracy.

### **2.4. Rights of Action**

The issuance of, and compliance with this Permit shall not be construed as precluding or limiting any legal claims or rights of action that any person, including the Crown in right of Ontario or any agency thereof, has or may have against the Permit Holder, its officers, employees, agents, and contractors.

## 2.5. Severability

The requirements of this Permit are severable. If any requirements of this Permit, or the application of any requirements of this Permit to any circumstance, is held invalid or unenforceable, the application of such requirements to other circumstances and the remainder of this Permit shall not be affected thereby.

## 2.6. Conflicts

Where there is a conflict between a provision of any submitted document referred to in this Permit, including its Schedules, and the conditions of this Permit, the conditions in this Permit shall take precedence.

## 3. Water Takings Authorized by This Permit

### 3.1. Expiry

This Permit expires on May 31, 2035. No water shall be taken under authority of this Permit after the expiry date.

### 3.2. Amounts of Taking Permitted

The Permit Holder shall only take water from the source, during the periods and at the rates and amounts of taking specified in Table A. Water takings are authorized only for the purposes specified in Table A.

Table A (litres)

	<b>Source Name and Location (Zone/Easting/Northing)</b>	<b>Source Information</b>	<b>Permitted Maximums</b>
1	G5 (17 / 555087 / 4806566)	<b>Source Type:</b> Well <b>Purpose Category:</b> Public administration <b>Specific Purpose:</b> Municipal Supply <b>Activity:</b> Water Supply	<b>Litres taken per minute:</b> 3,000 <b>Number of hours taken per day:</b> 24 <b>Litres taken per day:</b> 4,320,000 <b>Number of days taken per year:</b> 365
2	G5A (17 / 555084 / 4806544)	<b>Source Type:</b> Well <b>Purpose Category:</b> Public administration <b>Specific Purpose:</b> Municipal Supply <b>Activity:</b> Water Supply	<b>Litres taken per minute:</b> 3,000 <b>Number of hours taken per day:</b> 24 <b>Litres taken per day:</b> 4,320,000 <b>Number of days taken per year:</b> 365
3	P9	<b>Source Type:</b> Well	<b>Litres taken per minute:</b>

Source Name and Location (Zone/Easting/Northing)	Source Information	Permitted Maximums
(17 / 555804 / 4806576)	<b>Purpose Category:</b> Public administration <b>Specific Purpose:</b> Municipal Supply <b>Activity:</b> Water Supply	2,937 <b>Number of hours taken per day:</b> 24 <b>Litres taken per day:</b> 4,229,280 <b>Number of days taken per year:</b> 365
4 P15A (17 / 555784 / 4806573)	<b>Source Type:</b> Well <b>Purpose Category:</b> Public administration <b>Specific Purpose:</b> Municipal Supply <b>Activity:</b> Water Supply	<b>Litres taken per minute:</b> 2,937 <b>Number of hours taken per day:</b> 24 <b>Litres taken per day:</b> 4,229,280 <b>Number of days taken per year:</b> 365
<b>Maximum Total Liters Taken per day:</b>		<b>8,549,280</b>

3.3. Notwithstanding Table A, the combined taking from **Source 1 and 2** (wells G5 and G5A, respectively) shall not exceed **4,320,000 litres per day**.

3.4. Notwithstanding Table A, the combined taking from **Source 3 and 4** (wells P9 and P15A, respectively) shall not exceed **4,229,280 litres per day**, and the annual daily average rate shall not exceed **3,628,800 litres per day**.

#### 4. Monitoring

4.1. The Permit Holder shall maintain a record of all water takings. The daily volume of water taken shall be measured by a flow meter or calculated in accordance with the method described in the application for this Permit, or as otherwise accepted by the Director.

This record shall include the dates and times of water takings, the rates of pumping, and the total measured amounts of water pumped per day for each day that water is taken under the authorization of this Permit. A separate record shall be maintained for each source. The Permit Holder shall keep all required records up to date and available at or near the site of the taking and shall produce the records immediately for inspection by a Provincial Officer upon his or her request. The Permit Holder, unless otherwise required by the Director, shall submit, on or before March 31st in every year, the records required by this condition to the Ministry's Regulatory Self Reporting System.

4.2. The Permit Holder shall measure and record water levels once a month in the

following monitoring wells:

- i. C-PB-OW2-08-ABC
- ii. C-PB-OW1-08-B
- iii. C-PB-OW3-95-ABCDEFG
- iv. C-PB-OW1-13-ABC

4.3. The Permit Holder shall prepare and submit a report to the Director and the Guelph District every two years by **June 30** commencing **June 30, 2027** that presents the results of the well field water level monitoring for the two preceding calendar years, assesses changes in water levels in the supply aquifer(s) in relation to precipitation and water taking from the aquifer(s), and provides a summary for all interference complaints received by the Permit Holder related to this Permit and reported in the District Office in accordance with Condition 5.1, including the manner in which the Permit Holder has dealt with the complaint.

## 5. Impacts of the Water Taking

### 5.1. Notification

The Permit Holder shall immediately notify the local District Office of any complaint arising from the taking of water authorized under this Permit and shall report any action which has been taken or is proposed with regard to such complaint. The Permit Holder shall immediately notify the local District Office if the taking of water is observed to have any significant impact on the surrounding waters. After hours, calls shall be directed to the Ministry's Spills Action Centre at 1-800-268-6060.

### 5.2. Impacts for Water Situation Type

For Surface-Water Takings

The taking of water (including the taking of water into storage and the subsequent or simultaneous withdrawal from storage) shall be carried out in such a manner that streamflow is not stopped and is not reduced to a rate that will cause interference with downstream uses of water or with the natural functions of the stream.

For Groundwater Takings

If the taking of water is observed to cause any negative impact to other water supplies obtained from any adequate sources that were in use prior to initial issuance of a Permit for this water taking, the Permit Holder shall take such action necessary to make available to those affected, a supply of water equivalent in quantity and quality to their normal takings, or shall compensate such persons for their reasonable costs of so doing, or shall reduce the rate and amount of taking to prevent or alleviate the observed negative impact. Pending permanent restoration of the affected supplies, the Permit Holder shall provide, to those affected, temporary water supplies adequate to meet their normal requirements, or shall compensate

such persons for their reasonable costs of doing so.

If permanent interference is caused by the water taking, the Permit Holder shall restore the water supplies of those permanently affected.

## **6. Director May Amend Permit**

6.1. The Director may amend this Permit by letter requiring the Permit Holder to suspend or reduce the taking to an amount or threshold specified by the Director in the letter. The suspension or reduction in taking shall be effective immediately and may be revoked at any time upon notification by the Director. This condition does not affect your right to appeal the suspension or reduction in taking to the Environmental Review Tribunal under the *Ontario Water Resources Act*, Section 100 (4).

## **REASONS**

---

The reasons for the imposition of these terms and conditions are as follows:

1. Condition 1 is included to ensure that the conditions in this Permit are complied with and can be enforced.
2. Condition 2 is included to clarify the legal interpretation of aspects of this Permit.
3. Conditions 3 through 6 are included to protect the quality of the natural environment so as to safeguard the ecosystem and human health and foster efficient use and conservation of waters. These conditions allow for the beneficial use of waters while ensuring the fair sharing, conservation and sustainable use of the waters of Ontario. The conditions also specify the water takings that are authorized by this Permit and the scope of this Permit.

## APPEAL PROVISIONS

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In accordance with Section 100 of the *Ontario Water Resources Act*, R.S.O. 1990, you may by written notice served upon me and the Ontario Land Tribunal within 15 days after receipt of this notice, require a hearing by the Tribunal. Section 101 of the *Ontario Water Resources Act*, R.S.O. 1990, as amended, provides that the notice requiring the hearing ("the Notice") shall state:

1. The portions of the Permit or each term or condition in the Permit in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

In addition to these legal requirements, the Notice should also include:

1. The name of the appellant;
2. The address of the appellant;
3. The permit to take water number;
4. The date of the permit to take water;
5. The name of the Director;
6. The municipality within which the works are located;

This Notice must be served upon:

Registrar*		The Director, Section 34.1,
Ontario Land Tribunal		Ministry of the Environment, Conservation and Parks
655 Bay Street, Suite 1500	and	5775 Yonge Street, 8 <sup>th</sup> Floor
Toronto ON		Toronto, ON
M5G 1E5		M2M 4J1
<a href="mailto:OLT.Registrar@ontario.ca">OLT.Registrar@ontario.ca</a>		Fax: (416) 325-6347

**\* Further information on the Ontario Land Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349 or 1 (866) 448-2248, or [Ontario Land Tribunal's](#)**

Dated at Toronto this 9th day of October, 2025



Matthew Corriveau

Director, Section 34.1

*Ontario Water Resources Act*, R.S.O. 1990

c: Frank Kosa, REGIONAL MUNICIPALITY OF WATERLOO

Karl Belan, REGIONAL MUNICIPALITY OF WATERLOO

## SCHEDULE 1

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This Schedule "1" forms part of Permit To Take Water P-300-6117976847 Version Number 2.0, dated October 9, 2025.

1. Email entitled "PTTW Application Reference Number 1000363872, Pinebush Well – Request for Additional Information", from Karl Belan of the Region of Waterloo to MECP, dated August 13, 2025.

**AMENDED PERMIT TO TAKE WATER**Ground Water  
NUMBER 7600-A27N5B

*Pursuant to Section 34.1 of the Ontario Water Resources Act, R.S.O. 1990 this Permit To Take Water is hereby issued to:*

The Regional Municipality of Waterloo  
150 Frederick Street, 7th Floor  
Kitchener, ON N2G 4J3

*For the water taking from:* Three bedrock wells (P15, P15A, & P9)

*Located at:* Lot 5, Concession 2, Geographic Township of Waterloo  
Cambridge, Regional Municipality of Waterloo

191 Pinebrush Rd (Lot 5 Concession 2 Beasley Lower Block)  
Cambridge, Regional Municipality of Waterloo

*For the purposes of this Permit, and the terms and conditions specified below, the following definitions apply:*

**DEFINITIONS**

- (a) "Director" means any person appointed in writing as a Director pursuant to section 5 of the OWRA for the purposes of section 34.1, OWRA.
- (b) "Provincial Officer" means any person designated in writing by the Minister as a Provincial Officer pursuant to section 5 of the OWRA.
- (c) "Ministry" means Ontario Ministry of the Environment and Climate Change.
- (d) "District Office" means the Guelph District Office.
- (e) "Permit" means this Permit to Take Water No. 7600-A27N5B including its Schedules, if any, issued in accordance with Section 34.1 of the OWRA.
- (f) "Permit Holder" means The Regional Municipality of Waterloo.
- (g) "OWRA" means the *Ontario Water Resources Act*, R.S.O. 1990, c. O. 40, as amended.

*You are hereby notified that this Permit is issued subject to the terms and conditions outlined below:*

## **TERMS AND CONDITIONS**

### **1. Compliance with Permit**

- 1.1 Except where modified by this Permit, the water taking shall be in accordance with the application for this Permit To Take Water, dated June 25, 2015 and signed by Richard Wootton, and all Schedules included in this Permit.
- 1.2 The Permit Holder shall ensure that any person authorized by the Permit Holder to take water under this Permit is provided with a copy of this Permit and shall take all reasonable measures to ensure that any such person complies with the conditions of this Permit.
- 1.3 Any person authorized by the Permit Holder to take water under this Permit shall comply with the conditions of this Permit.
- 1.4 This Permit is not transferable to another person.
- 1.5 This Permit provides the Permit Holder with permission to take water in accordance with the conditions of this Permit, up to the date of the expiry of this Permit. This Permit does not constitute a legal right, vested or otherwise, to a water allocation, and the issuance of this Permit does not guarantee that, upon its expiry, it will be renewed.
- 1.6 The Permit Holder shall keep this Permit available at all times at or near the site of the taking, and shall produce this Permit immediately for inspection by a Provincial Officer upon his or her request.
- 1.7 The Permit Holder shall report any changes of address to the Director within thirty days of any such change. The Permit Holder shall report any change of ownership of the property for which this Permit is issued within thirty days of any such change. A change in ownership in the property shall cause this Permit to be cancelled.

### **2. General Conditions and Interpretation**

- 2.1 Inspections  
The Permit Holder must forthwith, upon presentation of credentials, permit a Provincial Officer to carry out any and all inspections authorized by the OWRA, the *Environmental Protection Act*, R.S.O. 1990, the *Pesticides Act*, R.S.O. 1990, or the *Safe Drinking Water Act*, S. O. 2002.
- 2.2 Other Approvals  
The issuance of, and compliance with this Permit, does not:
  - (a) relieve the Permit Holder or any other person from any obligation to comply with any other

applicable legal requirements, including the provisions of the *Ontario Water Resources Act* , and the *Environmental Protection Act* , and any regulations made thereunder; or

(b) limit in any way any authority of the Ministry, a Director, or a Provincial Officer, including the authority to require certain steps be taken or to require the Permit Holder to furnish any further information related to this Permit.

### 2.3 Information

The receipt of any information by the Ministry, the failure of the Ministry to take any action or require any person to take any action in relation to the information, or the failure of a Provincial Officer to prosecute any person in relation to the information, shall not be construed as:

(a) an approval, waiver or justification by the Ministry of any act or omission of any person that contravenes this Permit or other legal requirement; or

(b) acceptance by the Ministry of the information's completeness or accuracy.

### 2.4 Rights of Action

The issuance of, and compliance with this Permit shall not be construed as precluding or limiting any legal claims or rights of action that any person, including the Crown in right of Ontario or any agency thereof, has or may have against the Permit Holder, its officers, employees, agents, and contractors.

### 2.5 Severability

The requirements of this Permit are severable. If any requirements of this Permit, or the application of any requirements of this Permit to any circumstance, is held invalid or unenforceable, the application of such requirements to other circumstances and the remainder of this Permit shall not be affected thereby.

### 2.6 Conflicts

Where there is a conflict between a provision of any submitted document referred to in this Permit, including its Schedules, and the conditions of this Permit, the conditions in this Permit shall take precedence.

## 3. Water Takings Authorized by This Permit

### 3.1 Expiry

This Permit expires on **May 31, 2025**. No water shall be taken under authority of this Permit after the expiry date.

### 3.2 Amounts of Taking Permitted

The Permit Holder shall only take water from the source, during the periods and at the rates and amounts of taking specified in Table A. Water takings are authorized only for the purposes specified in Table A.

