Terra-Dynamics inc.
432 Niagara Street, Unit 2 St. Catharines, ON L2M 4W3

September 22, 2025

TD Greenhouses Ltd.
c/o Troy Pieterse
42554 Highway #3
Wainfleet, Ontario L0S 1V0

Re: Hydrogeological Report – 43237 Pettit Road, Township of Wainfleet, ON

Dear Mr. Pieterse,

1.0 Introduction, Background Information and Purpose

Terra-Dynamics Inc. (Terra-Dynamics) respectfully submits this Hydrogeological Study Report of sewage impacts to support a consent, or severance, of a surplus farm dwelling from 43237 Pettit Road, Township of Wainfleet (the Site) (Figure 1). The Hydrogeological Study assessed the risk to groundwater supplies from the existing private sewage system. The Hydrogeological Study is a requirement of the Niagara Region and the Township of Wainfleet (Township of Wainfleet, 2024) with relevant official plan policies listed below.

Niagara Official Plan Policy 4.1.9.2(b) [Niagara Region, 2022]:

> *"the minimum size of the proposed and retained lots shall each be 1 hectare unless it is determined through a hydrogeological study, that considers potential cumulative impacts, that a smaller size lot will adequately accommodate private water and sewage treatment facilities for long-term operation but not be less than 0.4 hectares"*

Township of Wainfleet Official Plan policy (Township, 2016):

Policy 3.1.4.3 c) ii) The new lot is limited to the minimum size required to accommodate the dwelling, the associated sewage system and water supply, and protect surface and groundwater features, e) iii) Each new lot shall be approximately 0.4 hectares, unless additional land area is required to support a well and a septic system, and protect surface and groundwater features.

As the existing residence and greenhouse are provided potable water via cisterns, this study does not include a water supply assessment (MECP, 1996b). This will require a development agreement on the surplus farm dwelling for water supply by cistern.

The following documents the hydrogeological study of the Site.

2.0 Methodology

The following methodologies were used to investigate the Site:

A. Submission of a Hydrogeological Study Terms of Reference to Niagara Region and the Township of Wainfleet (Appendix A).

B. Evaluation of Ministry of Environment, Conservation and Parks (MECP) water well records (Appendix B) and Ministry of Natural Resources and Forestry (MNRF) petroleum well records (Oil, Gas and Salt Resources Library, 2023) (Appendix C) located within 500 metres (m) of the Site.

C. A Site visit to observe conditions, including (i) collection of two hand-augered representative soil samples for laboratory grain-size analyses, along with four additional hand-augered locations, and (ii) mapping with a hand-held GPS locations of the existing on-site septic systems and cisterns.

D. Mailing/hand delivering a water use/septic survey to properties within 100 m of the Site (Appendix D).

E. Assessment of geological information using regional mapping of elevation, soils, sediments/overburden and bedrock.

F. Describing the hydrogeological setting using physical/geological information and water levels.

G. Assessment of the aquifer vulnerability using MECP Procedures (MECP, 1996a and MECP, 2008).

Terra-Dynamics Inc. began the assessment once confirmation of the appropriateness of the Terms of Reference was received from the Niagara Region (2025) and the Township of Wainfleet (2025).

3.0 Wells

3.1 Ministry of Environment, Conservation and Parks (MECP) Water Well Records

One MECP Water Well Record (WWR) is located at the Site, and another record is located within 500 m of the Site. Table 1 (attached) provides a summary of both wells, as well as two other water wells located outside, but near, the boundary (Figure 2 and Appendix B).

The on-site water well (WWR 6602566) is the only well summarized on Table 1 that was constructed into bedrock. This well (WWR 6602566) was constructed in the limestone bedrock in 1970 as an irrigation well and was recently decommissioned in September 2024. The total depth of this well was 44.2 metres below ground surface (m BGS) and bedrock was encountered at 43.9 m BGS, with the uppermost 18.3 m recorded as brown clay, the next 18.3 m recorded as brown sand and the 7.3 metres overlying the bedrock recorded as brown clay with some gravel (Figure 3). This well received water from the contact-zone aquifer, described by Singer et al (2003), as '*aquifers at the bedrock surface consisting of granular sediments and fractured bedrock overlain by clay*' (NPCA and AquaResource Inc., 2010).

MECP WWR 6604009 was constructed within the overburden in 1991 as a domestic well and has a total well depth of 37.8 m BGS. This well recorded similar overburden conditions as WWR 6602566 with the uppermost 19.5 m recorded as brown clay with sand, the next 8.2 m recorded as brown sand with gravel and the final 10.1 m recorded as brown clay with gravel.

Water well record WWR 6604170 was also reviewed to describe the physical setting, although located outside the 500 m boundary of the site. Constructed in 1994 for domestic use, the well was also constructed within the overburden and has a total well depth of 13.4 m. The well record describes the overburden as comprised of blue clay, with some grey sand and gravel encountered around 5.2 m to 5.5 m BGS and silt layers present between 5.5 m and 13.4 m BGS.

Water well record WWR 6602198 was also reviewed, located west of the Site, although beyond the 500 m boundary. This well was constructed in 1961 within the overburden and similar to the other well records, consisted primarily of clay.

3.2 Ministry of Natural resources and Forestry (MNRF) Petroleum Well Records

The Township of Wainfleet Official Plan (2016) indicates in Section 3.8.9 that:

"*In reviewing development proposals such as zoning by-law amendments, subdivision plans and land severances, Council shall require the proponent to consult with Niagara Region and the Petroleum Resources Centre of the Ministry of Natural Resources to determine:*

a) The presence of any gas wells (both active, suspended and abandoned) within 75 metres or greater of the application;
b) Any potential hazards these wells pose to the proposed development; and
c) *The means by which these hazards may be overcome, including the need for development setbacks, and/or capping methods*."

MNRF petroleum records within 500 m of the Site were reviewed and two records (F019945 & F014322) were identified with a third record situated just beyond the 500 m boundary. The two records within the 500 m boundary are located northeast of the Site, approximately 360 m and 320 m respectively, from the Site boundary (Figure 2). The third record (F014331) is located approximately 510 m south of the Site boundary.

All three MNRF petroleum records were natural gas wells and are recorded as 'abandoned', i.e. decommissioned, (Oil, Gas and Salt Resources Library, 2025) (Appendix C). No active petroleum wells plot at the Site (http://www.ogsrlibrary.com/wellcards/) and none were identified on-site during the June, 2025 site visit.

4.0 Physical Setting

The Site is flat with a ground surface elevation of generally 177 metres above sea level (m ASL) with some areas noted as about 176 m ASL (Figure 5) (NPCA, 2025).

The Site is located within the Big Forks Creek (BFC) East Kelly Subwatershed of the Central Welland River (CWR) Watershed, which outlets to Big Forks Creek and then the Welland River (NPCA, 2025).

The East Kelly Drain is located along the northern boundary of the Site with intermittent flow west to east (OMAFRA, 2025). Surface runoff from the Site can either be captured by the ditch tributary north of the Site or by ephemeral agricultural ditches located east on-site or off-site to the south (NPCA, 2017) (Figure 2). An agricultural pond is also present in the northern portion of the Site (NPCA, 2025).

4.1 Soils

The soils are mapped as Tavistock soils (see Figure 6, below), which are described as silty clay loam that is imperfectly drained and moderate to slowly permeable soils, with relatively high water-holding capacities and moderate to high surface runoff (Ontario Ministry of Agriculture and Food and Rural Affairs) (OMAFRA), 1989). Tavistock soils have 40 to 100 cm of loamy sediments over a lacustrine silty

clay subsoil (OMAFRA, 1989). The Tavistock soils are hydrologic soil group C (Table 2, below), and the Site is not reported as tile drained (OMAFRA, 2025). In contrast to 'silty clay loam' Chapman and Putnam (1984) regionally mapped the Site as part of the Norfolk Sand Plain; to resolve this discrepancy and better characterize the local subsurface conditions, six hand-auger investigations were completed onsite (Figure 5).

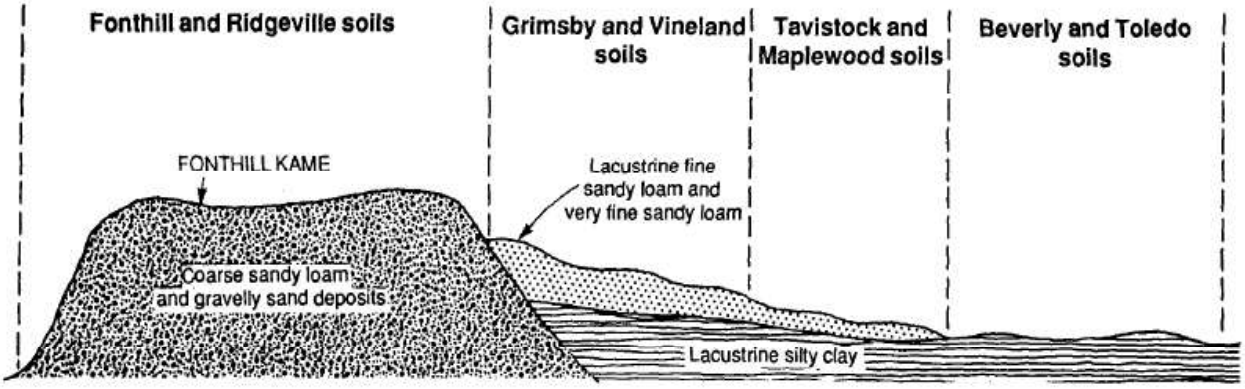


Figure 6 - Schematic landscape cross-section showing the relationship of soils on the Fonthill Kame and its southern slopes (OMAFRA, 1989).

