Region of Peel Permit to Take Water Groundwater and Surface Water Monitoring Program

2025 – Caledon Village Annual Water Level and Water Quality Report

February 2026

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1 Introduction

Watermark Environmental Ltd. (WEL) was retained by the Regional Municipality of Peel (the Region of Peel) to conduct the 2025 Groundwater Level and Groundwater Quality Monitoring Program (2022-222vPC13-1-021) for the Caledon Village Municipal Wellfield. Three (3) municipal production wells, Caledon Village Well 3 (CV 3), Caledon Village Well 3B (CV 3B), and Caledon Village Well 4 (CV 4), are operated by the Region of Peel in the Caledon Village municipal wellfield.

This report is organized to provide a hydrogeological background on the Caledon Village municipal wellfield, and summaries of the groundwater and surface water monitoring work completed in 2025. The summaries of the groundwater and surface water monitoring work completed include an overview of the methodologies employed; the scope of the monitoring completed; and the results of the monitoring completed. Where relevant, observations of historical monitoring years are also included to provide further context to existing and/or emerging water level and water quality trends. Finally, conclusions of the monitoring program from 2025 are summarized together with any recommendations for the following annual groundwater and surface water level monitoring program in 2026.

1.1 Caledon Village Municipal Wells

The CV 3 and CV 3B wells are located south of Caledon Village on the east side of Lot 13, Concession 3, Town of Caledon, Regional Municipality of Peel, and CV 4 is located northwest of Caledon Village at 1880 Beech Grove Side Road in Caledon, Ontario. CV 3 is located within the Caledon Village 3 Water Treatment Plant, while CV 3B is located external to the treatment plant within a tamper proof enclosure. CV 4 is located within the CV 4 Water Treatment Plant building. Both CV 3 and CV 3B are understood to have been completed within an unconfined sand and gravel aquifer, while CV 4 is completed within a confined to semi-confined aquifer. The Caledon Village wells are located in a glacial spillway referred to locally as the Caledon Meltwater Channel. Further discussion of regional hydrostratigraphy as it relates to the current study is provided in the next section. Both CV 3 and CV 4 have been assessed as groundwater under the direct influence of surface water (“GUDI”) with effective filtration (Stantec, 2002). Similar to CV 3, CV 3B is also expected to be classified as groundwater under direct influence of surface water (“GUDI”) with effective filtration.

The locations of the CV 3, CV 3B, and CV 4 municipal wells and the monitoring locations included in the monitoring program for 2025 are illustrated on **Figure 1** and **Figure 2**. The relevant well construction details for the municipal wells are summarized in **Table 1.1**.

Table 1.1 Caledon Village Municipal Wells Construction Details
Source: WEL, 2024

Well ID	MOE Well Tag	Year of Well Construction	Well Depth (mbgs)	Screen Length (m)	Screen Interval (mbgs)	Aquifer Materials
CV 3	4905945	1960	35.1	6.1	29.0 – 35.1	ORAC
CV 3B	A051686	2009	32.61	5.18	26.21 – 32.61	ORAC
CV 4	4907753	1992	75.9	14.6	61.30 – 75.90	ORAC

According to the current PTTW No. P-300-8032340160, the Region of Peel is permitted to take water from the Caledon Village Municipal Wells according to the allotments provided in **Table 1.2**. The PTTW No. P-300-8032340160 will expire on April 30, 2029.

Table 1.2 Caledon Village Municipal Wells PTTW Summary
Source: Table A from PTTW P-300-8032340160

Well ID	Maximum Volume (L/min)	Maximum Volume (L/day)
CV 3	1,364	1,964,160
CV 3B	909	1,308,960
CV 4	2,273	3,273,120
Maximum Combined Taking Permitted	4,546	6,546,240

1.2 Geological and Hydrogeological Setting

1.2.1 Physiography

The CV 3 and CV 3B wells are located within the Niagara Escarpment physiographic region (Chapman and Putnam, 1984). The landform trends from north to south and separates the Guelph Drumlin Field to the west from the Oak Ridges Moraine to the east. The escarpment is described as a major topographic change in the bedrock and formed as a result of differential erosion of softer underlying shale and harder dolostone. Most of the rock faces in this area are obscured by hummocky, boulder, morainic ridges and deposits of sand and gravel (CVSPA, 2015).