**Table A**

	Source Name / Description:	Source: Type:	Taking Specific Purpose:	Taking Major Category:	Max. Taken per Minute (litres):	Max. Num. of Hrs Taken per Day:	Max. Taken per Day (litres):	Max. Num. of Days Taken per Year:	Zone/ Easting/ Northing:
1	P15	Well Drilled	Municipal	Water Supply	2,937	24	4,229,280	365	17 555752 4806606
2	P15A	Well Drilled	Municipal	Water Supply	2,937	24	4,229,280	365	17 555784 4806574
3	P9	Well Drilled	Municipal	Water Supply	2,937	24	4,229,280	365	17 555804 4806576
							<b>Total Taking:</b>	4,229,280	

3.3 Notwithstanding the Maximum Taken per Day specified in the Table A of Condition 3.2, the daily taking from the well field (in any combination of three listed wells) shall not exceed an annual daily average of 3,628,800 litres per day.

**4. Monitoring**

4.1 Under section 9 of O. Reg. 387/04, and as authorized by subsection 34(6) of the Ontario Water Resources Act, the Permit Holder shall, on each day water is taken under the authorization of this Permit, record the date, the volume of water taken on that date and the rate at which it was taken. The daily volume of water taken shall be measured by a flow meter or calculated in accordance with the method described in the application for this Permit, or as otherwise accepted by the Director. A separate record shall be maintained for each source (used for multiple sources). The Permit Holder shall keep all records required by this condition current and available at or near the site of the taking and shall produce the records for inspection by a Provincial Officer upon his or her request. The Permit Holder, unless otherwise required by the Director, shall submit, on or before March 31st in every year, the records required by this condition to the ministry's Water Taking Reporting System.

4.2 The Permit Holder shall measure and record water levels once a month in the following monitoring wells:  
- C-PB-OW1ABC-13

4.3 The Permit Holder shall prepare and submit a report every two years by June 30 commencing June 30, 2016, that presents the results of the well field water level monitoring for the two preceding calendar years, assess changes in water levels in the supply aquifers in relation to precipitation and the water taking from the aquifers, and provides a summary of all interference complaints received by the Permit Holder related to this Permit and reported in the District Office in accordance with Condition 5.1 and the manner in which the Region has dealt with the complaint.

## **5. Impacts of the Water Taking**

### **5.1 Notification**

The Permit Holder shall immediately notify the local District Office of any complaint arising from the taking of water authorized under this Permit and shall report any action which has been taken or is proposed with regard to such complaint. The Permit Holder shall immediately notify the local District Office if the taking of water is observed to have any significant impact on the surrounding waters. After hours, calls shall be directed to the Ministry's Spills Action Centre at 1-800-268-6060.

### **5.2 For Groundwater Takings**

If the taking of water is observed to cause any negative impact to other water supplies obtained from any adequate sources that were in use prior to initial issuance of a Permit for this water taking, the Permit Holder shall take such action necessary to make available to those affected, a supply of water equivalent in quantity and quality to their normal takings, or shall compensate such persons for their reasonable costs of so doing, or shall reduce the rate and amount of taking to prevent or alleviate the observed negative impact. Pending permanent restoration of the affected supplies, the Permit Holder shall provide, to those affected, temporary water supplies adequate to meet their normal requirements, or shall compensate such persons for their reasonable costs of doing so.

If permanent interference is caused by the water taking, the Permit Holder shall restore the water supplies of those permanently affected.

## **6. Director May Amend Permit**

The Director may amend this Permit by letter requiring the Permit Holder to suspend or reduce the taking to an amount or threshold specified by the Director in the letter. The suspension or reduction in taking shall be effective immediately and may be revoked at any time upon notification by the Director. This condition does not affect your right to appeal the suspension or reduction in taking to the Environmental Review Tribunal under the *Ontario Water Resources Act*, Section 100 (4).

*The reasons for the imposition of these terms and conditions are as follows:*

1. Condition 1 is included to ensure that the conditions in this Permit are complied with and can be enforced.
2. Condition 2 is included to clarify the legal interpretation of aspects of this Permit.
3. Conditions 3 through 6 are included to protect the quality of the natural environment so as to safeguard the ecosystem and human health and foster efficient use and conservation of waters. These conditions allow for the beneficial use of waters while ensuring the fair sharing, conservation and sustainable use of the waters of Ontario. The conditions also specify the water takings that are authorized by this Permit and the scope of this Permit.

*In accordance with Section 100 of the Ontario Water Resources Act, R.S.O. 1990, you may by written Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 101 of the Ontario Water Resources Act, R.S.O. 1990, as amended, provides that the Notice requiring the hearing shall state:*

1. The portions of the Permit or each term or condition in the Permit in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

*In addition to these legal requirements, the Notice should also include:*

3. The name of the appellant;
4. The address of the appellant;
5. The Permit to Take Water number;
6. The date of the Permit to Take Water;
7. The name of the Director;
8. The municipality within which the works are located;

*This notice must be served upon:*

*The Secretary  
Environmental Review Tribunal  
655 Bay Street, 15th Floor  
Toronto ON  
M5G 1E5  
Fax: (416) 314-4506  
Email: [ERTTribunalsecretary@ontario.ca](mailto:ERTTribunalsecretary@ontario.ca)*

*AND*

*The Director, Section 34.1, Ministry of the  
Environment and Climate Change  
12th Floor  
119 King St W  
Hamilton ON L8P 4Y7  
Fax: (905) 521-7820*

***Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal:***

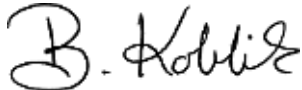
***by telephone at (416) 314-4600***

***by fax at (416) 314-4506***

***by e-mail at [www.ert.gov.on.ca](http://www.ert.gov.on.ca)***

This Permit cancels and replaces Permit Number 6616-9ZQGUM, issued on 2015/08/26.

Dated at Hamilton this 11th day of September, 2015.



Belinda Koblik  
Director, Section 34.1  
*Ontario Water Resources Act* , R.S.O. 1990

**Schedule A**

This Schedule "A" forms part of Permit To Take Water 7600-A27N5B, dated September 11, 2015.

**The Environmental Review Tribunal (ERT) has recently changed its phone and fax phone numbers, and as such you will need to use the following should you wish to contact the ERT:**

**New Public Inquiry Telephone Number:**

**Tel. (416) 212-6349**

**Toll Free 1(866) 448-2248**

**New Fax Number:**

**Fax: (416) 326-5370**

**Toll Free: 1(844) 213-3474**



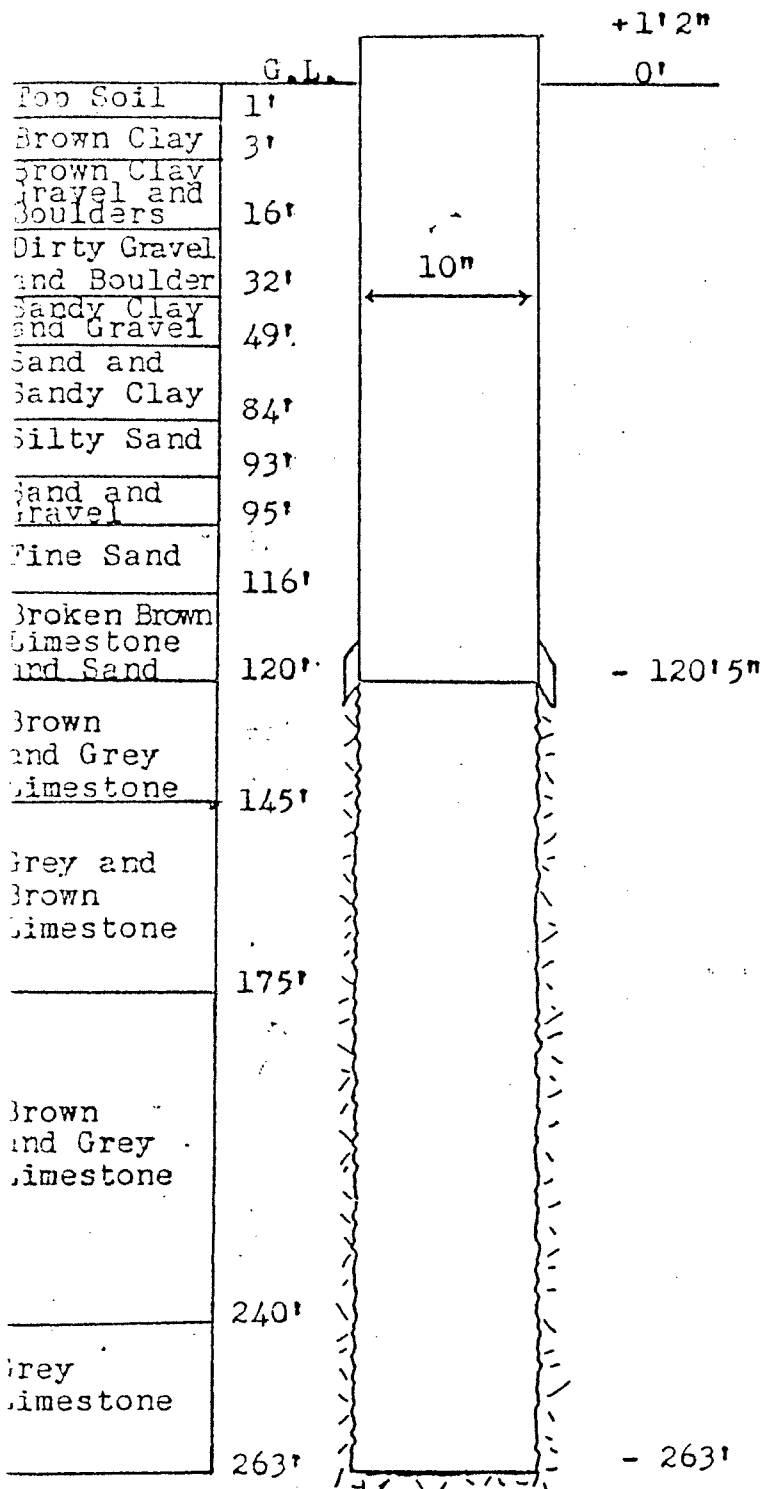
# BURNSIDE

[ THE DIFFERENCE IS OUR PEOPLE ]

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## Appendix B

### Well Records



Well Material

Outer Casing 121'7" - 10" welded pipe  
 Inner Casing  
 Screen  
 Plug  
 Gravel

Pump 3532 Rate  
 Main Br3

No. 40485 Setting BP-MB 150'  
 No. Stages 10 Length Bowl 6'10<sup>3</sup>/<sub>4</sub>"  
 Bowl 8" THC Size & Lgth. Suction None  
 Head T 300 Size Column 6" x 1"

Materials or setting details other than standard:  
 Impellers: Trim

Motor

Make U.S. Phase 3  
 H. P. 40 Cycles 60  
 R. P. M. 1800 Volts 550  
 Type H0 Amps. 39.2  
 Frame Serial 2875353  
 Bearing Nos. Upper - 7318BY, Lower - 6212J

Special Equipment

Zinc sleeves in column

P-9"

Well No. 2-59 (Rahman)

B.P. referred to original ground level + 2'9"  
 Clear depth below B.P. 265'9"  
 Started 3/5/59 Final Test  
 Preliminary Test 3/30/59 Static Level 67'  
 Final Test Pumping Level 38'9"  
 Guarantee I G P M Capacity 358 I G P M  
 Contract Pressure # Pressure Pump #  
 Length Air Line 151' Main #

**INTERNATIONAL WATER SUPPLY LTD.**  
 MONTREAL LONDON, CANADA SASKATOON  
 OAKVILLE WATER SUPPLY CONTRACTORS VANCOUVER

PUBLIC UTILITIES COMMISSION  
 PRESTON, ONTARIO  
 DRILLED BY D. Bauerlein DRAWN BY J.W.  
 INSTALLED BY K. McCutcheon APPROVED BY

# INTERNATIONAL WATER SUPPLY, LTD.

Pa

LONDON, ONTARIO, CANADA

## LOG OF WELL

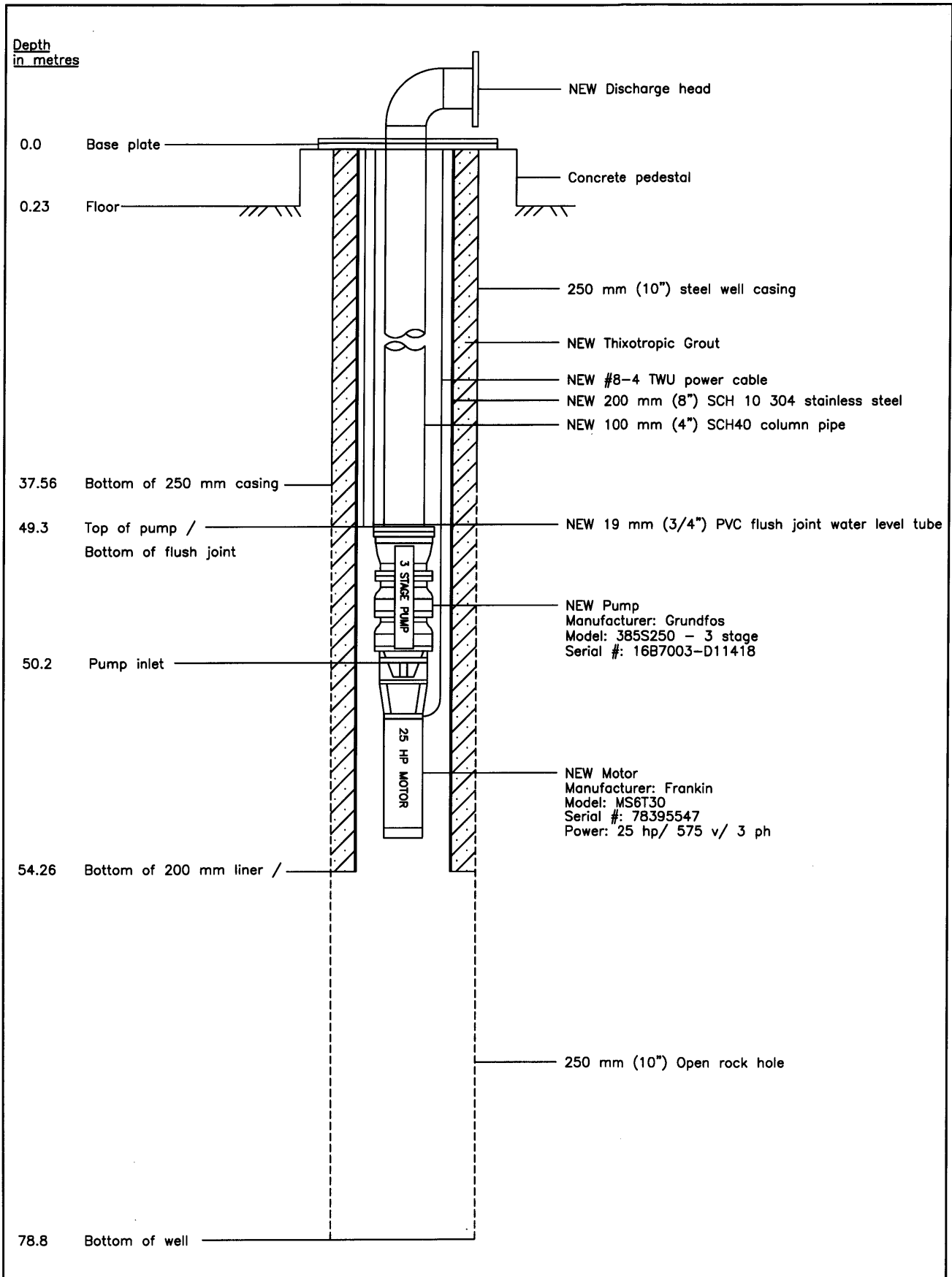
Log of Well for ..... Public Utilities Commission ..... Test No. 2-59  
 Address ..... Preston, Ontario .....  
 Location: County Waterloo, Twp. Waterloo, Con. 2, Lot 5, 650 West of back  
Hespeler Rd., 382' south Puslinch Lake Rd.  
 Date Drilling started March 5, 1959 ..... Date Test Hole Completed April 8, 1959  
 Total depth to bottom of Well 263' ..... Diameter Test Hole 10"  
 Water stands when not pumping 66' ..... feet 2 1/2" ..... inches from the surface of the ground