Table 2 - Hydrologic Soil Groups (USDA, 1986)

HSG Group	Soil description
A	sand, loamy sand or sandy loam
B	silt loam or loam
C	sandy clay loam
D	clay loam, silty clay loam, sandy clay, silty clay or clay

Five of the six soil hand-auger locations of the C horizon were brown to grey silty clay (i.e. HA-1, HA-2, HA-3, HA-4 and HA-6) with HA-5 having some sand with silt. Two samples (HA-2 and HA-5) were submitted for laboratory grain-size analysis. Table 3 presents the comparison of the grain-size results for HA-2 and HA-5 with the OMAFRA mapped Tavistock soils and the nearby Maplewood soils. The grain-size distribution of HA-2 is consistent with Tavistock soils, both of which are described by Fetter (1994) as silty clay. The HA-5 sample, which exhibited the highest sand content, was classified by Fetter (1994) as clay-silt. Maplewood soils, which display a similar grain-size distribution to HA-5, are described as clay.

Table 3 – Horizon C Grain-size Analyses Summary

Soil Name or Location (depth)	Gravel %	Sand %	Silt %	Clay %	Surface Texture
Tavistock [1] (>64 cm)	0	7	49	44	Silty Clay [3]
HA-2 [2] (70-90 cm)	0	4	47	49	Silty Clay [3]
HA-5 [2] (75-95 cm)	0	26	52	22	Clay-Silt [3]
Maplewood [1] (>57 cm)	0	19	51	30	Clay [3]

Notes: [1] – Kingston and Presant, 1989, [2] – HydrogeoSieve (Appendix E), [3] – Fetter, 1994

The on-site hand-augers (and grain-size analyses) indicate that the soils are predominantly silty clay, consistent with the Haldimand Clay Plain, based on a series of shallow hand-auger investigations, not Norfolk Sand Plain.

4.2 Overburden Geology

The surficial geology of the Site is regionally mapped as sand and silt, (OGS, 2003), with an overburden thickness mapping of approximately 43 m thick at the Site (NPCA, 2013). However, as noted in Section 4.1, shallow on-site hand-auger investigations indicate that the local shallow surficial geology consists primarily of silty clay. Additionally, as referenced in Section 3.1 and illustrated in Figure 3, local and nearby MECP Water Well Records show that the upper 20 m of overburden is composed primarily of clay.

A geologic cross-section through the Site shows that there is at least 18 metres of low permeability clay underlying the Site (Figure 3) consistent with a regional geological section produced by the Ontario Geological Survey (Appendix E, L-L'), which also visualizes the Site as underlain by a series of low permeability materials.

4.3 Bedrock Geology

The underlying bedrock is mapped as the Salina Formation, which can be described as evaporite-bearing (gypsum), argillaceous dolostone and shale and can be found at a depth of 44 m BGS at the Site (OGS, 2017).

4.4 Hydrogeologic Setting

The Site is underlain by silty clay, a low permeability overburden aquitard which protects the underlying bedrock aquifer as described below and shown in cross-section (Figure 3). This low permeability material protecting the bedrock aquifer was shown in water well records and in on-site hand-augering.

4.4.1 Overburden Aquitard

The Site is located close to Ontario Geological Survey (OGS) borehole BH08-NP-2014 which also identified 10 metres of Upper Whittlesey Aquitard consisting of silt (Burt, 2020, Appendix E, Figure 2). This is consistent with classification of the glaciolacustrine unit as an overburden aquitard by Gartner Lee Limited (1987) where the '*horizons will not transmit appreciable quantities of water*". The hydraulic conductivity of this silty clay aquitard is reported as $7x10^{-7}$ m/s, or less (GLL, 1987).

Two soil samples were collected from the Site (Figure 5) using a shallow hand-auger from a depth of 0.7 - 0.9 m BGS and submitted to a laboratory for grain-size analyses (Appendix E). The Excel-tool HydrogeoSieveXL (Devlin, 2015) was used to process the grain-size analyses to provide a shallow soil hydraulic conductivity estimate of $4x10^{-10}$ m/s at the HA-2 location and $2x10^{-8}$ m/s at the HA-5 location (Appendix E).

Gartner Lee Limited (1987) provides a good description of the expected water table conditions within the overburden aquitard:

> "*Detailed studies indicate that the water table fluctuates over the weathered/fractured upper two to three metres of the glaciolacustrine silts and clays comprising the overburden aquitard…flow in this shallow zone responds to daily climatic changes such that, during precipitation, the open fractures from weathering will quickly fill with water. The bulk of the discharge will then occur locally in swales that carry intermittent surface water …. The remainder will go to depth to recharge the ground water system.*"

Regional groundwater flow in the overburden aquitard is expected to follow topography (i.e. in a northeast direction) while being limited in velocity by the low hydraulic conductivity (Haitjema and Mitchell-Bruker, 2005). The vertical groundwater gradient is downwards from the overburden aquitard to the bedrock aquifer (NPCA, 2005). However, the groundwater flow would be limited by the low hydraulic conductivity of the silt and clay.

4.4.2 Bedrock Aquifer

The uppermost part of the bedrock is an aquifer where weathered, having "…*a higher hydraulic conductivity than the same formation at depth…attributed to weathering of the bedrock surface*…" (GLL, 1987).

The potentiometric surface of the bedrock aquifer has been mapped as close to 173 m ASL in the area of the Site with flow also towards the northeast (NPSPA, 2013).

The bedrock aquifer has been regionally mapped as having a low intrinsic susceptibility to contamination (NPCA, 2005) due to the protection provided by the overlying low permeability materials, e.g. silty clay.

4.4.3 Confined Bedrock Aquifer Conceptual Model

The Section 4.0 information is summarized in the schematic below, as a conceptual model for the assessment of potential sewage system impacts to groundwater and private wells (Figure 6).

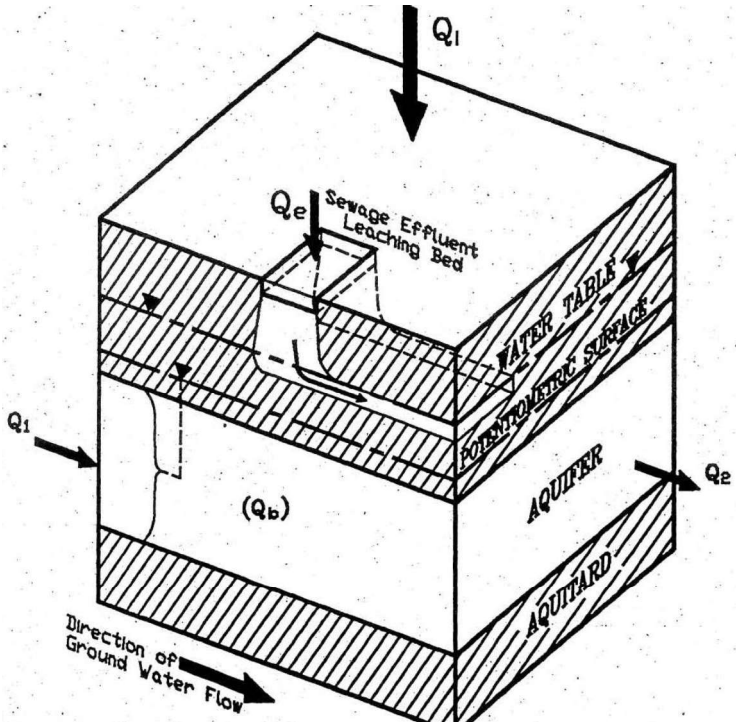


Figure 6 - Confined Aquifer Impact Assessment Subsurface Sewage System (MECP, 1995)

5.0 Water Use Survey Results

A water use and septic system survey (Appendix D) was hand delivered on June 18, 2025 to the seven parcels located within 100 m of the Site (Figure 4). Although no completed surveys were returned, Terra-Dynamics staff were able to speak directly with residents at three of the seven properties during survey delivery. The resident at 43239 Pettit Road confirmed their drinking water is supplied via a cistern but was unsure whether an old well exists on their property. The resident at 43229 Pettit Road also indicated the use of a cistern for drinking water and confirmed there is no well on their property. At 43240 Pettit Road, the resident noted that their drinking water is supplied by a cistern, however, an old private well remains on-site and located along the south edge of the house. The resident specified that the well was only used for outdoor purposes. This private well is located over 30 m from the Site and over 120 m from the Site's closest septic system and therefore will not have any impact to the proposed severance. No responses were received from the remaining four properties.
Based on a review of the limited MECP water well records near the Site and the information obtained during these discussions, it appears that all nearby residential properties rely on trucked-in water stored in cisterns for their potable water supply.

6.0 Assessment of Potential Sewage Impacts

Provincial Procedure D-5-4 (MECP, 1996a) provides an assessment process for assessing the groundwater impact potential of private sewage systems. The purpose of the assessment process "*is to ensure that the combined effluent discharges from all the individual on-site sewage systems in a development will have a minimal effect on the groundwater and the present or potential use of the adjacent property"* (MECP, 1996a).

This assessment process involves two main steps: (i) consideration of system isolation and if required, (ii) contaminant attenuation, as visualized below on Figure 7.

6.1 System Isolation

> *"Developments will normally be considered as low risk where it can be demonstrated that sewage effluent is hydrogeologically isolated from … supply aquifer(s)"* (MECP, 1996a).

The Design Guidelines for Sewage Works (MECP, 2008) provides criteria for evaluation of sewage system isolation from the underlying bedrock aquifer:

> "*Where it can be shown that the uppermost subsurface unit(s) at an infiltration facility have a vertical hydraulic conductivity of 10^{-5} cm/sec* (10^{-7} m/sec) *or less, is at least 10 metres (33 feet) thick and extends at least 100 m (330 ft) downgradient of the infiltration area, attenuation calculations may not be required."*

The overburden aquitard has a sufficiently low hydraulic conductivity (Section 4.4.1), and mapping of the aquitard shows over 10 m of thickness at the Site (Figure 3) extending over 100 m downgradient of the septic beds.

Consequently, private sewage servicing of the house (Figure 2) is (i) a low risk to the contact-zone aquifer, and (ii) nearby bedrock water supply wells, because the Site is hydrogeologically isolated from the aquifer. This conclusion is based upon the thickness and extent of the underlying aquitard as greater than the 10 m MECP criterion for hydrogeologic isolation (MECP, 2008).

As there is consistent documentation confirming these conditions at the Site, new collection of geologic information is not required.

Further to the guidance of Provincial Procedure D-5-4 under Step 2 (contamination attenuation), it is worth noting that the effluent will infiltrate into the surficial clay and silt soils, become anaerobic, and consequently denitrify (Robertson et al, 1996).