The CV 4 well is located within the Guelph Drumlin Field physiographic region, (Chapman and Putnam, 1984). The Guelph Drumlin Field is described as a plain of low-lying streamlined drumlins that are separated by interconnected meltwater channels. Between the Town of Alton and the Town of Caledon Village, the Guelph Drumlin Field physiographic region is situated between the Hillsburgh Sandhills and the Niagara Escarpment physiographic regions, which are located to the north and south, respectively.

The distribution of physiographic regions in the surrounding area is presented on **Figure 3**.

1.2.2 Topography and Drainage

The ground surface around CV 3 and CV 3B has been significantly modified by local aggregate operations and the creation of large ponds due to extraction from below the water table. However, the local topography generally slopes to the southeast from north of Caledon Village at 435 metres above sea level (masl) to the valley containing Caledon Creek at approximately 405 masl, which is northwest of CV 3 and CV 3B. The immediate area of the CV 3 and CV 3B wells is approximately flat with an average elevation of 426 masl.

CV 4 is situated within a bedrock valley infilled by glacial outwash deposits. The topographic relief from east to west varies from elevations between 420 masl to 450 masl. Locally, CV 4 is within a topographic depression where ground surface topography varies from approximately 393 masl at CV 4 to about 389 masl along the banks of the Credit River 300 m to the west.

A topographic map of the surrounding area is presented on **Figure 4**.

1.2.3 Surficial Geology

The understanding of regional geology and hydrogeology under which the current report has been prepared is based on the related information and mapping prepared by the Oak Ridges Moraine Groundwater Program (ORMGP) and the Ontario Geological Survey (OGS). The ORMGP, through their online mapping portal, provides the most accessible and up-to-date consensus on regional hydrogeological mapping and a comprehensive compilation of pertinent hydrogeological data relevant to the current investigation. The following units overlie the bedrock (from youngest to oldest) in the vicinity of the Caledon Village wells:

- Halton Till
- Oak Ridges Moraine
- Newmarket Till
- Lower Sediments (including: Thorncliffe Formation, Sunnybrook Drift, and Scarborough Formation)

The Caledon Village wells are located in a glacial spillway referred to locally as the Caledon Meltwater Channel. The Caledon Meltwater Channel is generally composed of water bearing glaciofluvial outwash deposits of sand and gravel. It is within these deposits that the Caledon Village wells are screened, and they collectively make up the Oak Ridges Moraine Aquifer Complex (ORAC). In the vicinity of the CV 3 and CV 3B complex, the ORAC is considered to be an unconfined aquifer unit due to the lack of sufficient confining material offered by the Halton Till. Whereas in the area of CV 4, the aquifer has most recently been assessed as a confined to semi-confined aquifer due to the presence of overlying confining glacial till materials belonging to the Halton Till (WEL, 2023).

A surficial geology map capturing the Caledon Village municipal wellfield is included as **Figure 5**. Hydrostratigraphic cross-sections taken through CV 3 and CV 3B, and CV 4 in perpendicular directions from the ORMGP model (2024) are included as **Figure 6** and **Figure 7**, respectively.

1.2.4 Bedrock Geology

The Caledon Village area is underlain by bedrock belonging to the Amabel, Clinton-Cataract and Queenston formations in order of increasing geological age. The Amabel Formation occurs above the Niagara Escarpment, while the Clinton and Cataract formations occur mainly along the face of the Escarpment. Finally, the Queenston Formation occurs below the Escarpment.

A bedrock geology map capturing the study area of the Caledon Village municipal wells is included as **Figure 8**.

2 Groundwater and Surface Water Level Summary

2.1 Groundwater and Surface Water Level Monitoring Scope

A summary of the groundwater and surface water level monitoring conducted in 2025 is provided in the summary tables of **Appendix B**. In **Table B-1** of **Appendix B**, the monitoring locations are identified along with the frequency of monitoring which was included in the 2025 monitoring year. In 2025, the Caledon Village municipal wellfield monitoring program included 30 groundwater monitoring stations capturing shallow, intermediate, and deep aquifer horizons, and 1 surface water monitoring station at CV 4. The monitoring locations for CV 3 and CV 3B, and CV 4 are illustrated on **Figure 1** and **Figure 2**, respectively.