THICKNESS	FROM	TO	FORMATION FOUND EACH STRATUM	THICKNESS	FROM	TO	FORMATION FOUND EACH STRATUM
1	0	1	Top soil				
2	1	3	Brown clay				
13	3	16	Brown clay, gravel and boulders				
16	16	32	Dirty gravel and boulders				
17	32	49	Sandy clay and gravel				
35	49	84	Sand and sandy clay				
9	84	93	Silty sand				
21	95	116	Fine sand				
4	116	120	Broken brown limestone and sand				
25	120	145	Brown and grey limestone and sand				
30	145	175	Grey and brown limestone				
65	175	240	Brown and grey limestone				
23	240	263	Grey limestone				
			80.16				

Remarks and opinion of Test ..... Pumped 79 hrs. at 358 IGPM, pumping level 88'9",  
 left 121'7" of 10" pipe in hole

D. W. Bauerlein

Driller.



**NOTES**

(1) All measurements below top of base plate which is 0.23 m above pumphouse floor.



**CLIENT**

**Regional Municipality of Waterloo**

**TITLE**

**Well P9  
Pump Installation Drawing**

PROJECT No. <b>006-279</b>			G:\Lotowater Projects\006 Region of Waterloo\279 RMOW Liner Project 2013\Well P9\Proposed Liner.dwg		
DESIGN	BP	2014/04/29	REVISION No. 2014/05/29	SCALE <b>N.T.S.</b>	FIGURE <b>6</b>
DRAWN	EH	2014/04/29			
CHECKED					

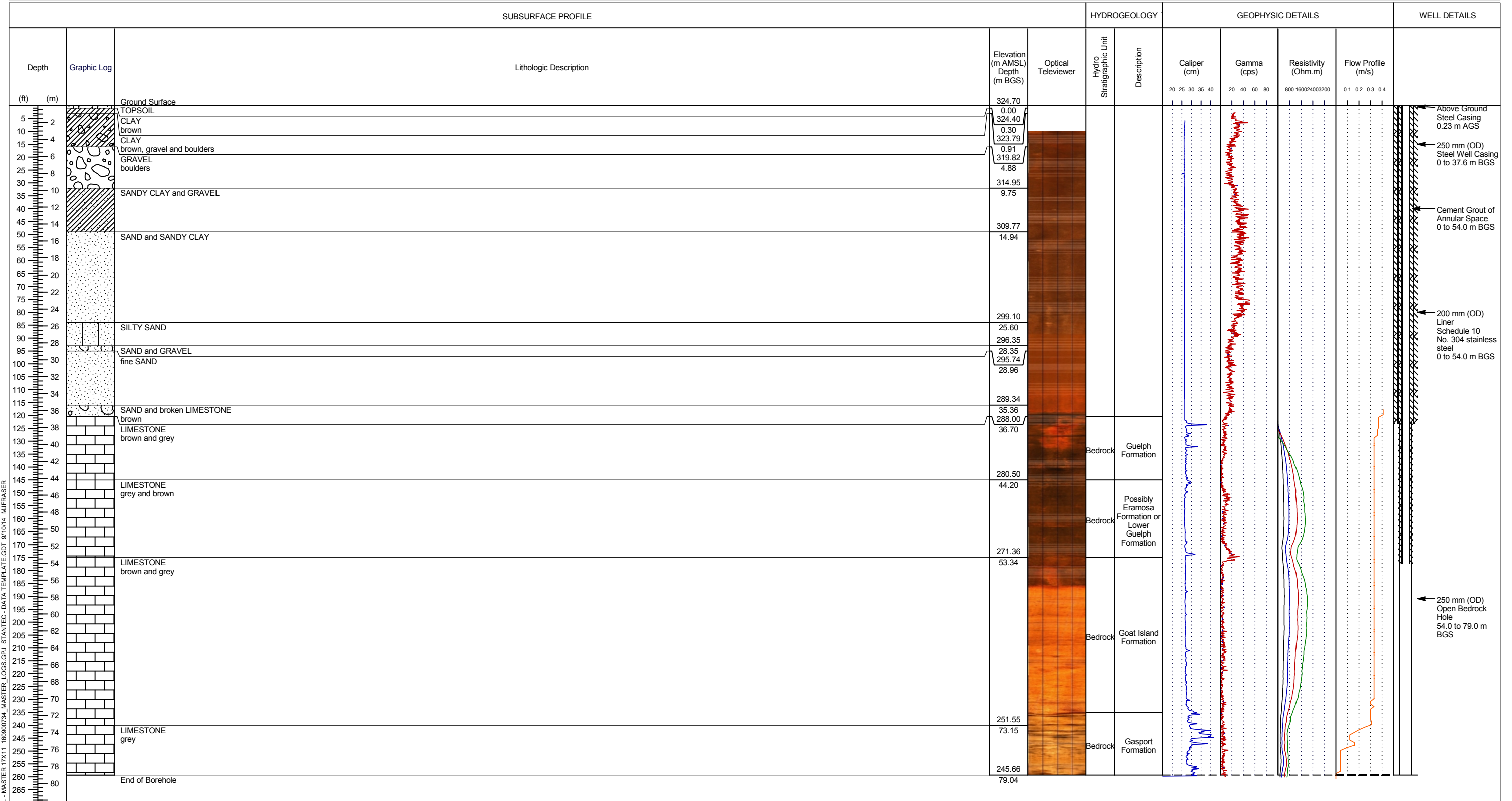
# Production Well: P9

**Project:** 2013 Well Construction and Testing  
**Client:** Regional Municipality of Waterloo  
**Location:** Region of Waterloo; Pinebush Well Field  
**Number:** 1609-00734

**Field Investigator:**  
**Contractor:** International Water Supply Ltd. / Lotwater Technical Services Inc  
**Drilling method:** n/a / Liner Installation  
**Date started/completed:** 05-Mar-1959 / 29-Apr-2014

**Ground surface elevation:** 324.70 m AMSL  
**Top of casing elevation:** 324.93 m AMSL  
**Easting:** 555804  
**Northing:** 4806576

**P9**



Notes:  
 m AMSL - metres above mean sea level  
 m BGS - metres below ground surface  
 m BTOC - metres below top of casing  
 n/a - not available/applicable

Elevation Data and GPS Co-ordinates from WRAS  
 WRAS No. 9207091  
 Stratigraphy from International Water Supply Ltd.  
 well log  
 Flow profile completed at a pumping rate of 20 L/s





P15

Well Material

Outer Casing 107'6" - 10" welded pipe  
 Inner Casing  
 Screen  
 Plug  
 Gravel

Pump

No. Setting BP-MB  
 No. Stages Length Bowl  
 Bowl Size & Lgth. Suction  
 Head Size Column

Materials or setting details other than standard:  
Impellers: Trim

Motor

Make Phase  
 H. P. Cycles  
 R. P. M. Volts  
 Type Amps.  
 Frame Serial  
 Bearing Nos.

Special Equipment

Now P-15

Well No. 4-58

B. P. referred to original ground level.....  
 Clear depth below B. P. ....  
 Started 12/3/58 Final Test  
 Preliminary Test 1/22/59 Static Level 56'3 1/2"  
 Final Test Pumping Level 79'3 1/2"  
 Guarantee I G P M Capacity 358 I G P M  
 Contract Pressure # Pressure Pump #  
 Length Air Line Main #

**OBSERVATION WELL (FERGUSON)**

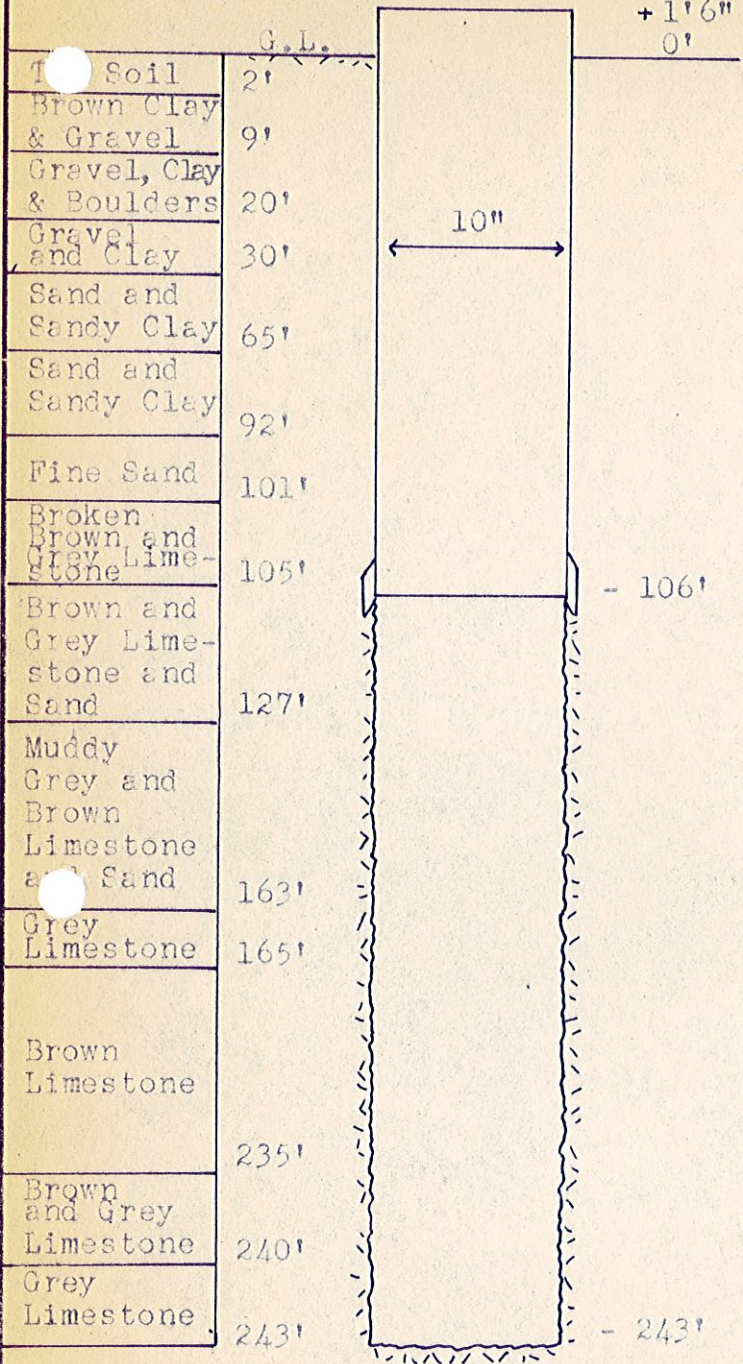
**INTERNATIONAL WATER SUPPLY LTD.**

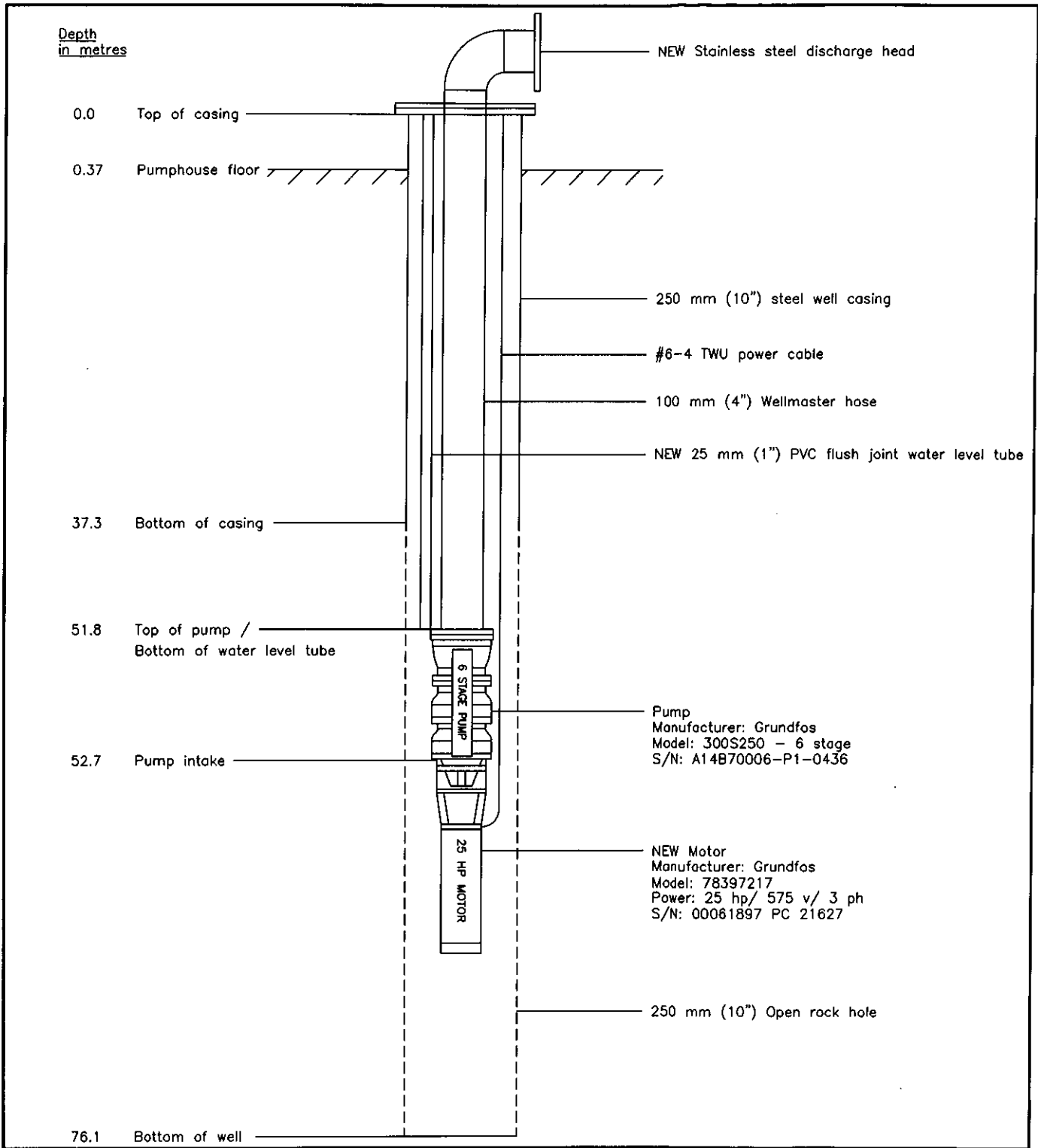
MONTREAL LONDON, CANADA SASKATOON  
 OAKVILLE WATER SUPPLY CONTRACTORS VANCOUVER