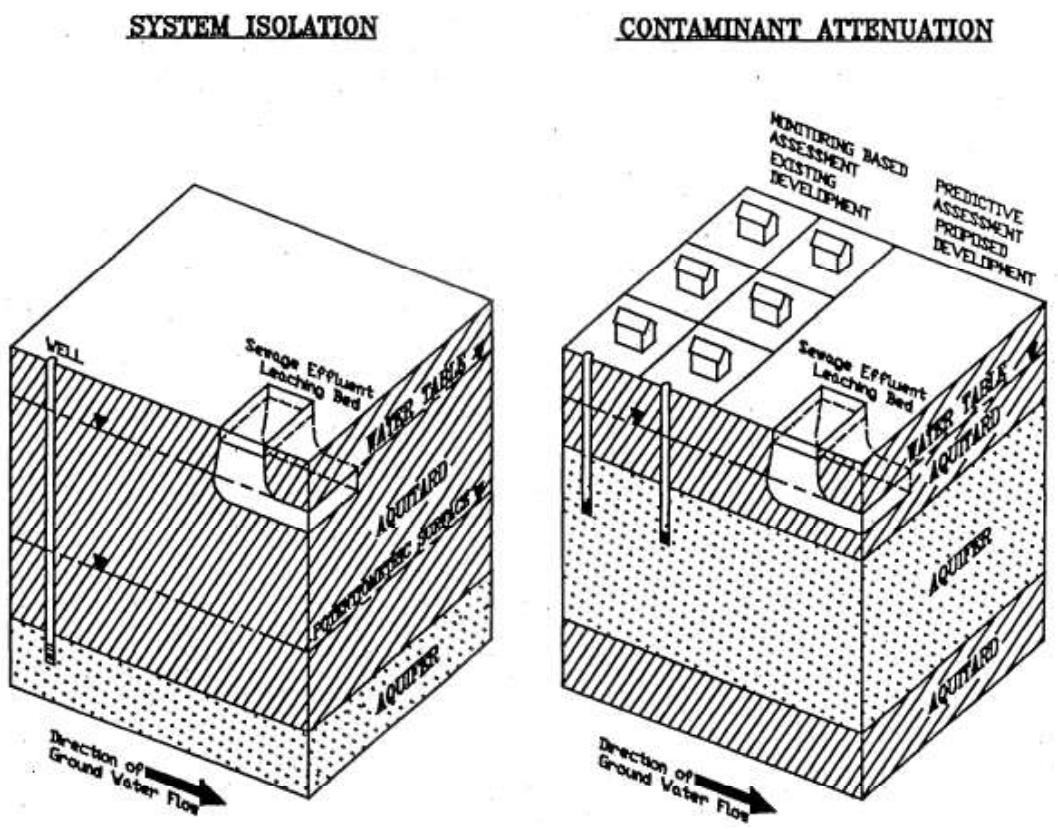


Figure 7 – Water Quality Assessment Process (MECP, 1995)

No sewage effluent will enter the water supply aquifer, hence "*the lot density of the proposed development may be dictated by… the need for sewage system replacement areas… and by the minimum distances… as defined by Ontario Regulations...*" (MECP, 1996a). In this case that density is a minimum of 4,047 m^2, 0.405 hectares or 1.0 acre (Township of Wainfleet, 2016).

Consequently, no contamination attenuation calculations are required to be completed, because:

> "*…where it has been demonstrated that the sewage effluent will not enter supply aquifers, the lot density of the proposed development may be dictated by factors such as the need for sewage system replacement areas, and by the minimum distances between individual on-site beds and wells* (or cisterns)*, as defined by Ontario Regulations…*" (MECP, 1996a)

6.2 Sewage System Effluent Disposal Location Considerations

The existing residence and greenhouse cisterns on the Site are positioned greater than 15 metres away from the leaching bed of the residence sewage system (Figure 4).

7.0 Conclusions and Recommendations

7.1 Conclusions

The following conclusions are provided:

1. The Site soils are predominantly silty clay, consistent with the Haldimand Clay Plain, based on a series of shallow hand-auger investigations. The Haldimand Clay Plain is recognized as a regional aquitard that does '*not transmit appreciable quantities of water*";

2. The silty clay aquitard beneath the Site has sufficiently low permeability, is greater than 10 m in thickness, and extends greater than 100 m from the Site to be classified as a low permeability environment;

3. The bedrock/contact-zone aquifer is hydrogeologically isolated from the existing and proposed sewage disposals systems by the underling silty clay aquitard.

4. No MNRF Petroleum Well records were located at the Site, nearby Petroleum Wells are recorded as abandoned;

5. No potable water supplies have been identified off-site exerting Part 8 Ontario Building Code set-backs on the proposed sewage disposal systems

6. No sewage effluent is predicted to enter the water supply aquifer, hence "*the lot density of the proposed development may be dictated by… the need for sewage system replacement areas… and by the minimum distances… as defined by Ontario Regulations...*" (MECP, 1996a). In this case that density is a minimum of 4,047 m^2, 0.405 hectares or 1.0 acre (Township of Wainfleet, 2016); and

7. There were no hydrogeological-based impediments to the proposed boundary adjustment and site development, given the following recommendations are implemented.

7.2 Recommendations

The following recommendations are provided for your consideration:

1. The future surplus farm dwelling consent, or severance can be a minimum of 0.4 hectares as per the requirements of the Township of Wainfleet and Niagara Region; and

2. A development agreement be completed with the Township of Wainfleet indicating water supply be via cistern.

We trust this information is sufficient for your present needs. Please do not hesitate to contact the undersigned if you have any questions.

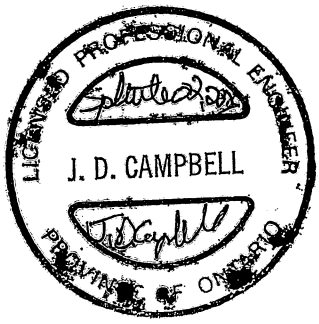
Yours truly,

TERRA-DYNAMICS INC.

Dan Baker, B.Sc., G.I.T
Geologist In Training

Jayme D. Campbell, P. Eng.
Senior Water Resource Engineer

Attachments
Figure 1 - Location of Subject Lands
Figure 2 – Regional Details
Figure 3 – Hydrogeologic Cross-Section
Figure 4 – Site Details
Figure 5 – Site Details Part 2
Table 1 – MECP WWIS Well Records
Appendix A – Terms of Reference
Appendix B - MECP Water Well Logs
Appendix C – Petroleum Well Data
Appendix D – Water Use and Septic System Survey
Appendix E – Supporting Information



8.0 References

Burt, A.K., 2020. Results of the 2014-2017 drilling programs on the Niagara Peninsula: Graphic logs, descriptions and analytical data; Ontario Geological Survey, Miscellaneous Release – Data 383.

Campbell, J.D., and Burt, A.K., 2016. Filling Groundwater Data Gaps in the Niagara Region to Assist Decision-Making Processes. Ontario Geological Survey Open File Report 13-018

Devlin, J.F., 2015. HydrogeoSieveXL: an Excel-based tool to estimate hydraulic conductivity from grain-size analysis.

Feenstra, B.H. 1984. Quaternary Geology of the Niagara-Welland Area; Ontario Geological Survey, Map 2496, Quaternary Geology Series, Scale 1:50 000, Geology1969-1972.

Fetter, C.W. (1994) Applied Hydrogeology. 3rd Edition, Macmillan College Publishing Company, New York.

Gartner Lee Limited (GLL), 1987. *Water Resources of the Niagara Frontier and the Welland River Drainage Basin.* Prepared for the Ontario Ministry of the Environment.

Haitjema, H.M. and Mitchell-Bruker, S., 2005. Are Water Tables a Subdued Replica of the Topography?, Vol. 43, No.6 – GROUND WATER, pg. 781-786.

Ministry of Agriculture, Food and Rural Affairs (OMAFRA), 2025. AgMaps. https://www.gisapplication.lrc.gov.on.ca/AIA/index.html?viewer=AIA.AIA&locale=en-US

Ministry of Agriculture and Food (and Rural Affairs) (OMAFRA), 1989. The Soils of the Regional Municipality of Niagara.

Ministry of the Environment, Conservation and Parks (MECP), 2025. www.ontario.ca/environment-and-energy/map-well-records.

Ministry of the Environment, (Conservation and Parks) (MECP), 2008. Design Guidelines for Sewage Works.

Ministry of the Environment (Conservation and Parks) (MECP), 1996a. Procedure D-5-4, Technical Guideline for Individual On-site Sewage Systems: Water Quality Impact Assessment.

Ministry of the Environment (Parks and Conservation) (MECP), 1996b. Procedure D-5-5, Technical Guideline for Private Wells: Water Supply Assessment.

Ministry of the Environment and Energy (Conservation and Parks) (MECP), 1995. MOEE Hydrogeological Technical Information Requirements for Land Development Applications.

Niagara Peninsula Conservation Authority (NPCA), 2025. Watershed Explorer. https://www.arcgis.com/apps/webappviewer/index.html?id=c7555050c8f24a7cbc829395557a7988

Niagara Peninsula Conservation Authority (NPCA), 2005. NPCA Groundwater Study. Report prepared by Waterloo Hydrogeologic Inc.

Niagara Peninsula Conservation Authority (NPCA), 1999. Port Robinson West Subwatershed Study.

Niagara Peninsula Conservation Authority and AquaResource Inc., 2010. Niagara Peninsula Tier 1 Water Budget and Water Quantity Stress Assessment, Final Report, Niagara Peninsula Source Protection Area.

Niagara Peninsula Source Protection Authority (NPSPA), 2013. Updated Assessment Report.

Niagara Region, 2025. Email from S. Dunsmore, Acting Director of Infrastructure Planning & Development Engineering.

Niagara Region, 2022. Niagara Official Plan.

Oil, Gas and Salt Resources Library, 2025. Well Search http://www.ogsrlibrary.com/wellcards/ .