The groundwater and surface water level monitoring program for 2025 included the following major tasks:

- Above ground inspection of monitoring wells, drivepoints, and surface water staff gauges to document any maintenance requirements;
- Collection of above ground monitoring well and drivepoint construction details, including stick-up, well diameters, etc.;
- Entry of all field monitoring data into the Region of Peel Survey123 monitoring well inspection app;
- Installation of seasonal groundwater and surface water level monitoring level loggers in April 2025 and retrieval of the same in November 2025;
- Replacing missing, inoperable, or damaged level loggers with Region of Peel supplied spares, including shipping select inoperable level loggers to Solinst Canada Ltd. for repair and/or data retrieval;
- Downloading level loggers in the field at seasonal monitoring locations;
- Downloading and Quality Assurance/Quality Control (QA/QC) of data retrieved from FlowWorks where realtime data for non-seasonal monitoring locations is hosted; and
- Compiling continuous and static groundwater and surface water level monitoring data for submission to the Region of Peel.

Groundwater levels were manually measured using a water level tape. To reduce the risk of cross-contamination between monitoring wells, the probe of the water level meter was cleaned with a 1% solution of Alconox® detergent and rinsed with distilled water, prior to each use.

Between April and November 2025, WEL downloaded continuous groundwater and surface water levels from level loggers installed in the seasonal monitoring locations for the Caledon Village municipal wellfield. Continuous groundwater level monitoring data at all permanent (non-seasonal) monitoring locations was downloaded online from FlowWorks throughout the entirety of 2025. Continuous groundwater levels and surface water levels from seasonal

monitoring locations equipped with level loggers continued to be downloaded in the field and the data was managed by WEL prior to submission to the Region of Peel.

Groundwater levels from the municipal wells were provided by the Region of Peel, including manual groundwater levels measured by Region of Peel operators and continuous operations data on the Caledon Village municipal wells recorded by the Region of Peel supervisory control and data acquisition (SCADA) system. Operations data from the Caledon Village municipal wells supplied by the Region of Peel included daily total flow, and maximum, minimum and average groundwater levels.

2.2 Groundwater and Surface Water Level Trends

Table C-1 and **Table C-2** in **Appendix C** summarize the groundwater and surface water levels measured from the Caledon Village wellfields during the monitoring period together with water levels that have been collected historically. Historical water levels were obtained directly from the ORMGP, as needed. Water level hydrographs are also included in **Appendix C** to illustrate the seasonal variability and overall continuity of water levels beginning from January 2025 through to December 2025 within the Caledon Village wellfields. After review of the water level monitoring data from 2025, the following conclusions are offered:

- When compared with flow data from the municipal pumping wells CV 3 and CV 3B, and CV 4, the normal short-term pumping operation of the municipal wells does not result in significant drawdowns at the monitoring wells nor drivepoint piezometers. Overall, the impact of the pumping wells on surrounding groundwater levels is most evident in monitoring wells screened closer to, and at similar depths as the pumping wells. For example, monitoring well CV OW1D near CV 4 is influenced by CV 4 and, while monitoring wells CV OW1I and CV OW1S are also influenced by CV 4, the influence is less pronounced. Groundwater levels are shown to rebound quickly following a measured drawdown.
- At CV 3 and CV 3B, only those groundwater monitors in the immediate vicinity of the municipal wells demonstrated an influence from pumping. Meanwhile, operations of the municipal wells demonstrated no influence on monitoring wells screened in the bedrock (monitoring wells CV EW3-3D and CV EW3-4) nor wells near to operations of the Caledon Sand and Gravel operations (monitoring wells CV TWC, CV TWB, and EW3-3S).
- Groundwater elevations between January 2025 and December 2025, inclusive, displayed an expected range of seasonal variability, with a few exceptions. During the months of July to September 2025, less than half the seasonal precipitation was recorded for areas of southwestern Ontario, and drought conditions persisted through much of the summer and early fall period. While groundwater elevations observed at monitoring wells were within the expected range of seasonal variability, some seasonal drivepoint piezometers such as CV DP5-04S and CV DP5-04D did show a response to the drought conditions. As the drought conditions were temporary, the seasonal monitoring locations and year-round monitoring wells located in the Caledon Village wellfield

continue to display seasonal variability associated with increases or decreases in aquifer recharge.