**PUBLIC UTILITIES COMMISSION**

PRESTON, ONTARIO

DRILLED BY D. Bauerlein DRAWN BY J.W.  
 INSTALLED BY APPROVED BY





CLIENT  
Regional Municipality of Waterloo

TITLE  
Well P15  
Pump Installation Drawing

PROJECT No. 006-380		G:\Lotowater Projects\006 Region of Waterloo\380 P15 Emergency Service\Pump Install.dwg		FIGURE <b>1</b>
DESIGN		REVISION No.    2016-11-07	SCALE    N.T.S.	
DRAWN	EH    2016-11-07			
CHECKED				

# Test Production Well: C-PB-TW2-13.

**Project:** 2012 Construction and Testing of Municipal Wells  
**Client:** Regional Municipality of Waterloo  
**Location:** Region of Waterloo; Pinebush Road Well Field  
**Number:** 160900679

**Field Investigator:** T. Pawlick  
**Contractor:** Gerrits Well Drilling Inc.  
**Drilling method:** DR24, truckmount, air rotary  
**Date started/completed:** 09-Jan-2013 / 23-May-2013

**Ground surface elevation:** 323.51 m AMSL  
**Top of casing elevation:** 324.20 m AMSL  
**Easting:** 555785  
**Northing:** 4806574

P15A

SUBSURFACE PROFILE				HYDROGEOLOGY		SAMPLE DETAILS		GEOPHYSIC DETAILS				WELL DETAILS		
Depth (ft) (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Optical Televiwer	Hydro Stratigraphic Unit	Description	Sample Number	Sample Type	Caliper (cm)	Gamma (cps)	Resistivity (Ohm.m)	Flow Profile (m/s)		
														20 25 30 35 40
		Ground Surface	323.51											
5		SAND medium grained, brown (7.5YR4/4), well graded, dry	0.00		AFB1	Upper Waterloo Moraine Sediments and Equivalents	1	GB						
10		GRAVEL fine to coarse grained gravel, some medium sand, grey, well graded, damp to wet, sub angular to sub-rounded	3.05				2	GB						
15		GRAVEL fine to coarse grained gravel, some medium sand, grey, well graded, damp to wet, sub angular to sub-rounded	3.05				3	GB						
20		GRAVEL brown (7.5YR5/4) at 6.10 m BGS	3.05				4	GB						
25		SAND fine grained, brown (7.5YR5/4), wet	9.14				5	GB						
30		SANDY SILT fine grained sand, possible trace clay, brown-reddish brown (7.5YR4/4,5/6), wet	12.19				6	GB						
35		SANDY SILT fine grained sand, possible trace clay, brown-reddish brown (7.5YR4/4,5/6), wet	12.19				7	GB						
40		SANDY SILT fine grained sand, possible trace clay, brown-reddish brown (7.5YR4/4,5/6), wet	12.19				8	GB						
45		SANDY SILT fine grained sand, possible trace clay, brown-reddish brown (7.5YR4/4,5/6), wet	12.19				9	GB						
50		reddish brown (7.5YR4/4) at 18.3 m BGS	18.3		ATB3	Lower Maryhill Till and Equivalents	10	GB						
55		reddish brown (7.5YR4/4) at 18.3 m BGS	18.3				11	GB						
60		reddish brown (7.5YR4/4) at 18.3 m BGS	18.3				12	GB						
65		CLAYEY SILT brown (10YR3/6), very wet	21.34		AFD1	Sand and Gravel	13	GB						
70		CLAYEY SILT brown (10YR3/6), very wet	21.34				14	GB						
75		CLAYEY SILT grey (7.5YR5/1), wet at 24.4 m BGS	24.4		Bedrock	Guelph Formation	15	GB						
80		CLAYEY SILT grey (7.5YR5/1), wet at 24.4 m BGS	24.4				16	GB						
85		CLAYEY SILT grey (7.5YR5/1), wet at 24.4 m BGS	24.4				17	GB						
90		SAND fine grained, trace silt, brown, well graded	27.43				18	GB						
95		SAND fine grained, trace silt, brown, well graded	27.43				19	GB						
100		SAND some silt, some coarse grained gravel, greyish brown (10YR5/2), angular to sub angular	27.43				20	GB						
105		SAND some silt, some coarse grained gravel, greyish brown (10YR5/2), angular to sub angular	27.43				21	GB						
110		SAND some silt, some coarse grained gravel, greyish brown (10YR5/2), angular to sub angular	27.43				22	GB						
115		SAND some silt, some coarse grained gravel, greyish brown (10YR5/2), angular to sub angular	27.43				23	GB						
120		SAND some silt, some coarse grained gravel, greyish brown (10YR5/2), angular to sub angular	27.43				24	GB						
125		DOLOSTONE medium to coarse granular cuttings, brown fractures and vugs from 37.2 to 38.2 m BGS large fracture at 39.1 m BGS, vuggy from 39.1 to 45.0 m BGS	36.58		Bedrock	Possibly Eramosa Formation or Lower Guelph Formation	25	GB						
130		DOLOSTONE medium to coarse granular cuttings, brown fractures and vugs from 37.2 to 38.2 m BGS large fracture at 39.1 m BGS, vuggy from 39.1 to 45.0 m BGS	36.58				26	GB						
135		DOLOSTONE medium to coarse granular cuttings, brown fractures and vugs from 37.2 to 38.2 m BGS large fracture at 39.1 m BGS, vuggy from 39.1 to 45.0 m BGS	36.58				27	GB						
140		DOLOSTONE medium to coarse granular cuttings, brown fractures and vugs from 37.2 to 38.2 m BGS large fracture at 39.1 m BGS, vuggy from 39.1 to 45.0 m BGS	36.58				28	GB						
145		DOLOSTONE medium to coarse granular cuttings, brown fractures and vugs from 37.2 to 38.2 m BGS large fracture at 39.1 m BGS, vuggy from 39.1 to 45.0 m BGS	36.58				29	GB						
150		DOLOSTONE possibly some shale, fine to coarse granular and planar cuttings, grey (GLE2.5/1) dark grey at 44.8 m BGS grey (GLE2.5/1) at 45.7 m BGS competent rock from 46.0 to 51.0 m BGS grey (GLE1.5/1) at 47.2 m BGS light grey and brown at 48.8 m BGS blue grey at 51.8 m BGS	44.20		Bedrock	Goat Island Formation	30	GB						
155		DOLOSTONE possibly some shale, fine to coarse granular and planar cuttings, grey (GLE2.5/1) dark grey at 44.8 m BGS grey (GLE2.5/1) at 45.7 m BGS competent rock from 46.0 to 51.0 m BGS grey (GLE1.5/1) at 47.2 m BGS light grey and brown at 48.8 m BGS blue grey at 51.8 m BGS	44.20				31	GB						
160		DOLOSTONE possibly some shale, fine to coarse granular and planar cuttings, grey (GLE2.5/1) dark grey at 44.8 m BGS grey (GLE2.5/1) at 45.7 m BGS competent rock from 46.0 to 51.0 m BGS grey (GLE1.5/1) at 47.2 m BGS light grey and brown at 48.8 m BGS blue grey at 51.8 m BGS	44.20				32	GB						
165		DOLOSTONE possibly some shale, fine to coarse granular and planar cuttings, grey (GLE2.5/1) dark grey at 44.8 m BGS grey (GLE2.5/1) at 45.7 m BGS competent rock from 46.0 to 51.0 m BGS grey (GLE1.5/1) at 47.2 m BGS light grey and brown at 48.8 m BGS blue grey at 51.8 m BGS	44.20				33	GB						
170		DOLOSTONE possibly some shale, fine to coarse granular and planar cuttings, grey (GLE2.5/1) dark grey at 44.8 m BGS grey (GLE2.5/1) at 45.7 m BGS competent rock from 46.0 to 51.0 m BGS grey (GLE1.5/1) at 47.2 m BGS light grey and brown at 48.8 m BGS blue grey at 51.8 m BGS	44.20				34	GB						
175		DOLOSTONE possibly some shale, fine to coarse granular and planar cuttings, grey (GLE2.5/1) dark grey at 44.8 m BGS grey (GLE2.5/1) at 45.7 m BGS competent rock from 46.0 to 51.0 m BGS grey (GLE1.5/1) at 47.2 m BGS light grey and brown at 48.8 m BGS blue grey at 51.8 m BGS	44.20				35	GB						
180		DOLOSTONE possibly some shale, fine to coarse granular and planar cuttings, grey (GLE2.5/1) dark grey at 44.8 m BGS grey (GLE2.5/1) at 45.7 m BGS competent rock from 46.0 to 51.0 m BGS grey (GLE1.5/1) at 47.2 m BGS light grey and brown at 48.8 m BGS blue grey at 51.8 m BGS	44.20				36	GB						
185		DOLOSTONE possibly some shale, fine to coarse granular and planar cuttings, grey (GLE2.5/1) dark grey at 44.8 m BGS grey (GLE2.5/1) at 45.7 m BGS competent rock from 46.0 to 51.0 m BGS grey (GLE1.5/1) at 47.2 m BGS light grey and brown at 48.8 m BGS blue grey at 51.8 m BGS	44.20				37	GB						
190		DOLOSTONE possibly some shale, fine to coarse granular and planar cuttings, grey (GLE2.5/1) dark grey at 44.8 m BGS grey (GLE2.5/1) at 45.7 m BGS competent rock from 46.0 to 51.0 m BGS grey (GLE1.5/1) at 47.2 m BGS light grey and brown at 48.8 m BGS blue grey at 51.8 m BGS	44.20				38	GB						
195		DOLOSTONE possibly some shale, fine to coarse granular and planar cuttings, grey (GLE2.5/1) dark grey at 44.8 m BGS grey (GLE2.5/1) at 45.7 m BGS competent rock from 46.0 to 51.0 m BGS grey (GLE1.5/1) at 47.2 m BGS light grey and brown at 48.8 m BGS blue grey at 51.8 m BGS	44.20				39	GB						
200		DOLOSTONE possibly some shale, fine to coarse granular and planar cuttings, grey (GLE2.5/1) dark grey at 44.8 m BGS grey (GLE2.5/1) at 45.7 m BGS competent rock from 46.0 to 51.0 m BGS grey (GLE1.5/1) at 47.2 m BGS light grey and brown at 48.8 m BGS blue grey at 51.8 m BGS	44.20		40	GB								
205		DOLOSTONE possibly some shale, fine to coarse granular and planar cuttings, grey (GLE2.5/1) dark grey at 44.8 m BGS grey (GLE2.5/1) at 45.7 m BGS competent rock from 46.0 to 51.0 m BGS grey (GLE1.5/1) at 47.2 m BGS light grey and brown at 48.8 m BGS blue grey at 51.8 m BGS	44.20		41	GB								
210		DOLOSTONE possibly some shale, fine to coarse granular and planar cuttings, grey (GLE2.5/1) dark grey at 44.8 m BGS grey (GLE2.5/1) at 45.7 m BGS competent rock from 46.0 to 51.0 m BGS grey (GLE1.5/1) at 47.2 m BGS light grey and brown at 48.8 m BGS blue grey at 51.8 m BGS	44.20		42	GB								
215		DOLOSTONE possibly some shale, fine to coarse granular and planar cuttings, grey (GLE2.5/1) dark grey at 44.8 m BGS grey (GLE2.5/1) at 45.7 m BGS competent rock from 46.0 to 51.0 m BGS grey (GLE1.5/1) at 47.2 m BGS light grey and brown at 48.8 m BGS blue grey at 51.8 m BGS	44.20		43	GB								
220		DOLOSTONE possibly some shale, fine to coarse granular and planar cuttings, grey (GLE2.5/1) dark grey at 44.8 m BGS grey (GLE2.5/1) at 45.7 m BGS competent rock from 46.0 to 51.0 m BGS grey (GLE1.5/1) at 47.2 m BGS light grey and brown at 48.8 m BGS blue grey at 51.8 m BGS	44.20		44	GB								
225		DOLOSTONE possibly some shale, fine to coarse granular and planar cuttings, grey (GLE2.5/1) dark grey at 44.8 m BGS grey (GLE2.5/1) at 45.7 m BGS competent rock from 46.0 to 51.0 m BGS grey (GLE1.5/1) at 47.2 m BGS light grey and brown at 48.8 m BGS blue grey at 51.8 m BGS	44.20		45	GB								
230		DOLOSTONE possibly some shale, fine to coarse granular and planar cuttings, grey (GLE2.5/1) dark grey at 44.8 m BGS grey (GLE2.5/1) at 45.7 m BGS competent rock from 46.0 to 51.0 m BGS grey (GLE1.5/1) at 47.2 m BGS light grey and brown at 48.8 m BGS blue grey at 51.8 m BGS	44.20		46	GB								
235		DOLOSTONE possibly some shale, fine to coarse granular and planar cuttings, grey (GLE2.5/1) dark grey at 44.8 m BGS grey (GLE2.5/1) at 45.7 m BGS competent rock from 46.0 to 51.0 m BGS grey (GLE1.5/1) at 47.2 m BGS light grey and brown at 48.8 m BGS blue grey at 51.8 m BGS	44.20		47	GB								
240		DOLOSTONE possibly some shale, fine to coarse granular and planar cuttings, grey (GLE2.5/1) dark grey at 44.8 m BGS grey (GLE2.5/1) at 45.7 m BGS competent rock from 46.0 to 51.0 m BGS grey (GLE1.5/1) at 47.2 m BGS light grey and brown at 48.8 m BGS blue grey at 51.8 m BGS	44.20		48	GB								
245		DOLOSTONE possibly some shale, fine to coarse granular and planar cuttings, grey (GLE2.5/1) dark grey at 44.8 m BGS grey (GLE2.5/1) at 45.7 m BGS competent rock from 46.0 to 51.0 m BGS grey (GLE1.5/1) at 47.2 m BGS light grey and brown at 48.8 m BGS blue grey at 51.8 m BGS	44.20		49	GB								
250		DOLOSTONE possibly some shale, fine to coarse granular and planar cuttings, grey (GLE2.5/1) dark grey at 44.8 m BGS grey (GLE2.5/1) at 45.7 m BGS competent rock from 46.0 to 51.0 m BGS grey (GLE1.5/1) at 47.2 m BGS light grey and brown at 48.8 m BGS blue grey at 51.8 m BGS	44.20		50	GB								
255		DOLOSTONE possibly some shale, fine to coarse granular and planar cuttings, grey (GLE2.5/1) dark grey at 44.8 m BGS grey (GLE2.5/1) at 45.7 m BGS competent rock from 46.0 to 51.0 m BGS grey (GLE1.5/1) at 47.2 m BGS light grey and brown at 48.8 m BGS blue grey at 51.8 m BGS	44.20											
260		DOLOSTONE possibly some shale, fine to coarse granular and planar cuttings, grey (GLE2.5/1) dark grey at 44.8 m BGS grey (GLE2.5/1) at 45.7 m BGS competent rock from 46.0 to 51.0 m BGS grey (GLE1.5/1) at 47.2 m BGS light grey and brown at 48.8 m BGS blue grey at 51.8 m BGS	44.20											
265		DOLOSTONE possibly some shale, fine to coarse granular and planar cuttings, grey (GLE2.5/1) dark grey at 44.8 m BGS grey (GLE2.5/1) at 45.7 m BGS competent rock from 46.0 to 51.0 m BGS grey (GLE1.5/1) at 47.2 m BGS light grey and brown at 48.8 m BGS blue grey at 51.8 m BGS	44.20											
270		DOLOSTONE possibly some shale, fine to coarse granular and planar cuttings, grey (GLE2.5/1) dark grey at 44.8 m BGS grey (GLE2.5/1) at 45.7 m BGS competent rock from 46.0 to 51.0 m BGS grey (GLE1.5/1) at 47.2 m BGS light grey and brown at 48.8 m BGS blue grey at 51.8 m BGS	44.20											
275		DOLOSTONE possibly some shale, fine to coarse granular and planar cuttings, grey (GLE2.5/1) dark grey at 44.8 m BGS grey (GLE2.5/1) at 45.7 m BGS competent rock from 46.0 to 51.0 m BGS grey (GLE1.5/1) at 47.2 m BGS light grey and brown at 48.8 m BGS blue grey at 51.8 m BGS	44.20											
280		DOLOSTONE possibly some shale, fine to coarse granular and planar cuttings, grey (GLE2.5/1) dark grey at 44.8 m BGS grey (GLE2.5/1) at 45.7 m BGS competent rock from 46.0 to 51.0 m BGS grey (GLE1.5/1) at 47.2 m BGS light grey and brown at 48.8 m BGS blue grey at 51.8 m BGS	44.20											
285		DOLOSTONE possibly some shale, fine to coarse granular and planar cuttings, grey (GLE2.5/1) dark grey at 44.8 m BGS grey (GLE2.5/1) at 45.7 m BGS competent rock from 46.0 to 51.0 m BGS grey (GLE1.5/1) at 47.2 m BGS light grey and brown at 48.8 m BGS blue grey at 51.8 m BGS	44.20											
290		DOLOSTONE possibly some shale, fine to coarse granular and planar cuttings, grey (GLE2.5/1) dark grey at 44.8 m BGS grey (GLE2.5/1) at 45.7 m BGS competent rock from 46.0 to 51.0 m BGS grey (GLE1.5/1) at 47.2 m BGS light grey and brown at 48.8 m BGS blue grey at 51.8 m BGS	44.20											
295		DOLOSTONE possibly some shale, fine to coarse granular and planar cuttings, grey (GLE2.5/1) dark grey at 44.8 m BGS grey (GLE2.5/1) at 45.7 m BGS competent rock from 46.0 to 51.0 m BGS grey (GLE1.5/1) at 47.2 m BGS light grey and brown at 48.8 m BGS blue grey at 51.8 m BGS	44.20											