Ontario Geological Survey (OGS), 2017. Paleozoic Geology, Welland-Fort Erie Area, Southern Ontario. Map P.3811.

Ontario Geological Survey (OGS), 2003. Surficial geology of southern Ontario. Miscellaneous Release Data – 128. Project Summary and Technical Document, 53 pp.

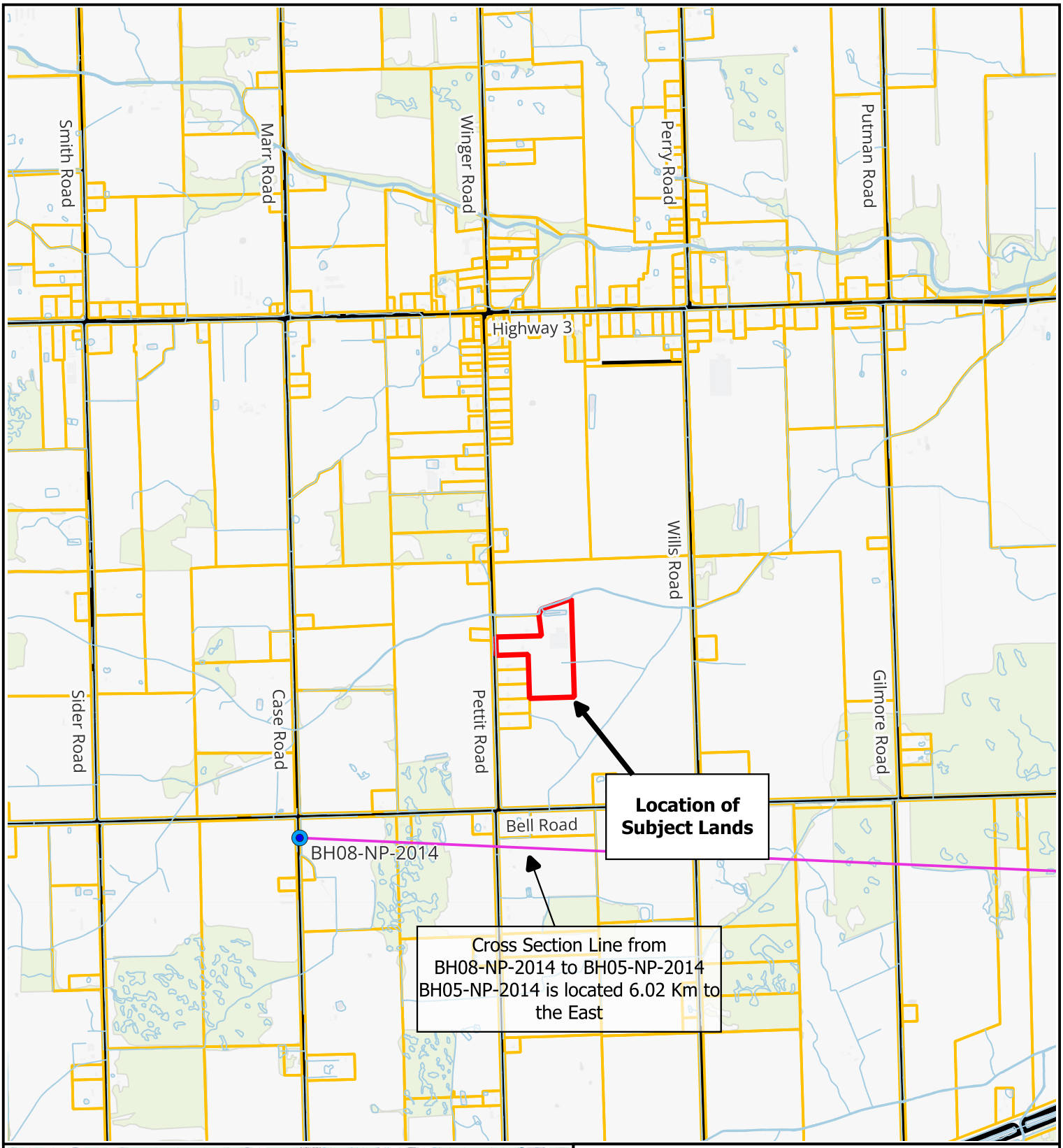
Robertson, W.D., Russell, B.M., Cherry, J.A., 1996. Attenuation of nitrate in aquitard sediments of southern Ontario. Journal of Hydrology, vol.180, p. 267-281.

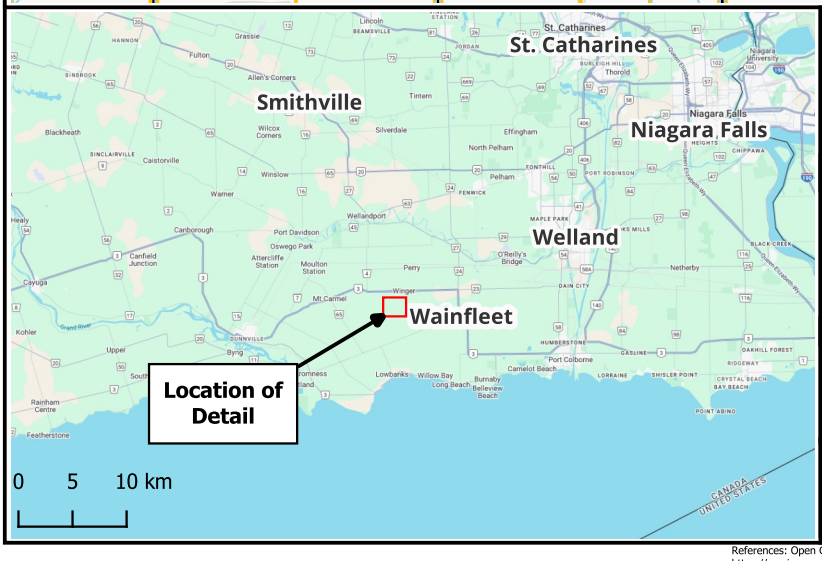
Singer, S.N., Cheng, C.K. and Scafe, M.G., 2003. The Hydrogeology of Southern Ontario 2nd Edition. Environmental Monitoring and Reporting Branch, Ministry of the Environment.

Township of Wainfleet, 2025. Email from S. Ivins, Planner, Assistant Secretary-Treasurer-Committee of Adjustment

Township of Wainfleet, 2016. Township of Wainfleet Official Plan

United States Department of Agriculture (USDA), 1986. Urban Hydrology for Small Watersheds.





Location of Subject Lands

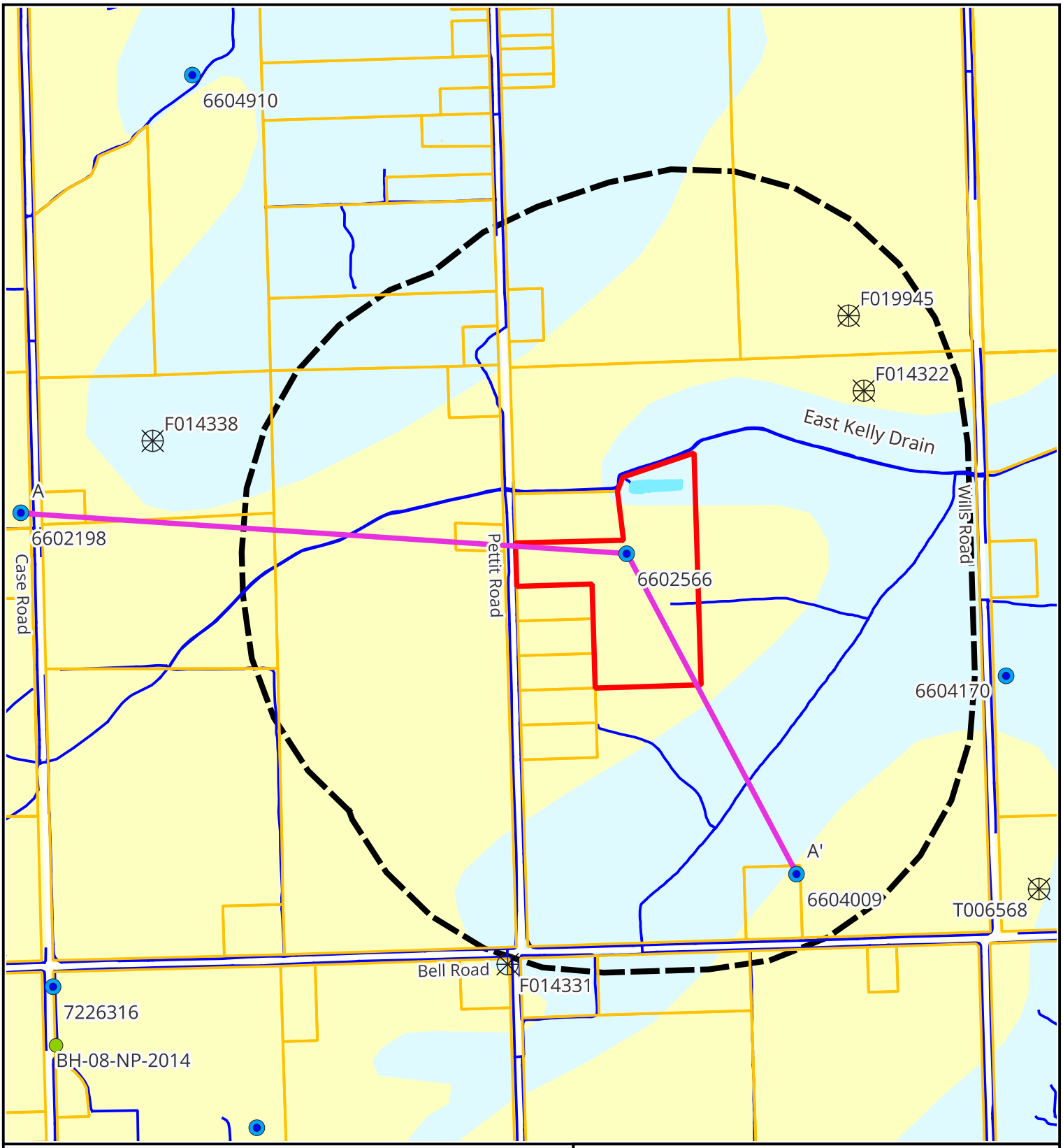
Hydrogeological Report
43237 Pettit Road, Wainfleet ON