- The operations of CV 3 and CV 3B had no discernable influence on the shallow groundwater system. Similarly, CV 4 had no discernable influence on neither the shallow nor surface water systems near the well.
- A gradient change was observed to occur from 2023 to 2024 at both monitoring well groupings for CV OW1D, CV OW1I, and CV OW1S, and OW2D, OW2I, and OW2S. As these changes have continued into 2025, these changes are expected to be the result of revisions to the measuring point elevations at these monitors in 2024, and will continue to be monitored moving forward as a deviation from historical monitoring results at CV 4.

Considering groundwater levels collected in 2025, there is no significant difference from the groundwater level variability recorded in 2024 within the monitoring network, with the exception of the drought conditions observed CV DP5-04S and CV DP5-04D. Notwithstanding, the relative variability in groundwater levels year over year remains unchanged, suggesting that there have been no unexpected changes in the groundwater levels within the municipal wellfield and that the current operations of the Caledon Village municipal wells are sustainable at present.

Included at the end of **Appendix C** are hydrographs illustrating static groundwater levels at CV 3, CV 3B, and CV 4 over the previous 5 years. As evidenced in those hydrographs, static groundwater levels fluctuate within a normal range of variability under non pumping conditions and have been stable overall during this time. Based on these monitoring results, there have been no significant changes in the groundwater resources available to CV 3, CV 3B, and CV 4. Similar trends are expected in 2026.

3 Water Quality Summary

3.1 Water Quality Sampling Methodology

The results of groundwater and surface water sampling completed in 2025 are provided in the summary tables of **Appendix D**. Within the tables of **Appendix D**, the sampling locations are identified along with a water quality parameter reference table organizing the analyses that occur within the Caledon Village wellfield. In all, nine (9) groundwater monitoring locations were included in the water quality sampling program for 2025. In 2025, water quality sampling in the Caledon Village wellfield was completed in April and May 2025. Additionally, PFAS compounds were sampled in February, August, and November 2025 at the following locations in the CV 3 and CV 3B wellfield: CV TWDs, CV TW1-05, CV TW5-05, and CV TWB. No PFAS sampling was completed in the CV 4 wellfield. It is understood that from year-to-year, water quality sampling alternates between the autumn and spring sampling events; therefore, in 2026, water quality monitoring should be completed in the fall monitoring period.

Where possible, groundwater quality samples were collected following an initial purging of at least three (3) well volumes measured at the time of sampling. In cases where a significant volume of groundwater would require purging, confirmation of sufficient well purging was determined on a case-by-case basis using field parameters for temperature, pH and conductivity as recorded by a handheld multi-parameter probe. Groundwater quality samples were collected by either a manual inertial pump or hydrolift, using wattera tubing and footvalves, or a bailer where more appropriate. Field-filtered samples were collected for metals as well as for Organic Nitrogen, Chemical Oxygen Demand, and Total Kjeldahl Nitrogen, as needed. Field-filtered samples were passed first through a 0.45 micron field filter.

After collection, all samples were placed on ice within dedicated coolers for transport to the laboratory. All samples were submitted to Bureau Veritas Canada Inc. (BV Labs) in Mississauga, Ontario, for analysis on the same day that they were collected. The Certificates of Analysis (CoAs) and Chains of Custody (COCs) are included in **Appendix E**.

3.2 Groundwater Quality Trends

Analytical results were compared to the Aesthetic Objectives (AOs), Operational Guidelines (OGs), and Maximum Acceptable Concentrations (MACs) of the Ontario Drinking Water Standards (ODWS) Ontario Regulation 169/03. After review of the water quality results from 2025, the following conclusions are offered:

- No exceedances of any parameter with a reported ODWS MAC criteria were identified in the Caledon Village wellfields, including Nitrate. Specifically, concentrations for Nitrates in 2025 were non-detect or very low similar to 2023, 2024 and historical water quality data from CV 3, CV 3B, and CV 4;
- VOC and BTEX parameters were reported as non-detect at all locations where those parameters were sampled in the CV 3 and CV 3B, and CV 4 wellfields, except for a minor detection for Chloroform at CV TW1-05 in the CV 3 and CV 3B wellfield;

- PFAS parameters were reported as non-detect for most compounds; however, all four locations sampled for PFAS were observed to have concentrations of PFBA, PFPeA, PFHxA, PFOA, and/or PFOS. While PFAS compounds were identified at all locations sampled for PFAS, no location was observed to have a sum of a subset of 25 PFAS compounds greater than Health Canada's 30 ng/L objective (Health Canada, 2024); and
- Concentrations for Chloride and Sodium were below the ODWS AOs of 250 mg/L and 200 mg/L, respectively, at all locations sampled in 2025, except for CV OW2I in the CV 4 wellfield which exceeded the AO for Sodium.