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STANTEC BOREHOLE AND WELL - MASTER TX11 - 160900679 - LOGS.GPJ - STANTEC - DATA TEMPLATE.GDT 9/11/14 M.FRASER

Notes:  
 m AMSL - metres above mean sea level  
 m BGS - metres below ground surface  
 m BTOC - metres below top of casing  
 GB - grab sample  
 n/a - not available/applicable

WRAS Object Number 9207050  
 Flow profile completed at a pumping rate of 4.73 L/s  
 Note caliper log was completed on pilot hole Test Well TW2-13 and is presented on the log for the purpose of identifying fractures.



# Test Production Well: C-PB-TW2-13.

**Project:** 2012 Construction and Testing of Municipal Wells  
**Client:** Regional Municipality of Waterloo  
**Location:** Region of Waterloo; Pinebush Road Well Field  
**Number:** 160900679

**Field Investigator:** T. Pawlick  
**Contractor:** Gerrits Well Drilling Inc.  
**Drilling method:** DR24, truckmount, air rotary  
**Date started/completed:** 09-Jan-2013 / 23-May-2013

**Ground surface elevation:** 323.51 m AMSL  
**Top of casing elevation:** 324.20 m AMSL  
**Easting:** 555785  
**Northing:** 4806574

SUBSURFACE PROFILE				HYDROGEOLOGY		SAMPLE DETAILS		GEOPHYSIC DETAILS				WELL DETAILS			
Depth (ft) (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Optical Televiewer	Hydro Stratigraphic Unit	Description	Sample Number	Sample Type	Caliper (cm)		Gamma (cps)	Resistivity (Ohm.m)	Flow Profile (m/s)		
									20 25 30 35 40	20 40 60 80					800 1600 2400 3200
305		DOLOSTONE medium to coarse granular cuttings, dark blue grey, competent			Bedrock	Gasport Formation	51	GB							
310															
315															
320															
325															
330															
335															
340															
345															
350															
355															
360															
365															
370															
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425															
430															
435															
440															
445															
450															
455															
460															
465															
470															
475															
480		DOLOSTONE light grey	177.20				86	GB							
485			146.30				87	GB							
490		DOLOSTONE with shale partings greenish grey	174.46		Bedrock	Lower Gasport Hydro Unit (GSB)	88	GB							
495			149.05					89	GB						
500		DOLOSTONE pinkish brown	171.41				90	GB							
505			152.10		Bedrock	Cabot Head Formation	91	GB							
510		SHALE green	170.50					92	GB						
515		End of Borehole	153.01												
520			168.98												
525			154.53												
530															
535															
540															
545															
550															
555															
560															
565															
570															
575															
580															
585															
590															
595															

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← 152 mm diameter open borehole 80.7 to 135.0 m

← Cement grout 135.0 to 154.5 m

Notes:  
 m AMSL - metres above mean sea level  
 m BGS - metres below ground surface  
 m BTOC - metres below top of casing  
 GB - grab sample  
 n/a - not available/applicable

WRAS Object Number 9207050  
 Flow profile completed at a pumping rate of 4.73 L/s  
 Note caliper log was completed on pilot hole Test Well TW2-13 and is presented on the log for the purpose of identifying fractures.



STANTEC BOREHOLE AND WELL - MASTER TX11 - 160900679 - LOGS.GPJ - STANTEC - DATA TEMPLATE.GDT 9/11/14 M.FRASER

# Monitoring Well: C-PB-OW1-13

C-PB-OW1-13-(A-B-C)

**Project:** 2012 Construction and Testing of Municipal Wells  
**Client:** Regional Municipality of Waterloo  
**Location:** Region of Waterloo; Pinebush Road Well Field  
**Number:** 160900679

**Field Investigator:** T. Pawlick  
**Contractor:** Gerrits Well Drilling Inc.  
**Drilling method:** DR24, truckmount, air rotary  
**Date started/completed:** 09-Jan-2013 / 23-May-2013

**Ground surface elevation:** 322.23 m AMSL  
**Top of casing elevation:** n/a  
**Easting:** 555793  
**Northing:** 4806616

SUBSURFACE PROFILE				HYDROGEOLOGY		SAMPLE DETAILS		WELL DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m AMSL)	Hydro Stratigraphic Unit	Description	Sample Number	Sample Type	
0	0		Ground Surface	323.14					
0	0		SAND and GRAVEL coarsening with depth from sand to fine grained gravel, brown (7.5YR5/4), rounded to angular wet at	322.23			1	GB	← Above Ground Casing Stick-Up = 0.91 m
5	2			0.00			2	GB	
10	4						3	GB	
15	6						4	GB	
20	8						5	GB	
25	10			313.39	AFB1	Upper Waterloo Moraine Sediments and Equivalents	6	GB	
30	12		SAND fine to medium grained, little coarse gravel, trace silt, brown, poorly graded, wet, subrounded yellowish red (5YR5/6) at 12.2 m BGS	8.84			7	GB	
35	14						8	GB	
40	16						9	GB	
45	18		SILTY SAND fine grained, reddish brown (5YR5/8), wet very wet between 15.2 and 21.3 m BGS reddish brown (5YR4/4) at 18.3 m BGS	15.24			10	GB	
50	20						11	GB	
55	22		dark brown (7.5YR4/6) at 21.3 m BGS	299.98	ATB3	Lower Maryhill Till and Equivalents	12	GB	
60	24		SILTY CLAY brown, wet reddish brown (7.5YR4/4) at 24.4 m BGS	22.25			13	GB	
65	26			294.80			14	GB	
70	28		SILTY SAND fine grained, brown (7.5YR4/4), wet some gravel, light grey (7.5YR7/1) at 30.5 m BGS	27.43	AFD1	Sand and Gravel	15	GB	← Bentonite Grout 0 to 54.8 m
75	30						16	GB	
80	32			288.70	Bedrock	Guelph Formation	17	GB	
85	34		DOLOSTONE medium to coarse granular cuttings, light brown large fracture from 33.9 to 35.3 m BGS fracture zone from 36.1 to 36.6 m BGS dark brown from 36.6 to 38.1 m BGS competent porous rock from 38.0 to 49.5 m BGS and vugs from 38.0 to 44.5 m BGS increase in water content during drilling at 38.1 m BGS	33.53			18	GB	
90	36						19	GB	
95	38		DOLOSTONE possibly some shale, coarse granular and planar cuttings cuttings, brown	41.15	Bedrock	Possibly Eramosa Formation of Lower Guelph Formation	20	GB	
100	40						21	GB	
105	42						22	GB	
110	44		vuggy with ring features from 49.5 to 51.0 m BGS	271.67	Bedrock	Goat Island Formation	23	GB	
115	46						24	GB	
120	48		DOLOSTONE fine to medium granular cuttings, light grey, competent increased planer cuttings, medium to coarse granular cuttings, dark grey from 51.8 to 53.3 m BGS fracture at 51.9 m BGS vuggy from 53.0 to 53.5 m BGS large fracture at 54.1 m BGS fractures with some cavern and ring features from 54.1 to 55.0 m BGS competent rock from 55.5 to 59.8 m BGS vuggy from 59.8 to 63.8 m BGS	50.56			25	GB	
125	50						26	GB	
130	52						27	GB	
135	54						28	GB	← Sand/Gravel 54.8 to 56.7 m
140	56						29	GB	
145	58						30	GB	
150	60						31	GB	
155	62						32	GB	
160	64						33	GB	
165	66						34	GB	
170	68		large fracture (0.25 cm) and becoming vuggy at 67.6 m BGS	253.65	Bedrock	Gasport Formation	35	GB	← Bentonite Grout and/or Chips 56.7 to 74.1 m
175	70		DOLOSTONE medium to coarse granular cuttings, dark blue grey, high water pressure during drilling	68.58			36	GB	
180	72		large vug or cavern at 72.1 m BGS				37	GB	
185	74						38	GB	
190	76		large fracture or cavern at 74.2 m BGS				39	GB	
195	78						40	GB	← Sand and/or Gravel 74.1 to 79.1 m
200	80		fractured from 77.0 to 77.3 m BGS competent rock from 77.3 to 82.3 m BGS fine to medium granular cuttings, light blue grey from 77.7 to 86.9 m BGS				41	GB	
205	82						42	GB	
210	84		fractures with staining from 82.3 to 82.5 m BGS				43	GB	
215	86						44	GB	
220	88						45	GB	
225	90		lost drilling returns at 86.9 m BGS				46	GB	
230	92						47	GB	
235	94						48	GB	
240	96						49	GB	

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STANTEC BOREHOLE AND WELL - MASTER TX11 - 160900679 LOGS.GPJ STANTEC - DATA TEMPLATE.GDT 9/11/14 M.FRASER

Screen Interval: 75.59 - 78.64; 108.20 - 110.49; 120.40 - 123.44 m BGS  
 Sand Pack Interval: 123.44 - 124.36; 123.44 - 124.36; 119.48 - 124.36 m BGS  
 Well Seal Interval: 56.69 - 74.07; 79.10 - 106.50; 112.78 - 119.48 m BGS

Notes:  
 m AMSL - metres above mean sea level  
 m BGS - metres below ground surface  
 m BTOC - metres below top of casing  
 GB - grab sample