Terra-Dynamics inc.
432 Niagara Street, Unit 2 St. Catharines, ON L2M 4W3

0 500 m

Figure 1

References: Open Government Licence – Ontario. Niagara Region: Urban Area Boundaries, Rural Settlements, Waterbodies, Watercourses/Base Map: ESRI. "Gray" https://services.arcgisonline.com/ArcGIS/rest/services/Canvas/World_Light_Gray_Base/MapServer. Base Map: "Google Roads" https://mt1.google.com/vt/lyr



- Site Outline
- 500m Buffer of Site
- Parcels
- Petroleum Wells (MNRF)
- Water Wells (MECP WWIS)
- Ontario Geological Survey Borehole
- Hydrogeologic Cross Section Location
- Agricultural Pond
- Ditches or Creeks of East Kelly Drain

Surficial Geology

- Clay
- Sand

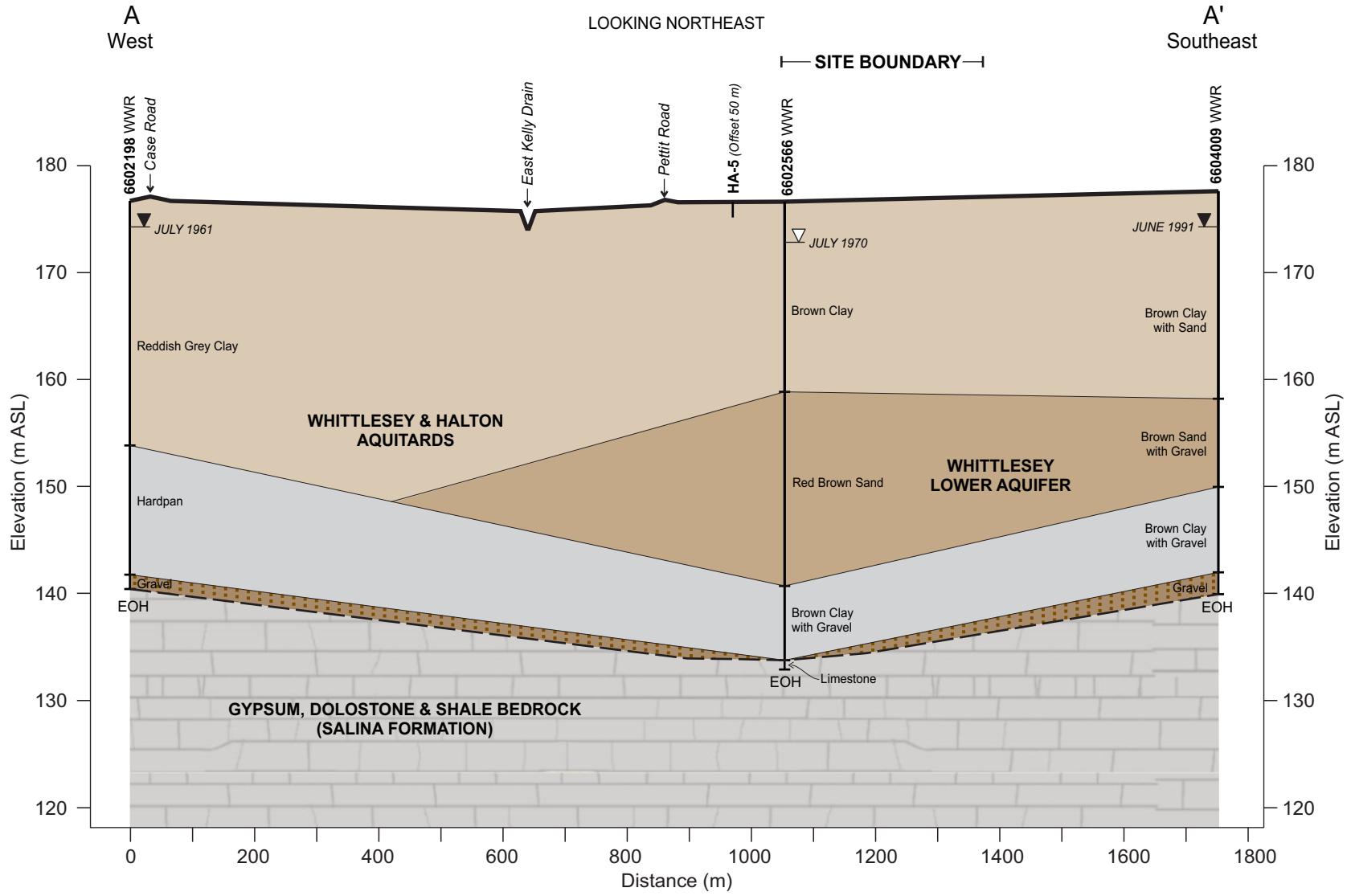
Regional Details

Hydrogeological Report 43237 Pettit Road, Wainfleet ON

Terra-Dynamics inc.
432 Niagara Street, Unit 2 St. Catharines, ON L2M 4W3

0 100 200 m

Figure 2



▼ Overburden Water Well Level on Date Noted

▽ Bedrock Water Well Level on Date Noted

WWR Waterwell Record

EOH End of Hole

— — Inferred

See Figure 2 for location of cross-section.

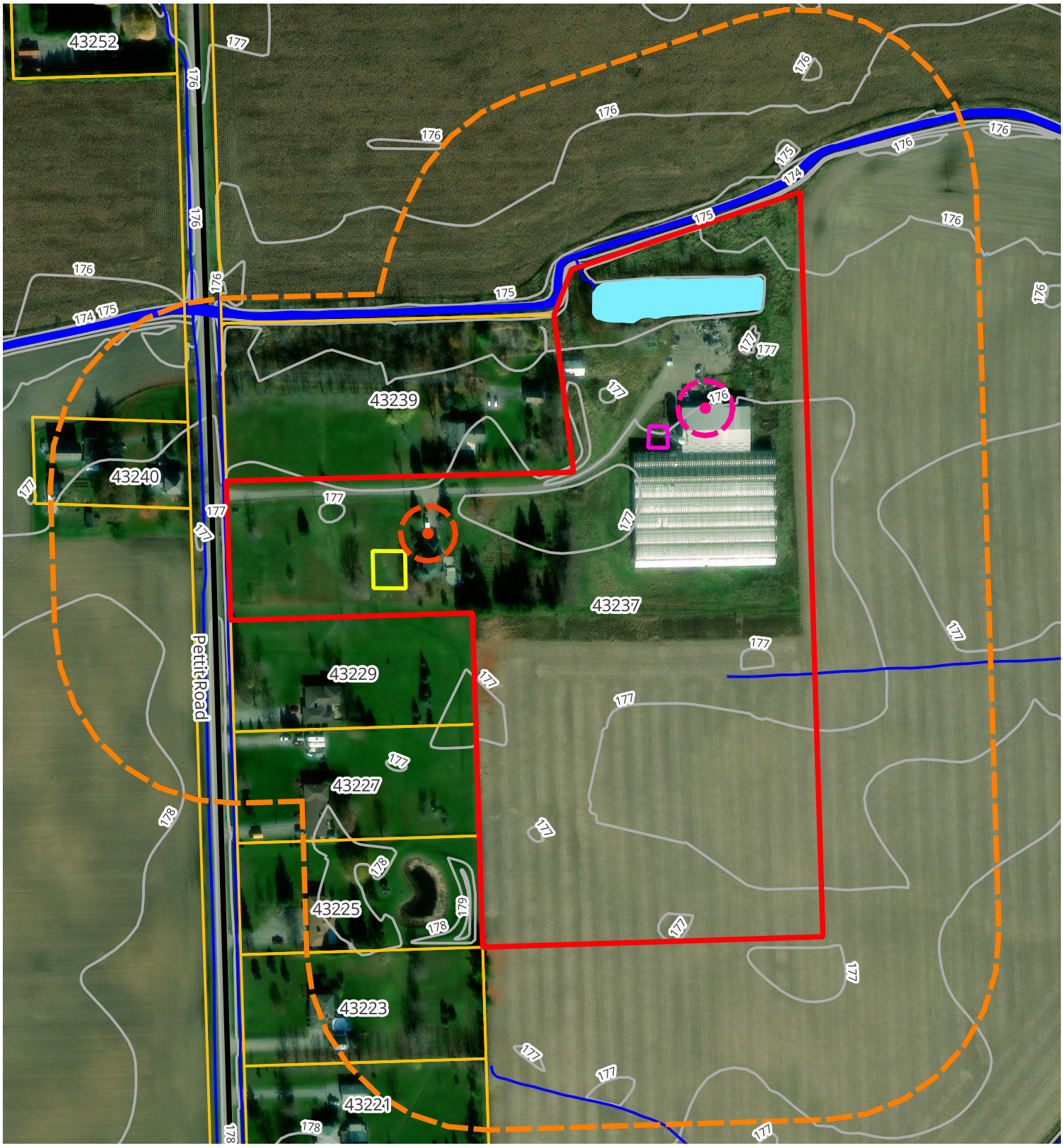
Hydrogeologic Cross-section

Hydrogeological Report
43237 Pettit Road, Wainfleet, ON

Terra-Dynamics inc.

Figure 3

H:\TERRA_DYNAMICS\9901 - TD 43237 Pettit Road\corel\Figure 3 Hydrogeologicl Cross-section A-A.cdr Revised: Septmeber 15, 2025.