Historical time-concentration plots of the parameters Nitrate, Chloride, and Sodium appended with results of sampling from 2025 are provided in **Appendix D**. Historical water quality information was obtained directly from the ORMGP, as needed.

Based on the time-concentration plots, the concentration of Nitrate at the monitored locations have been low, if not non-detect, and stable over the previous 10 years at monitoring locations around CV 3 and CV 3B, and CV 4. Such observations may be anticipated given that the predominant land use around CV 3, CV 3B, and CV 4, which have remained relatively unchanged, offer few sources for nutrients which could infiltrate groundwater. Further, in the case of CV 4, there is a significant confining layer of the Halton Till aquitard separating the CV 4 aquifer from surface.

When assessing concentrations for Chloride and Sodium, concentrations in 2025 at the sampled locations were within the established flat, stable trends that follow historical water quality data. Two exceptions to this are Chloride and Sodium concentrations in CV OW2I which have been increasing slightly year-over-year in the previous 10 years, while still falling far below their respective ODWS AOs over that period.

4 Conclusions and Recommendations

4.1 Conclusions

Using the water level and water quality monitoring data collected over the 2025 monitoring period, and considering the results historical water level and water quality monitoring, the following conclusions in regard to the operations of the Caledon Village municipal wells are offered:

- Groundwater and surface water elevations in 2025 continue to display seasonal trends associated with changes in recharge, particularly those more shallow groundwater monitoring locations in the Caledon Village wellfields, as has been observed historically. A slight decrease in groundwater elevations in some shallow piezometers was observed due to the drought conditions in 2025; however, as these conditions were temporary, it is anticipated that elevations will return to seasonal normals in 2026.
- When compared with flow data from the municipal pumping wells CV 3, CV 3B and CV 4, the normal short-term pumping operation of the municipal wells does not result in significant drawdowns at the monitoring wells nor drivepoint piezometers. Overall, the influence of the pumping wells on surrounding groundwater levels is most evident in monitoring wells screened closer to, and at similar depths as the pumping wells.
- Considering groundwater levels and groundwater quality samples collected in 2025, there is no significant difference in groundwater level variability nor groundwater quality when compared to results of historical monitoring.

4.2 Recommendations

Based on these conclusions, the following recommendations are offered for the 2026 monitoring year:

- Continue the current groundwater and surface water level monitoring program and assess the monitoring data in context of historical monitoring results for trends that may indicate irregular influences from the pumping wells; and
- Continue the current water quality sampling program to monitor for any changes in water quality at the monitoring wells.

5 Signatures

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Hydrogeologist

Revision History

Rev	Date	Description	Prepared by	Approved by
--	2026-02-17	Initial Draft submission for review	Victor Marcucci	Ian Gardiner
00	2026-02-26	Report Submission	Victor Marcucci	Ian Gardiner

This report was prepared using scientific principals and professional judgement in the assessment of the available facts and information. The interpretations within this report are based on the limits of the existing information, budgeted scope of work and schedule. The information presented in this document is not to be construed as legal advice.

Watermark Environmental Ltd. relied on information from the Region of Peel, independent sources, and other historical documentation as referenced in this report. The accuracy and completeness of third-party sources was not verified. It is noted that the regulatory guidelines, standards and related documents as they are referenced in this report are subject to interpretation and may change over time.

This report was prepared for the exclusive use of the Region of Peel and the Ministry of the Environment, Conservation and Parks. Any use which a third party makes of this report, or reliance of decisions based on it, are the responsibility of such third parties. Watermark Environmental Ltd. accepts no responsibility for damages, if it were to occur, suffered by any third party as a result of decisions made or actions taken based on this report.

6 References

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Figures

Appendix A

Caledon Village Municipal Wells PTTW P-300-8032340160

Appendix B

Monitoring Network Summary Tables

Appendix C

Groundwater and Surface Water Levels

Appendix D

Groundwater and Surface Water Quality Results

Appendix E

Groundwater and Surface Water Quality Certificates of Analysis