WRAS Object Number 9207051

Top of Casing Elevations:  
 A - 323.951  
 B - 323.945  
 C - 323.957

n/a - not available/applicable

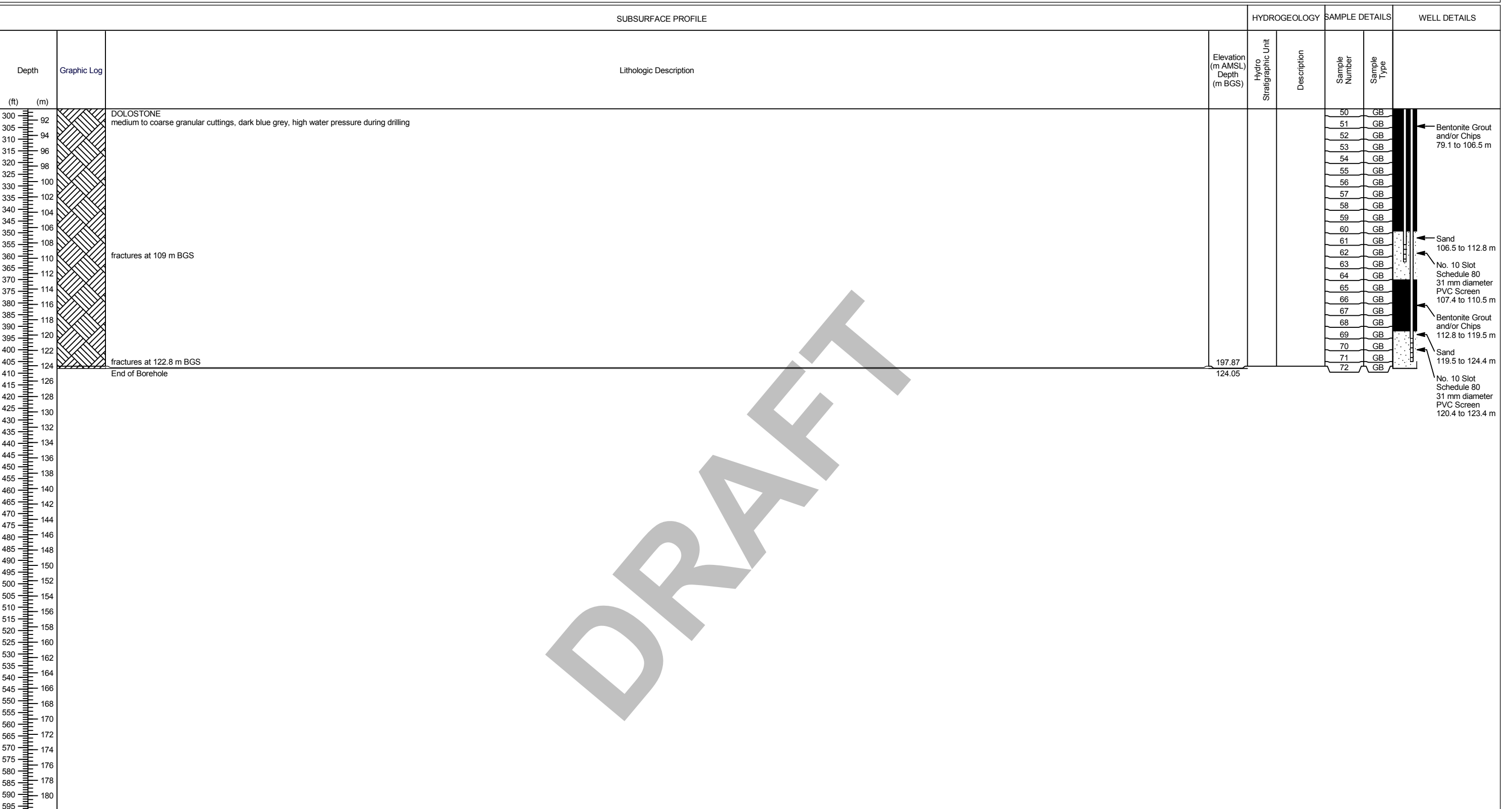


# Monitoring Well: C-PB-OW1-13

**Project:** 2012 Construction and Testing of Municipal Wells  
**Client:** Regional Municipality of Waterloo  
**Location:** Region of Waterloo; Pinebush Road Well Field  
**Number:** 160900679

**Field Investigator:** T. Pawlick  
**Contractor:** Gerrits Well Drilling Inc.  
**Drilling method:** DR24, truckmount, air rotary  
**Date started/completed:** 09-Jan-2013 / 23-May-2013

**Ground surface elevation:** 322.23 m AMSL  
**Top of casing elevation:** n/a  
**Easting:** 555793  
**Northing:** 4806616



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STANTEC BOREHOLE AND WELL - MASTER TX11 - 160900679 LOGS.GPJ STANTEC - DATA TEMPLATE.GDT 9/11/14 M.FRASER

Screen Interval: 75.59 - 78.64; 108.20 - 110.49; 120.40 - 123.44 m BGS  
 Sand Pack Interval: 123.44 - 124.36; 123.44 - 124.36; 119.48 - 124.36 m BGS  
 Well Seal Interval: 56.69 - 74.07; 79.10 - 106.50; 112.78 - 119.48 m BGS

Notes:  
 m AMSL - metres above mean sea level  
 m BGS - metres below ground surface  
 m BTOC - metres below top of casing  
 GB - grab sample

WRAS Object Number 9207051

Top of Casing Elevations:  
 A - 323.951  
 B - 323.945  
 C - 323.957

n/a - not available/applicable





## Notice of Collection of Personal Information

Personal information contained on this form is collected pursuant to sections 35-50 and 75(2) of the *Ontario Water Resources Act* and section 16.3 of the Wells Regulation. This information will be used for the purpose of maintaining a public record of wells in Ontario. This form and the information contained on the form will be stored in the Ministry's well record database and made publicly available. Questions about this collection should be directed to the Water Well Customer Service Representative at the Wells Help Desk, 125 Resources Road, Toronto Ontario M9P 3V6, at 1-888-396-9355 or [wellshelpdesk@ontario.ca](mailto:wellshelpdesk@ontario.ca).

Fields marked with an asterisk (\*) are mandatory.

Well Tag Number \*

[No Tag on Well](#)

### Type \*

 Construction     Abandonment

### Measurement recorded in: \*

 Metric     Imperial

## 1. Well Owner's Information

Last Name and First Name, or Organization is mandatory. \*

Last Name	First Name
Organization <a href="#">The Regional Municipality of Waterloo</a>	Email Address

### Current Address

Unit Number	Street Number * 150	Street Name * <a href="#">Frederick Street</a>	City/Town/Village <a href="#">Kitchener</a>
Country <a href="#">Canada</a>	Province <a href="#">Ontario</a>	Postal Code <a href="#">N2G 4J3</a>	Telephone Number <a href="#">519-575-4400</a>

## 2. Well Location

### Address of Well Location

Unit Number	Street Number * 181	Street Name * <a href="#">Pinebush Road</a>	Township <a href="#">Dumfries</a>
Lot	Concession	County/District/Municipality <a href="#">Waterloo</a>	
City/Town <a href="#">Cambridge</a>	Province <a href="#">Ontario</a>	Postal Code <a href="#">N1R 7H8</a>	
UTM Coordinates	Zone * 17	Easting * 555748	Northing * 4806630
NAD 83			<a href="#">Test UTM in Map</a>
Municipal Plan and Sublot Number			

Other

## 3. Abandonment and Sealing

 Well Depth                      [263](#)                      (ft)

Provide information of well (e.g. construction date, original contractor). **Do not** enter private information  
[Original construction date April 8, 1959. Original contractor International Water Supply Ltd..](#)

Original Owner  
Original owner unknown

General Description	Depth From (ft)	Depth To (ft)
Drilled to 7' with 24' casing Drilled to 62' with 16" casing Cut casing 10" at 60' and pulled casing	0	62

#### 4. Annular Space

Depth From (ft)	Depth To (ft)	Type of Sealant Used (Material and Type)	Volume Placed (cubic feet)
0	4	Concrete	2.2
4	122	Cement Bent. Grout	64.9
122	128	Bent. Chips	3.3
128	263	Gravel	74.25

#### 5. Method of Construction

- Cable Tool     Rotary (Conventional)     Rotary (Reverse)     Boring     Air percussion     Diamond  
 Jetting     Driving     Digging     Rotary (Air)     Augering     Direct Push  
 Other (specify) \_\_\_\_\_

#### 6. Well Use

- Public     Industrial     Cooling & Air Conditioning  
 Domestic     Commercial     Not Used  
 Livestock     Municipal     Monitoring  
 Irrigation     Test Hole     Dewatering  
 Other (specify) \_\_\_\_\_

#### 7. Status of Well

- Water Supply     Replacement Well     Test Hole  
 Recharge Well     Dewatering Well     Observation and/or Monitoring Hole  
 Alteration (Construction)     Abandoned, Insufficient Supply     Abandoned, Poor Water Quality  
 Abandoned, other (specify) no longer in use  
 Other (specify) \_\_\_\_\_

#### 8. Construction Record - Casing (use negative number(s) to indicate depth above ground surface)

Inside Diameter (in)	Open Hole or Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness	Depth From (ft)	Depth To (ft)

### 9. Construction Record - Screen

Outside Diameter (in)	Material (Plastic, Galvanized, Steel)	Slot Number	Depth From (ft)	Depth To (ft)

### 10. Water Details

Water found at Depth (ft)  Gas Kind of water  Fresh  Untested  Other

### 11. Hole Diameter

Depth From (ft)	Depth To (ft)	Diameter (in)
0	263	10

### 12. Results of Well Yield Testing

Pumping Discontinued

Explain \_\_\_\_\_

If flowing give rate

Flowing \_\_\_\_\_ (GPM)

Draw down

Time (min)	Static Level	1	2	3	4	5	10	15	20	25	30	40	50	60
Water Level (ft)														

Recovery

Time (min)	1	2	3	4	5	10	15	20	25	30	40	50	60
Water Level (ft)													

After test of well yield, water was

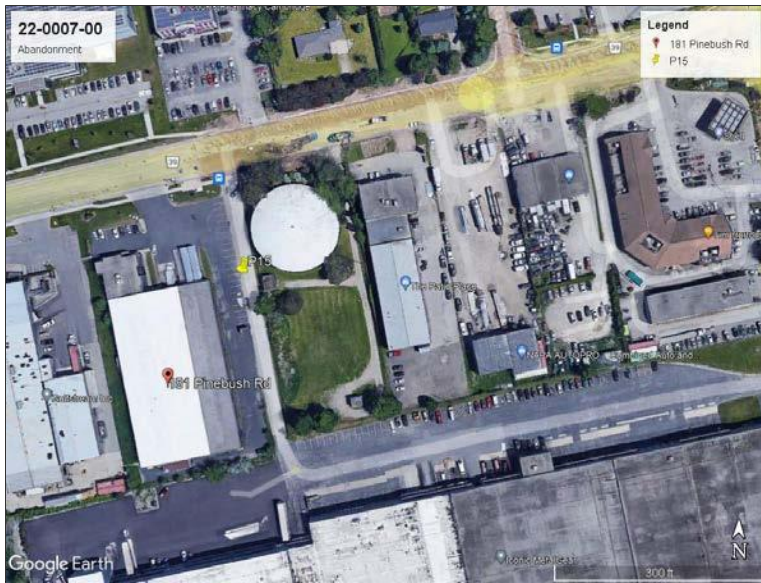
Clear and sand free  Other (specify)

Pump intake set at (ft)	Pumping rate (GPM)	Duration of pumping hrs + min	Final water level end of pumping (ft)	Disinfected? <input type="checkbox"/> Yes <input type="checkbox"/> No

Recommended pump depth (ft)	Recommended pump rate (GPM)	Well production (GPM)

### 13. Map of Well Location \*

Map 1. Please Click the map area below to import an image file to use as the map.  Make map area bigger



#### 14. Information

Well owner's information package delivered <input type="checkbox"/> Yes <input type="checkbox"/> No	Date Package Delivered (yyyy/mm/dd)	Date Work Completed (yyyy/mm/dd) *
		2022/02/15

Comments

#### 15. Well Contractor and Well Technician Information

Business Name of Well Contractor *	Well Contractor's License Number *
Aardvark Drilling Inc.	7675

##### Business Address

Unit Number	Street Number	Street Name *
C	25	Lewis Road
City/Town/Village *	Province	Postal Code *
Guelph	ON	N1H 1E9

Business Telephone Number	Business Email Address
519-826-9340	info@aardvarkdrillinginc.com

Last Name of Well Technician *	First Name of Well Technician *	Well Technician's License Number *
Richards	Adrian	2554

#### 16. Declaration \*

I hereby confirm that I am the person who constructed the well and I hereby confirm that the information on the form is correct and accurate.