- 100 m Buffer of Site
- Site Outline
- Parcels
- Agricultural Pond
- Ditches or Creeks of East Kelly Drain
- Ground Contours (m ASL)
- House Septic Bed
- Greenhouse Septic Bed
- Greenhouse Cistern
- Greenhouse Cistern 15m Buffer
- House Cistern 15m Buffer
- House Cistern

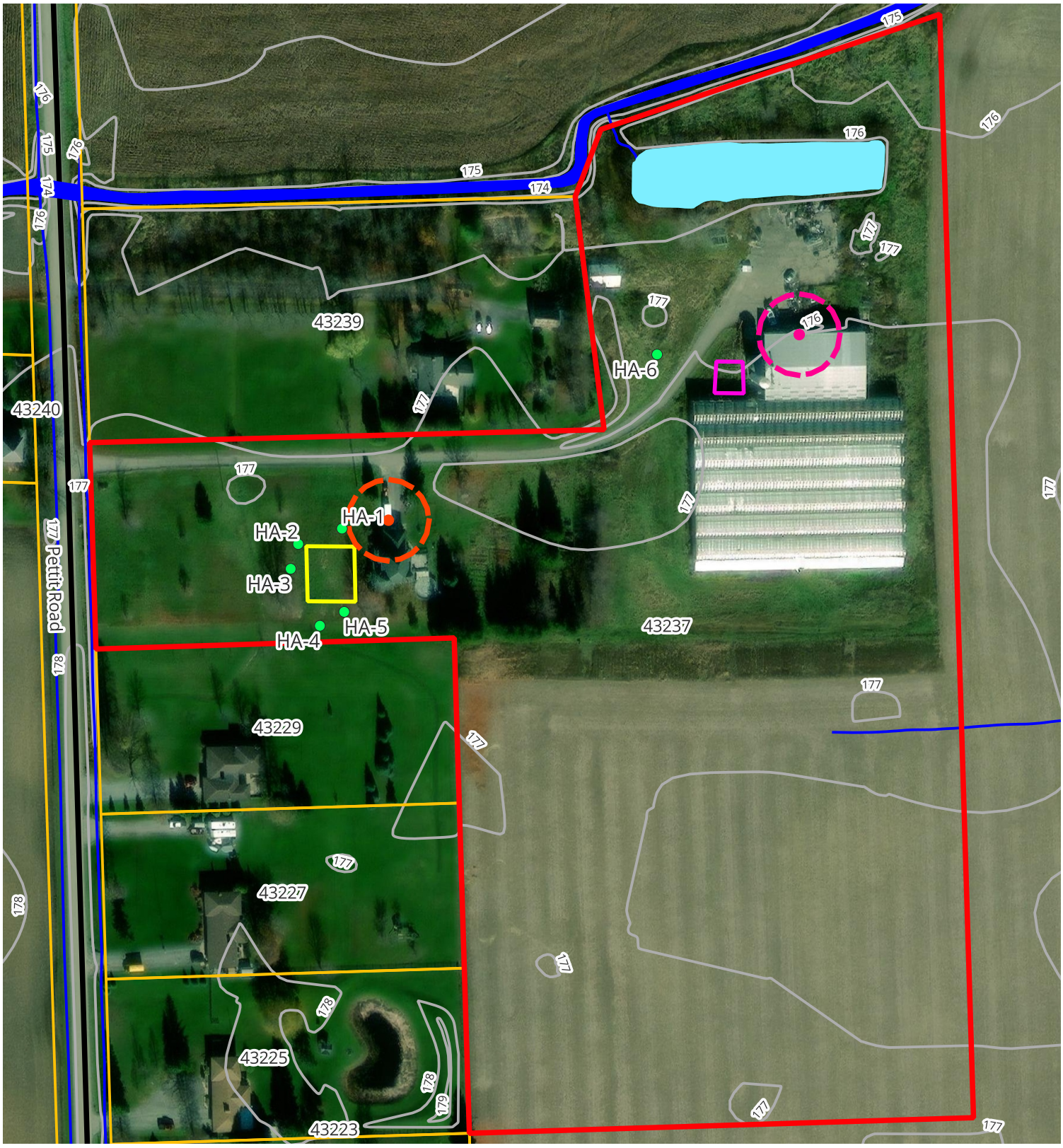
Site Details

Hydrogeological Report
43237 Pettit Road,
Wainfleet ON

Terra-Dynamics inc.
432 Niagara Street, Unit 2 St. Catharines, ON L2M 4W3

0 40 80 m

Figure 4



- Site Outline
- Parcels
- Agricultural Pond
- Ditches or Creeks of East Kelly Drain
- Ground Contours (m ASL)
- House Septic Bed
- Greenhouse Septic Bed
- Greenhouse Cistern
- Greenhouse Cistern 15m Buffer
- House Cistern 15m Buffer
- House Cistern
- Hand Augers

Site Details Part 2

Hydrogeological Report 43237 Pettit Road, Wainfleet ON

Terra-Dynamics inc.
432 Niagara Street, Unit 2 St. Catharines, ON L2M 4W3

0 25 50 m

Figure 5

Table 1: Ministry of the Environment, Conservation and Parks (MECP) Water Well Information System (WWIS) Well Records

WWIS	Year Constructed	Bedrock Depth (mBGS)	Static Water Level (mBGS)	Finished Well Depth (mBGS)	Depth into Bedrock (m)	Approximate Well Diameter (inches)	Purpose	Material Summary
6602198	1961	NA	2.4	36.6	0.0	18.0	Domestic	0m - 22.9m (redish grey clay), 22.9m - 35.1m (hardpan), 35.1m - 36.6m (gravel)
6602566 *	1970	43.9	4.3	44.2	0.3	8.0	Irrigation	0m - 18.3m (brown clay), 18.3m - 36.6m (red brown sand), 36.6m - 43.9m (brown clay with gravel), 43.9m - 44.2m (grey limestone)
6604009	1991	NA	3.4	37.8	0.0	6.0	Domestic	0m - 19.5m (brown clay with sand), 19.5m - 27.7m (brown sand with gravel), 27.7m - 35.7m (brown clay with gravel), 35.7m - 37.8m (grey gravel)
6604170	1994	NA	2.4	13.4	0.0	48.0	Domestic	0m - 4.6m (NA), 4.6m - 5.2m (blue clay), 5.2m - 5.5m (grey sand and gravel), 5.5m - 13.4m (blue clay with silt layers)
Median		43.9	2.9		0.0			
Average		43.9	3.1		0.1			

Notes:
NA (Not Available), BGS (Below Ground Surface), m (metres)
* - WWR 6602566 was recently decommissioned in September 2024

Appendix A

Terms of Reference

Terra-Dynamics inc.
432 Niagara Street, Unit 2 St. Catharines, ON L2M 4W3

June 11, 2025

Niagara Region
Susan M. Dunsmore, P. Eng.
Acting Director, Infrastructure Planning & Development Engineering
1815 Sir Isaac Brock Way
Thorold, ON L2V 4T7

Township of Wainfleet
Sarah Ivins, B.U.R.Pi., Dipl. M.A., ACST
Planner, Assistant Secretary-Treasurer-Committee of Adjustment
31940 Highway #3, P.O. Box 40
Wainfleet, ON L0S 1V0

Re: Hydrogeological Study Terms of Reference – 43237 Pettit Road, Township of Wainfleet, ON

Dear Ms. Dunsmore and Ms. Ivins,

1.0 Introduction, Background Information and Purpose

Terra-Dynamics Inc. (Terra-Dynamics) respectfully submits this proposed Hydrogeological Study Terms of Reference to complete a hydrogeological study of sewage impacts to support a consent, or severance, of a surplus farm dwelling from 43237 Pettit Road, Township of Wainfleet (the Site). The hydrogeological study is a requirement of Niagara Region and the Township of Wainfleet (Township of Wainfleet, 2024) with relevant official plan policies listed below.

Niagara Official Plan Policy 4.1.9.2(b) [Niagara Region, 2022]:

> *"the minimum size of the proposed and retained lots shall each be 1 hectare unless it is determined through a hydrogeological study, that considers potential cumulative impacts, that a smaller size lot will adequately accommodate private water and sewage treatment facilities for long-term operation but not be less than 0.4 hectares"*

Township of Wainfleet Official Plan policy (Township, 2016):

> *Policy 3.1.4.3 c) ii) The new lot is limited to the minimum size required to accommodate the dwelling, the associated sewage system and water supply, and protect surface and groundwater features,e) iii) Each new lot shall be approximately 0.4 hectares, unless additional land area is required to support a well and a septic system, and protect surface and groundwater features*

As the existing residence and greenhouse are provided potable water via cisterns, this study does not include a water supply assessment (MECP, 1996b). This will require a development agreement on the surplus farm dwelling for water supply by cistern.

2.0 Scope of Work

2.1 Water Well Record Search and Documentation

Water well records within 500 m of the Site will be mapped out using the Ministry of the Environment, Conservation and Parks (MECP) online database. They will be located on a site map and well log information will be summarized and documented in the report.

2.2 Water Well Survey

A water well and septic system survey questionnaire and explanation letter pertaining to the need for the survey, will be delivered to the developed parcels within 100 m of the Site. This is primarily to map existing water supplies and sewage infrastructure that may exert building code set-backs which must be conformed to during a site design process.

2.3 Site Visit

The subject property will be visited by a Terra-Dynamics' staff member to assess site conditions. This will include: (i) a hand-augered representative soil sample for laboratory grain-size analyses, and (ii) visually mapping the existing on-site septic system, cisterns and any water wells to inform of potential setbacks.

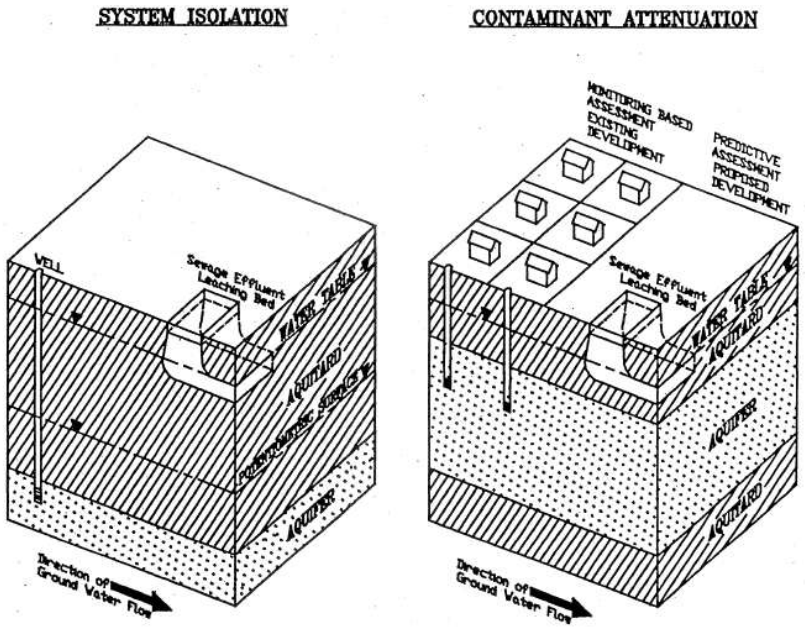
2.4 Description of Geologic and Hydrogeologic Setting

The Site's geologic and hydrogeologic settings will be described both in a regional, and local context, to assess the aquifer's vulnerability and sensitivity. A hydrogeologic cross-section will be prepared through the Site to summarize the physical setting.