Last Name	First Name	Email Address
England	Matthew	mengland@aardvarkdrillinginc.com

Signature	Date Submitted (yyyy/mm/dd)
Matt England Digitally signed by Matt England Date: 2022.03.01 13:27:09 -05'00'	2022/03/01

#### 17. Ministry Use Only

Audit Number  
QVYR JIJ8



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## **Appendix C**

### **Monitoring Data (Pumped Volumes and Hydrographs)**



TABLE C-1  
WELL FIELD WATER PRODUCTION SUMMARY  
REGION OF WATERLOO - 2025 GROUNDWATER MONITORING REPORT

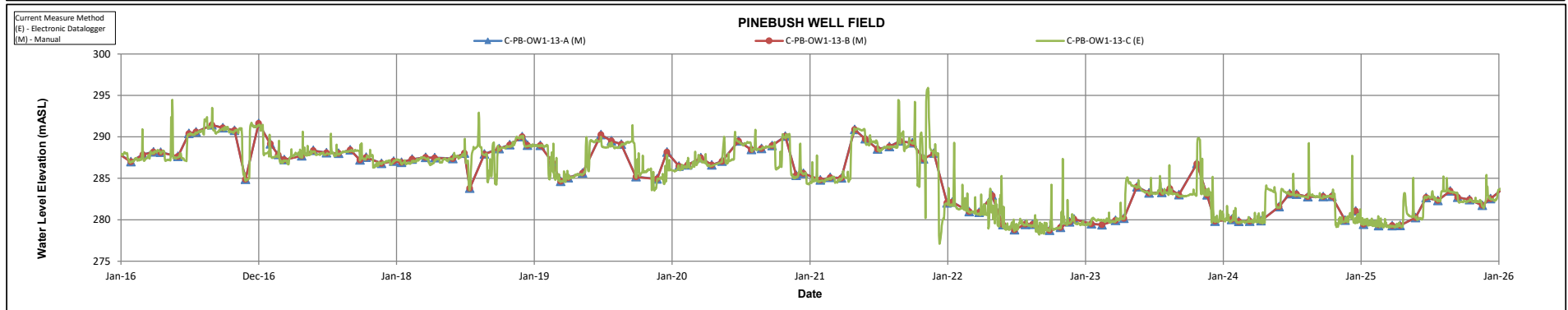
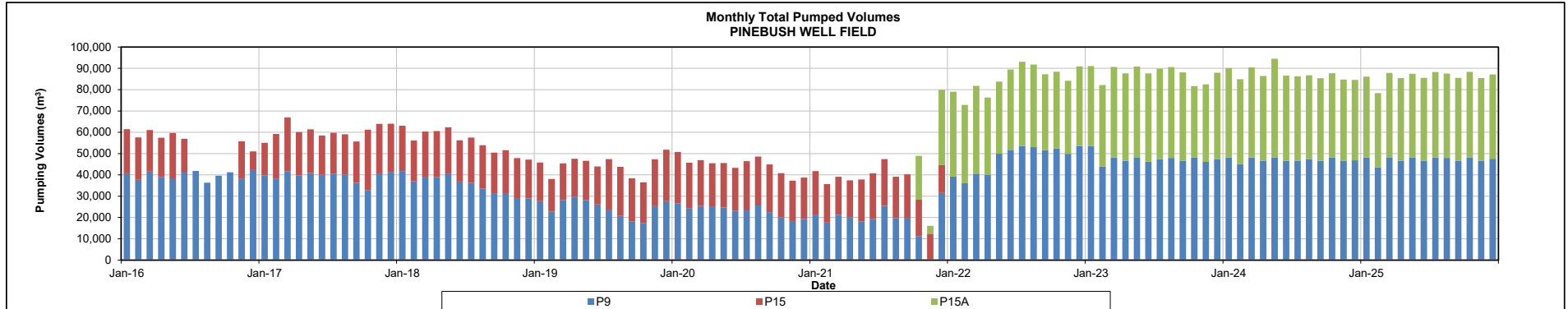
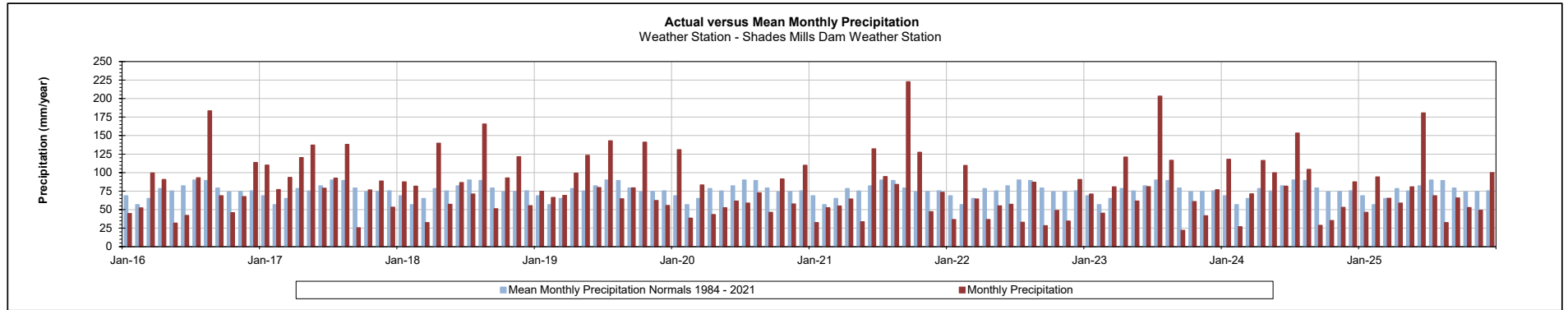


Well Field	Major or Minor Supply	Production Well Name	Status	Permit to Take Water Details			2021 Production Summary			2022 Production Summary			2023 Production Summary			2024 Production Summary			2025 Production Summary					
				MOE Permit Number <sup>1</sup>	Permitted Capacity (total m <sup>3</sup> /year)*	Permitted Rate (L/s)*	Total Production Well Volume (total m <sup>3</sup> /year)	Average Daily Rate (m <sup>3</sup> /day)	Average Rate (L/s)	Total Production Well Volume (total m <sup>3</sup> /year)	Average Daily Rate (m <sup>3</sup> /day)	Average Rate (L/s)	Total Production Well Volume (total m <sup>3</sup> /year)	Average Daily Rate (m <sup>3</sup> /day)	Average Rate (L/s)	Total Production Well Volume (total m <sup>3</sup> /year)	Average Daily Rate (m <sup>3</sup> /day)	Average Rate (L/s)	Total Production Well Volume (total m <sup>3</sup> /year)	Average Daily Rate (m <sup>3</sup> /day)	Average Rate (L/s)			
Pinebush	Major	P9 P15 P15A	Supply Supply Supply <b>Well Field Total</b>	7600-A27N5B	Combined Rate for 7600-A27N5B 1,324,512 <b>1,324,512</b>		225,794	619	7	571,960	1,567	18	570,199	1,562	18	565,372	1,549	18	566,309	1,552	18			
				7600-A27N5B			219,197	601	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
				7600-A27N5B			59,542	0	0	446,783	0	0	480,489	1,316	15	483,061	1,323	15	483,061	1,323	15	466,729	1,279	15
							<b>504,533</b>	<b>1,382</b>	<b>16</b>	<b>1,018,743</b>	<b>2,791</b>	<b>32</b>	<b>1,050,688</b>	<b>2,879</b>	<b>33</b>	<b>1,048,433</b>	<b>2,872</b>	<b>33</b>	<b>1,033,038</b>	<b>2,830</b>	<b>33</b>			

\* Maximum taken per day from all wells shall not exceed annual daily average of 3,628,800 L/day

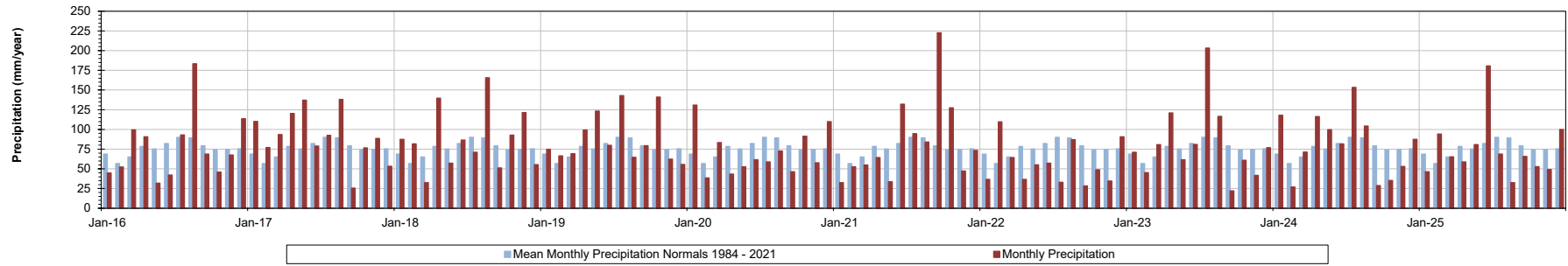
Notes:  
 -- = no applicable data  
 n/a = data not available  
 \* = rates and volumes based on permitted L/day  
<sup>1</sup> = Current Permit

REGION OF WATERLOO  
 2025 GROUNDWATER MONITORING REPORT -  
 PINEBUSH P9/P15/P15A WELL FIELD

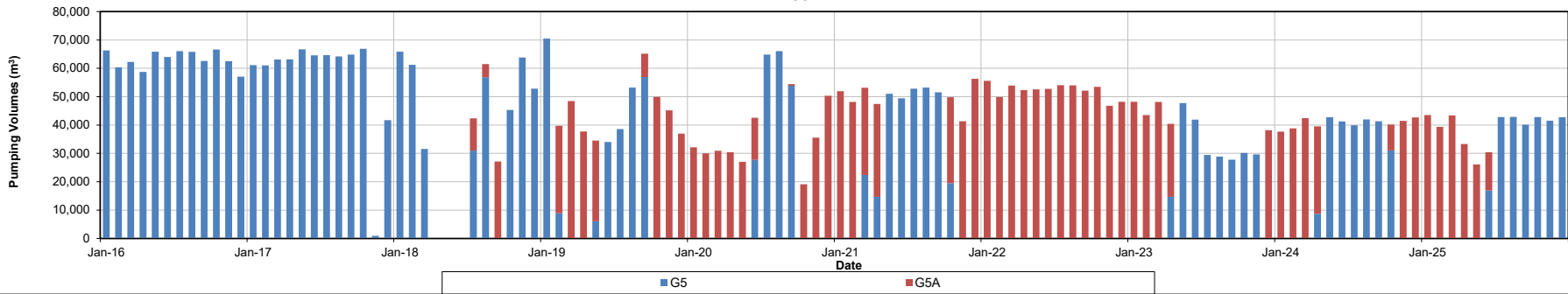


REGION OF WATERLOO  
 2025 GROUNDWATER MONITORING REPORT -  
 PINEBUSH P9/P15/P15A WELL FIELD

**Actual versus Mean Monthly Precipitation**  
 Weather Station - Shades Mills Dam Weather Station

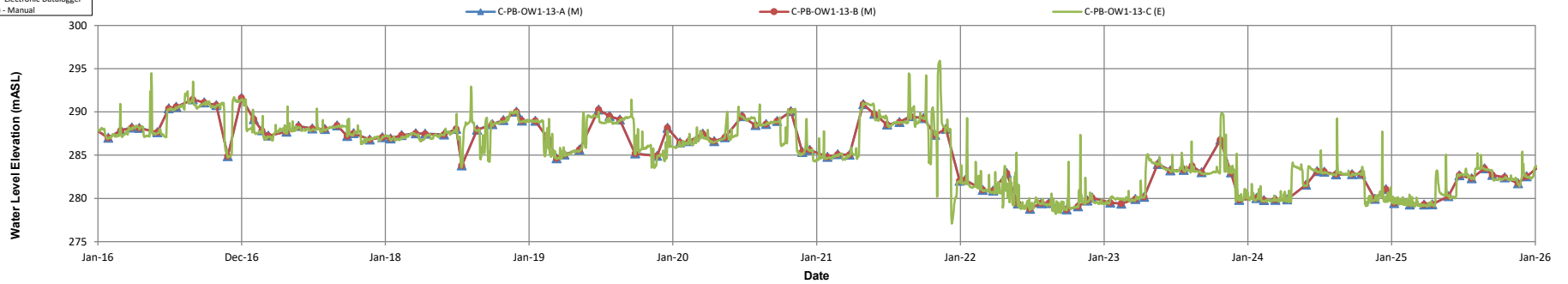


**Monthly Total Pumped Volumes**  
 PINEBUSH WELL FIELD



**PINEBUSH WELL FIELD**

Current Measure Method  
 (E) - Electronic Datalogger  
 (M) - Manual





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## Appendix D

### Precipitation Data

**Table D-1**  
**Precipitation Variation from Average**  
**Region of Waterloo - 2025 Groundwater Monitoring Report**

Year	Kitchener/Waterloo Weather Station Established 1966		
	Annual Precipitation (mm)	30-yr NORMAL Precipitation 1981-2010 (mm)	Difference (mm)
	2016	748	851
2017	818	851	-33
2018	749	851	-102
2019	695	851	-156
2020	689	851	-162
2021	772	851	-79
2022	438	851	-413
2023	813	851	-38
2024	874	851	23
2025	723	851	-128

Year	University of Waterloo Station Established 1988		
	Annual Precipitation (mm)	Average Precipitation 1998-2024 (mm)	Difference (mm)
	2016	891	871
2017	989	871	118
2018	950	871	79
2019	923	871	52
2020	953	871	82
2021	1022	871	151
2022	578	871	-293
2023	959	871	88
2024	763	871	-108
2025	943	871	72

Year	Shand Dam Established 1939		
	Annual Precipitation (mm)	Average Precipitation 1940-2025 (mm)	Difference (mm)
	2016	976	926
2017	1093	926	167
2018	849	926	-77
2019	1081	926	155
2020	1017	926	91
2021	876	926	-50
2022	798	926	-128
2023	1015	926	89
2024	994	926	68
2025	995	926	69

Year	Conestogo Dam Established 1961		
	Annual Precipitation (mm)	Average Precipitation 1961-2025 (mm)	Difference (mm)
	2016	983	990
2017	1210	990	220
2018	962	990	-28
2019	992	990	2
2020	1021	990	31
2021	975	990	-15
2022	907	990	-83
2023	1053	990	63
2024	972	990	-18
2025	1025	990	35

Year	Woolwich Dam Established 1960		
	Annual Precipitation (mm)	Average Precipitation 1960-2025 (mm)	Difference (mm)
	2016	844	835
2017	986	835	151
2018	869	835	34
2019	824	835	-11
2020	862	835	27
2021	649	835	-186
2022	668	835	-167
2023	859	835	24
2024	793	835	-42
2025	732	835	-103

Year	Shade's Mills Dam Established 1960		
	Annual Precipitation (mm)	Average Precipitation 1960-2025 (mm)	Difference (mm)
	2016	934	909
2017	1092	909	183
2018	1042	909	133
2019	1059	909	150
2020	848	909	-62
2021	1020	909	111
2022	682	909	-227
2023	982	909	73
2024	976	909	67
2025	895	909	-14

Year	Laurel Dam Established 1960		
	Annual Precipitation (mm)	Average Precipitation 1960-2025 (mm)	Difference (mm)
	2016	985	938
2017	1062	938	124
2018	1071	938	133
2019	940	938	2
2020	938	938	0
2021	1027	938	89
2022	689	938	-249
2023	921	938	-17
2024	907	938	-31
2025	894	938	-44