2.5 Assessment of Sewage Impacts to Groundwater Supplies from Septic Systems

The potential sewage impacts to the groundwater system and private wells will be assessed. The assessment will use Provincial Procedure D-5-4 (MECP, 1996a). Provincial Procedure D-5-4 provides assessment processes for determining the potential groundwater impact of private sewage systems. The purpose of the assessment process "*is to ensure that the … effluent discharges from … the individual on-site sewage system*(s) *in a development will have a minimal effect on the groundwater and the present or potential use of the adjacent property"* (MECP, 1996).

This assessment process involves two main steps (visualized below): (i) consideration of system isolation and (ii) contaminant attenuation. If the underlying aquifer is confirmed as highly vulnerable (i.e. not isolated from at-surface activities), a contaminant assessment is completed to determine if there is sufficient dilution via infiltration. However, based upon our initial review of information we believe the Site is isolated from the underlying aquifers.



Individual On-Site Sewage System Water Quality Impact Risk Assessment (MECP, 1995)

2.6 Provision of a Report

A report documenting the hydrogeological study will be prepared for submittal to the Township of Wainfleet and Niagara Region for their review.

We trust this information is sufficient for your present needs. Please do not hesitate to contact us if you have any questions. Thank you for the opportunity to submit this Hydrogeologic Study Terms of Reference.

Yours truly,
TERRA-DYNAMICS INC.

Dan Baker, G.I.T.
Geologist-in-Training

Jayme D. Campbell, P. Eng.
Senior Water Resource Engineer

6.0 References

Ministry of the Environment (Parks and Conservation), 1996a. *Procedure D-5-4, Technical Guideline for Individual On-site Sewage Systems: Water Quality Impact Assessment*.

Ministry of the Environment (Parks and Conservation), 1996b. *Procedure D-5-5, Technical Guideline for Private Wells: Water Supply Assessment*.

Niagara Region, 2022. Niagara Official Plan.

Township of Wainfleet, 2024. Record of Pre-Consultation, 43237 Pettit Road, Thursday March 28, 2024.

Township of Wainfleet, 2016. Township of Wainfleet Official Plan. Prepared by Sorensen Gravely Lowes Planning Associates Inc., AgPlan Ltd., Cumming + Company, North-South Environmental Inc. and R&R Associates Inc.

Appendix B

MECP Water Well Logs

L.P.

UTM Z E

5 R 34 N

Elev. 4 R 0580

Basin 24

GROUND WATER BRANCH
NOV 14 1961
ONTARIO WATER RESOURCES COMMISSION

66 No 2198

The Ontario Water Resources Commission Act

WATER WELL RECORD

County or District Welland Township, Village, Town or City Wainfleet

Con. 10 Lot 34 Date completed 15 (day) July (month) 61 (year)

[redacted] dress R R 1 Wainfleet

Casing and Screen Record

Inside diameter of casing 1½"

Total length of casing 120'

Type of screen —

Length of screen —

Depth to top of screen —

Diameter of finished hole 1½"

Pumping Test

Static level 8'

Test-pumping rate 5' G.P.M.

Pumping level 15'

Duration of test pumping 2 hr.

Water clear or cloudy at end of test clear

Recommended pumping rate 5' G.P.M.

with pump setting of 25' feet below ground surface

Well Log

Overburden and Bedrock Record	From ft.	To ft.	Water Record: Depth(s) at which water(s) found	Water Record: Kind of water (fresh, salty, sulphur)
red soil grey clay	0	75'		
hardpan	75'	115'		
gravel	115'	120	115'	fresh with a slight sulphur odour

For what purpose(s) is the water to be used?

House & farm

Is well on upland, in valley, or on hillside? upland

Drilling or Boring Firm M. Deshaies

R.R.1 Wainfleet

Address

Licence Number 56

Name of Driller or Borer same as firm

Address

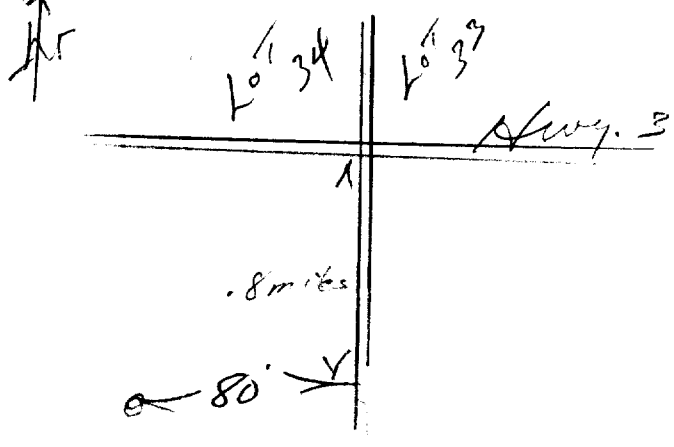
Date Nov. 7/61

Marcel Deshaies

(Signature of Licensed Drilling or Boring Contractor)

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



Form 7 15M Sets 60-5930

OWRC COPY

CSS.58

The Ontario Water Resources Commission Act

WATER WELL RECORD

304/14W
(304/14E)

Water management in Ontario

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 (1 2) 6602566 | MUNICIP. 66007 (10 14) | CON. CON (15) 04 (22 23 24)

COUNTY OR DISTRICT: Welland
TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: Wainfleet.
CON., BLOCK, TRACT, SURVEY, ETC.: CON 4
LOT: 30 31 32 031 (25-27)
OWNER (SURNAME FIRST): CHINA FARM. Ltd (28-47)
ADDRESS: R.R. 1 Wainfleet.
DATE COMPLETED: 07 (48-53) DAY 22 MO 7th YR 70 (I II IV)

21 (1 2) UTM ZONE 17 (10) EASTING 627570 (12-17) NORTHING 4754650 (18-24) RC. 4 (25) ELEVATION 80 0575 (26-29) RC. 4 (30) BASIN CODE 24 (31-47)

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH – FEET FROM	DEPTH – FEET TO
Brown	Clay &			0	60
Bl Brown	Sand.			60	120
Brown	Clay	& gravel.		120	144
Grey	Limestone			144	145

API

31 (1 2) 0960605 | 0120609 | 0144605/11 | 0145215
32 (10 14 15 21 32 43 54 65 75 80)

41 WATER RECORD

WATER FOUND AT – FEET	KIND OF WATER
0145 (13)	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL (14)
(15-18)	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL (19)
(20-23)	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL (24)
(25-28)	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL (29)
(30-33)	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL (34) (80)

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH – FEET FROM	DEPTH – FEET TO
(10-11) 8 08	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE (12)	.188	0	~~144~~ 0144 (13-16)
(17-18)	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE (19)		144	0145 ~~145~~ (20-23)
(24-25)	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE (26)			(27-30)

SCREEN

SIZE(S) OF OPENING (SLOT NO.): Nil. (31-33) | DIAMETER (34-38) INCHES | LENGTH (39-40) FEET
MATERIAL AND TYPE | DEPTH TO TOP OF SCREEN (41-44) FEET (80)

61 PLUGGING & SEALING RECORD

DEPTH SET AT – FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
(10-13)	(14-17)	
(18-21)	(22-25)	
(26-29)	(30-33) (80)	

71 PUMPING TEST

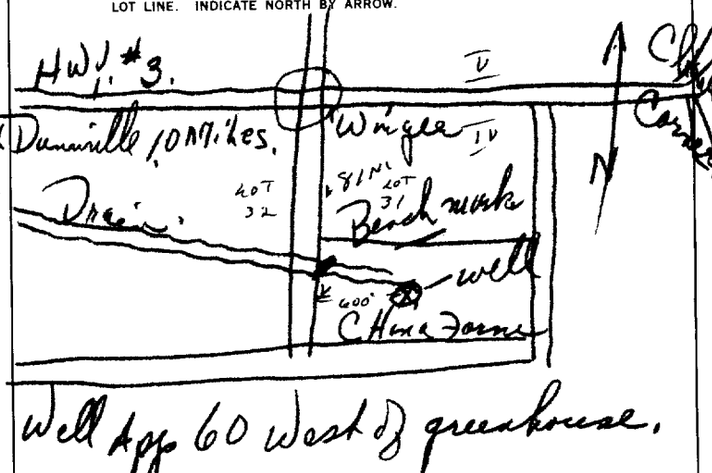
PUMPING TEST METHOD (10): 1 ☐ PUMP 2 ☒ BAILER
PUMPING RATE (11-14): 0050 50 gal GPM.
DURATION OF PUMPING (15-16 HOURS, 17-18 MINS.): 00 HOURS 30 MINS.
25 WATER LEVELS DURING: 1 ☒ PUMPING 2 ☐ RECOVERY

STATIC LEVEL	WATER LEVEL END OF PUMPING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
014 B6 (19-21) FEET	014 B6 (22-24) FEET	014 B6 (26-28) FEET	014 B6 (29-31) FEET	(32-34) FEET	(35-37) FEET

IF FLOWING, GIVE RATE (38-41) GPM. | PUMP INTAKE SET AT FEET | WATER AT END OF TEST (42): ☒ 1 CLEAR 2 ☐ CLOUDY
RECOMMENDED PUMP TYPE: ☒ SHALLOW ☐ DEEP | RECOMMENDED PUMP SETTING (43-45) 020 FEET | RECOMMENDED PUMPING RATE (46-49) 0040 GPM.
(50-53) 100-0 GPM./FT. SPECIFIC CAPACITY

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



Well App 60 West of greenhouse.