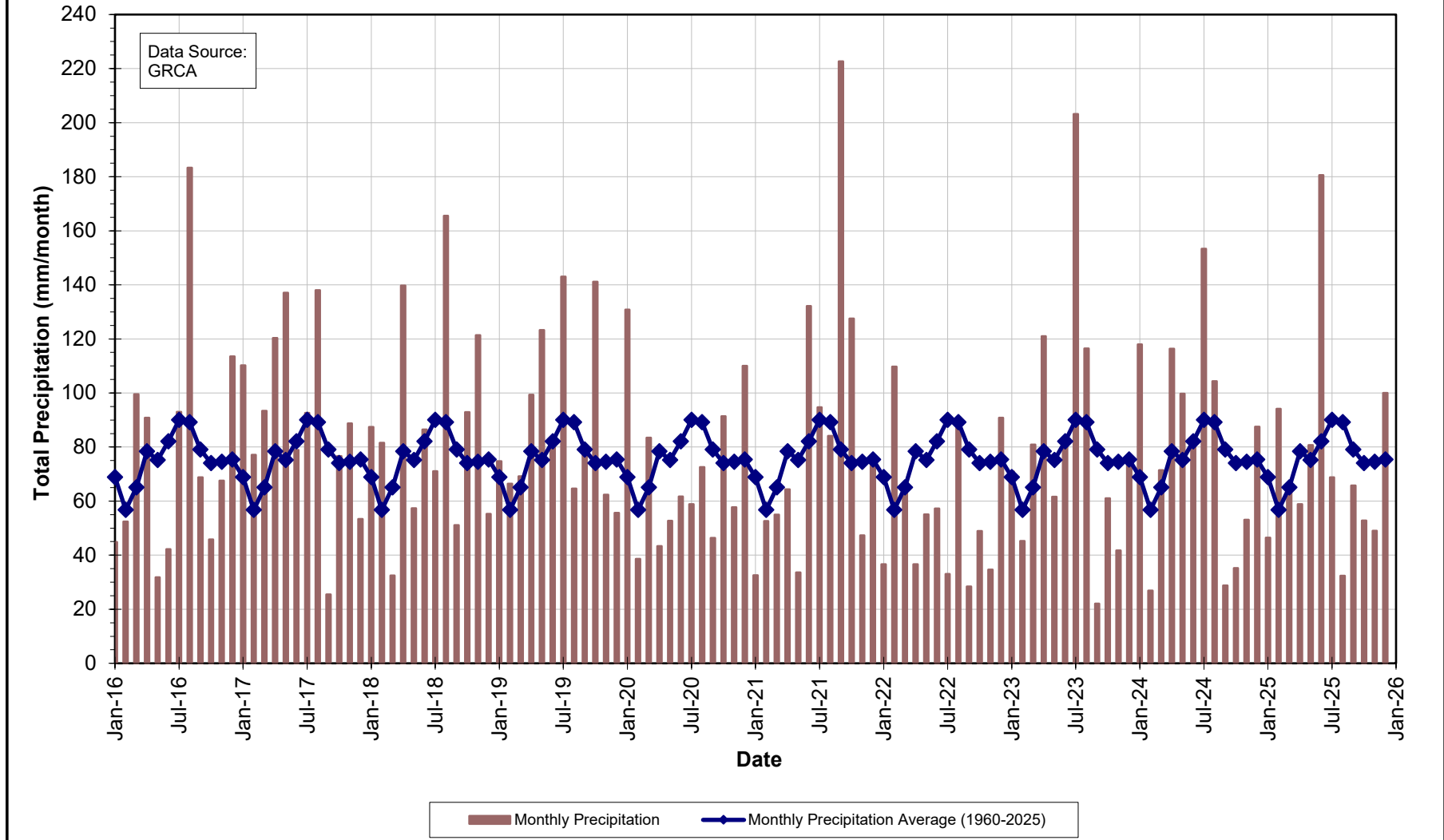
Year	Roseville Weather Station Established 1972		
	Annual Precipitation (mm)	30-yr NORMAL Precipitation 1981-2010 (mm)	Difference (mm)
	2016	899	919
2017	882	919	-37
2018	905	919	-14
2019	957	919	38
2020	817	919	-102
2021	832	919	-87
2022	637	919	-282
2023	945	919	26
2024	856	919	-63
2025	786	919	-133

**NOTES:**

WIA station data is not subject to review by the National Climate Archives, therefore, undergoes very limited quality checking.  
 GRCA Dam stations data is not reviewed extensively and undergoes limited quality checking.

Region of Waterloo – 2025 Groundwater Monitoring Report

Figure D.1  
Shade's Mills Dam  
Monthly Precipitation





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## Appendix E

### Monitoring Program Overview

## GROUNDWATER LEVEL MONITORING PROGRAM PROCEDURES

### E.1 Overview

The Region of Waterloo (Region) collects water level measurements at specific monitoring wells to ensure sustainable long-term water supply and to meet monitoring and reporting requirements for the Region's water-taking permits. The goal of the program is to manage and protect the Region's groundwater supply and to assess the potential impact of municipal pumping on the groundwater and surface water resources in the Region. The ongoing collection and assessment of groundwater level data is integral to assess any changes to the water resources that may occur due to pumping.

#### E.1.1 Production Well Pumping and Water Levels

In 2023 the Region managed approximately 132 production wells with status defined as:

- Commissioned – Active wells
- New Not-Commissioned – Well are inactive or locked out until future demand or repairs/maintenance of other wells requires activating them

The well fields are referred to as Urban (Kitchener, Waterloo, and Cambridge) and Rural (North Dumfries, Woolwich, Wilmot, and Wellesley). Well fields in Kitchener, Waterloo, and Cambridge are referred to as the Integrated Urban System (IUS).

The Region's active production wells are monitored through the Region's SCADA (Supervisory Control and Data Acquisition) system, which reads and records the volume pumped on a daily basis. A few wells do not have their own meter but are combined with other nearby well(s) in the well field and the combined flow is divided into a record for each source. Water level measurements are obtained from the production wells where required. All manual measurements are obtained using either an air line or a water level tape.

### E.1.2 Monitoring Wells and Surface Water levels

Water levels are measured at monitoring wells and at some surface water features. The objective of this monitoring is to collect data to ensure that the Region's water taking has minimal impact on the environment and on private water takers.

Water levels in the Region's monitoring wells are measured either electronically or manually. Most of the wells that are monitored electronically use datalogger equipment manufactured by *In-Situ Inc.*® LevelTROLLs® and RuggedTROLLs®, as well as, by *Van Essen Instruments (formerly Schlumberger Water Services)* Mini-Divers®, Micro-Divers®, and TD-Divers®; or by *Solinst*® Levelloggers®. The datalogger pressure sensor models used may be either vented (gauged) or non-vented (absolute) for *In-Situ Inc.*®; whereas, for *Van Essen Instruments* and for *Solinst*®, non-vented (absolute) models are used. Barometric dataloggers by each manufacturer suspended in select well locations are also used with the non-vented (absolute) models to provide the required barometric pressure compensation necessary in producing the water level data. Manual monitoring is done using a *Solinst*® and/or *Heron Instruments Inc.* electronic water level meter with both visual and audio indicators.

The electronically monitored wells are typically measured every hour, with increased frequency as required. At the hourly frequency, the following trends can be distinguished in an individual monitoring well:

- Seasonal climate trends;
- Water level changes in the aquifer that is being pumped;
- Water level changes in aquifers connected to the pumped aquifer; and
- Individual precipitation events in unconfined aquifers.

The manually monitored wells are measured once per month. At this frequency only the first three responses listed above can be distinguished.

### E.1.3 Climatological Data

To evaluate the reaction of water levels to changes in climatic conditions, precipitation data are monitored at various locations throughout the Region. Within the Region of Waterloo, climate data is collected by Environment Canada at the Region of Waterloo International Airport (WIA) and the Roseville weather station, by the Grand River Conservation Authority (GRCA) at various Dam locations and by the University of Waterloo at a weather station located on the north campus.

## **E.2 Groundwater Level Collection Protocols**

### **E.2.1 Groundwater Level Monitoring Network Summary Well Checklist**

A well checklist and data entry spreadsheet are prepared of all the measuring points where water levels will be collected on a monthly basis. The checklist and spreadsheet are organized by well field so wells in close proximity are grouped together and indicates whether locations are measured with electronic dataloggers or manual measurements only. Once a well is visited, data is entered in the spreadsheet and the well is checked off the list; thus, the checklist and spreadsheet provides an obvious indication that work is unfinished if a location is unchecked and has no data.

### **E.2.2 Well Inspection**

Upon visiting a well for the first time, the well/casing/equipment details are noted, photos taken, and GPS coordinates are recorded in a field book and/or in the monthly data entry spreadsheet. Well/casing/equipment details includes: location, access, condition, materials, diameters, casing security, surface seal condition, requiring repair or not, well/casing stickup measurements from ground level, well total depth, and the type of datalogger and/or sampling equipment installed. Any notable deficiencies, concerns, problems, or changes in the well condition are recorded in a field book and/or in the monthly data entry spreadsheet, as well as, photos are taken. Also, any observed activities taking place around or near the well that are worth noting are recorded in a field book and/or in the monthly data entry spreadsheet.

### **E.2.3 Monitoring Well Manual Water Level Measurement Procedure**

- Unlock well casing and open well casing lid.
- Remove well cap (if present).
- Use an Electronic Water Level meter and lower the probe down the well until the meter beeps to indicate the probe has encountered water.
- The probe is raised up until the beep of the meter stops, indicating the probe is now above the water.
- Then the probe is slowly lowered down until the probe just contacts the water level surface causing the meter to beep.
- At this point the depth (in meters) is read off the water level meter tape from the measuring point of the well (in most cases is the top of the casing or pipe) and this provides the water level depth below the measuring point.
- The date, time, and water level depth measured is recorded in a field book and/or in the monthly data entry spreadsheet.
- This procedure is repeated for each of the well screens inside the well casing.

- Replace well caps.
- Close well casing lid and lock well casing.

#### **E.2.4 Downloading of Water Levels from Electronic Dataloggers Procedure**

##### **For Non-Vented (Absolute) Datalogger Models:**

*In-Situ Inc.*® LevelTROLLs® and RuggedTROLLs®, *Van Essen Instruments Divers*®, and *Solinst*® Levelloggers®

- Prior to downloading data from the datalogger, a manual water level is measured in each well screen containing a datalogger.
- The datalogger is pulled out of the well, unthreaded from the cap that is attached to a wire cable and connected to (or placed in) the corresponding datalogger communication device. The communication device is connected to a laptop/tablet PC or a RuggedReader® Handheld PC and the associated datalogger software is started.
- Water level data stored in the datalogger is subsequently downloaded and viewed using the datalogger software and saved on the hard drive/memory.
- Note: downloading data from the datalogger does not automatically stop the datalogger from recording.
- The status of the datalogger is viewed and checked for correct operation and to confirm that the datalogger is hanging in the well water within its operating range.
- Select datalogger details such as the battery level and free/used memory are recorded in a field book and/or in the monthly data entry spreadsheet.
- If the datalogger does not require restarting to free up memory or to change the sample rate, then the datalogger is removed from the communication device and is threaded back onto its cap and lowered back down the well on the wire cable.
- If the datalogger does require restarting to free up memory or to change the sample rate, then the datalogger is stopped, reprogrammed, and restarted using the datalogger software and, as a result, erases the previous data stored in memory on the datalogger.
- This procedure is repeated for each datalogger within each of the well screens inside the well casing.
- After all the non-vented (absolute) dataloggers have been downloaded then the Barometric dataloggers are downloaded following the same procedure as above.

**For Vented (Gauged) Datalogger Models:***In-Situ Inc.*® LevelTROLLs®

- Prior to downloading data from the datalogger, a manual water level is measured in each well screen containing a datalogger.
- The desiccant tube is unconnected from the datalogger cable.
- The datalogger cable is connected to a communication cable device that is connected to a laptop/tablet PC or a RuggedReader® Handheld PC and the datalogger software is started.
- Water level data stored in the datalogger is subsequently downloaded and viewed using the datalogger software and saved on the hard drive/memory.
- Note: downloading data from the datalogger does not automatically stop the datalogger from recording.
- The status of the datalogger is viewed and checked for correct operation and to confirm that the datalogger is hanging in the well water within its operating range.
- Select datalogger details such as the battery level, free/used memory, and desiccant condition (colour) are recorded in a field book and/or in the monthly data entry spreadsheet.
- The desiccant tube condition is checked and replaced if necessary.
- If the datalogger does not require restarting to free up memory or to change the sample rate, then the communication cable device is disconnected from the datalogger cable and the desiccant tube is reconnected.
- If the datalogger does require restarting to free up memory or to change the sample rate, then the datalogger is stopped, reprogrammed, and restarted using the datalogger software and, as a result, erases the previous data stored in memory on the datalogger.
- This procedure is repeated for each datalogger within each of the well screens inside the well casing.

**E.2.5 Data Entry and Processing into the Burnside MS ACCESS/SQL® Database**

- All field data collected (i.e. date, time, manual water level depth measured, comments) and recorded for each well screen and datalogger in a field book is entered into the monthly data entry spreadsheet, unless already entered in the field using a laptop/tablet PC.
- The monthly data entry spreadsheet is checked and reviewed prior to importing the data into a database table using Burnside Water Level Data Tools software. Manual water level depth values are converted into water level elevation values using the software during this import process.
- Any associated well notes, comments, and datalogger details are entered into a database table under the appropriate well and screen.

## 2025 Groundwater Level Monitoring Program Report – APPENDIX E

- Water level data from the dataloggers downloaded to a laptop/tablet PC or a RuggedReader® Handheld PC are transferred to Burnside file folder network upon returning to the office.
- These datalogger water level data files are subsequently read and the data is imported into a database table using Burnside Water Level Data Tools software.
- Using Burnside Water Level Data Tools software, the datalogger water level data are reviewed and processed (as described below) resulting in corrected water level depth values and corrected water level elevation values that are stored in a database table.
- *For Non-Vented (Absolute) Datalogger Models:*  
Datalogger water level data is first barometric pressure compensated using selected Barometric datalogger data, then a manual water level depth value measured at the time of the most recent download is applied and used to convert the barometric compensated water level data into corrected water level depth values, which are converted into water level elevation values that are appended to a database table.
- *For Vented (Gauged) Datalogger Models:*  
A manual water level depth value measured at the time of the most recent download is applied to the datalogger water level data to convert the water level data into corrected water level depth values, which are converted into water level elevation values that are appended to a database table.
- Temperature data recorded by the dataloggers are also imported into a database table.
- Hydrographs are subsequently created for each well and screen from the water level elevation data in the database for review and presentation. If there are some data points that are erroneous, then these data points are marked as non-reportable (invalid) within the database and/or are removed resulting in them not being plotted on the hydrographs.
- An updated data file is provided to the Region on a quarterly basis for upload into their eWRAS EQUIS database.