DRILLERS REMARKS:

FINAL STATUS OF WELL (54)

☒ 1 WATER SUPPLY ☐ 2 OBSERVATION WELL ☐ 3 TEST HOLE ☐ 4 RECHARGE WELL ☐ 5 ABANDONED, INSUFFICIENT SUPPLY ☐ 6 ABANDONED, POOR QUALITY ☐ 7 UNFINISHED

WATER USE (55-56) 03

☐ 1 DOMESTIC ☐ 2 STOCK ☒ 3 IRRIGATION ☐ 4 INDUSTRIAL ☐ OTHER ☐ 5 COMMERCIAL ☐ 6 MUNICIPAL ☐ 7 PUBLIC SUPPLY ☐ 8 COOLING OR AIR CONDITIONING ☐ 9 NOT USED

METHOD OF DRILLING (57)

☒ 1 CABLE TOOL ☐ 2 ROTARY (CONVENTIONAL) ☐ 3 ROTARY (REVERSE) ☐ 4 ROTARY (AIR) ☐ 5 AIR PERCUSSION ☐ 6 BORING ☐ 7 DIAMOND ☐ 8 JETTING ☐ 9 DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: CULVER DRILLING Co Ltd | LICENCE NUMBER: 1661
ADDRESS: George Culver 431 Main St Dunnville Ont
NAME OF DRILLER OR BORER | LICENCE NUMBER
SIGNATURE OF CONTRACTOR: G. H. Culver | SUBMISSION DATE: DAY 24 MO 1 YR 71

OWRC COPY

OFFICE USE ONLY

DATA SOURCE (58): 1 | CONTRACTOR (59-62): 1661 | DATE RECEIVED (63-68): [illegible] 1270 (80)
DATE OF INSPECTION: 12, 5, 71 | INSPECTOR: J.C.P. S.C. 71
REMARKS: PLOTTED ON HALDIMAND MAP
CSS.58

Ontario — Ministry of the Environment, Conservation and Parks

Measurements recorded in: ☐ Metric ☒ Imperial

Well Tag No. (Place Sticker and/or Print Below): 6602566

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Well Owner's Information

First Name	Last Name/Organization	E-mail Address	☐ Well Constructed by Well Owner
	TD Greenhouses Ltd.		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
42554 Hwy 3	Wainfleet	ON.	L0S1V0	2892313318

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
43237 Pettit Rd.	Wainfleet	31	4

County/District/Municipality	City/Town/Village	Province	Postal Code
Niagara	Winger	Ontario	L0S1V0

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	627521	4754331		

Overburden and Bedrock Materials/Abandonment Sealing Record (see instructions on the back of this form)

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
		decommission			

Annular Space

Depth Set at (m/ft) From	Depth Set at (m/ft) To	Type of Sealant Used (Material and Type)	Volume Placed (m^3/ft^3)
0	145	3/8 Holeplug	36 bags

Method of Construction

☐ Cable Tool ☐ Diamond ☐ Rotary (Conventional) ☐ Jetting ☐ Rotary (Reverse) ☐ Driving ☐ Boring ☐ Digging ☐ Air percussion ☐ Other, specify

Well Use

☐ Public ☐ Commercial ☐ Not used ☐ Domestic ☐ Municipal ☐ Dewatering ☐ Livestock ☐ Test Hole ☐ Monitoring ☐ Irrigation ☐ Cooling & Air Conditioning ☐ Industrial ☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
8	Steel	.188	0	144

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

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: decomm. ☐ Other, specify

Water Details

Water found at Depth (m/ft)	Gas	Kind of Water	Other, specify
	☐	☐ Fresh ☐ Untested	
	☐	☐ Fresh ☐ Untested	
	☐	☐ Fresh ☐ Untested	

Hole Diameter

Depth (m/ft) From	Depth (m/ft) To	Diameter (cm/in)

Results of Well Yield Testing

After test of well yield, water was: ☐ Clear and sand free ☐ Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft)

Pumping rate (l/min / GPM)

Duration of pumping ____ hrs + ____ min

Final water level end of pumping (m/ft)

If flowing give rate (l/min/GPM)

Recommended pump depth (m/ft)

Recommended pump rate (l/min/GPM)

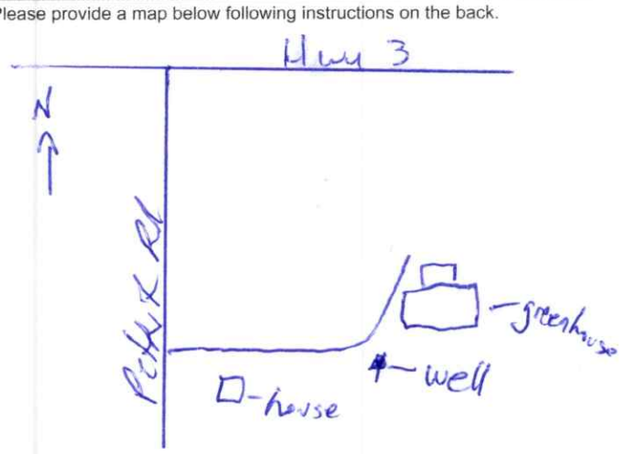
Well production (l/min/GPM)

Disinfected? ☒ Yes ☐ No

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

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Field Well Drilling Inc.	7713

Business Address (Street Number/Name) Email	Municipality
Fieldwelldrilling@gmail.com	Vineland

Province	Postal Code	Business E-mail Address
ON.	L0R2C0	4622 Spring Creek Rd.

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
9055637355	Cole Matt

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
4185		2025 07 30

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☒ Yes ☐ No	2025 07 30	2025 07 30

Ministry Use Only

Audit No. Z451443

Received

Ministry's Copy

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

WELLAND

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 (1 2) 6604009 MUNICIP 66007 (10 14) CON. CON 64 (15 22 23 24)

COUNTY OR DISTRICT | TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE | CON. BLOCK, TRACT, SURVEY, ETC. | LOT 25-27

[redacted] OFLEET | CON 4 | LOT 30

[redacted] R#1 | DATE COMPLETED 48-53: DAY 04 MO 06 YR 91

(21 1 2) (M 10) (12 17) (NG 18 24) (RC 25) ELEVATION (26) (RC 30) BASIN CODE (31) (II) (III) (IV 47)

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
BROWN	CLAY		PACKED	0	48
BROWN	CLAY	FINE SAND	LOOSE	48	56
BROWN	CLAY		PACKED	56	64
BRONN	SAND	COARSE GRAVEL	FINE	64	70
BROWN	SAND		FINE	70	91
BROWN	CLAY		PACKED	91	113
BROWN	CLAY	COARSE GRAVEL	PACKED	113	117
GREY	GRAVEL		FINE	117	124

31 (1 2) (10 14 15 21) (32 43) (54 65 75 80)

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
124	1 ☑ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
6 1/8	1 ☑ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC	1.88	0	123
6	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☑ OPEN HOLE 5 ☐ PLASTIC		123	124
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET
MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN FEET	

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	DEPTH SET AT - FEET TO	MATERIAL AND TYPE (CEMENT GROUT LEAD PACKER ETC.)

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☑ BAILER

PUMPING RATE: 16 GPM

DURATION OF PUMPING: 1 HOURS 15 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING: 1 ☐ PUMPING 2 ☑ RECOVERY			
		15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
11 FEET	12 FEET	12 FEET	12 FEET	12 FEET	12 FEET

IF FLOWING, GIVE RATE: GPM

PUMP INTAKE SET AT: FEET

WATER AT END OF TEST: 1 ☐ CLEAR 2 ☑ CLOUDY

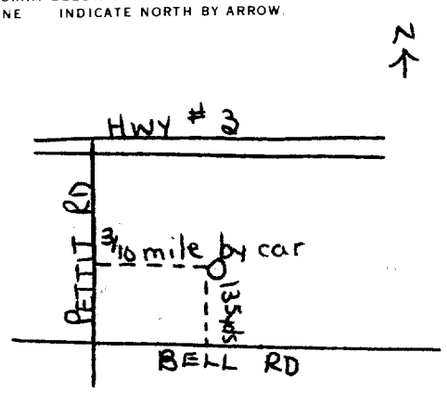
RECOMMENDED PUMP TYPE: ☑ SHALLOW ☐ DEEP

RECOMMENDED PUMP SETTING: 50 FEET

RECOMMENDED PUMPING RATE: GPM

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



91367

DRILLERS REMARKS

FINAL STATUS OF WELL

1 ☑ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED ☐ DEWATERING

WATER USE

1 ☑ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED

METHOD OF CONSTRUCTION

1 ☑ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING ☐ DIGGING ☐ OTHER

CONTRACTOR

NAME OF WELL CONTRACTOR: KEN SCHOOLEY

WELL CONTRACTOR'S LICENCE NUMBER: 4795

ADDRESS: RR#1 PORT COLBORNE

NAME OF WELL TECHNICIAN: KEN SCHOOLEY

WELL TECHNICIAN'S LICENCE NUMBER: T-0351

SIGNATURE OF TECHNICIAN/CONTRACTOR: Ken Schooley

SUBMISSION DATE: DAY 12 MO 06 YR 91

OFFICE USE ONLY

DATA SOURCE | CONTRACTOR 4795 | DATE RECEIVED JUL 30 1991

DATE OF INSPECTION | INSPECTOR

REMARKS

CSS.ES

MINISTRY OF THE ENVIRONMENT COPY

FORM NO. 0506 (11/86) FORM 9

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

WELLAND

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 (1 2) **6604170** MUNICIP. 6,6,0,0,7 (10 14) CON. C,O,N (15 22) 0,4 (23 24)

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON. BLOCK, TRACT, SURVEY, ETC.	LOT (25-27)
[redacted]	WAINFLEET	4	29

[redacted] RR#1 WAINFLEET

DATE COMPLETED (48-53): DAY 10 MO 3 YR 94

(1 2) M (10) (12 17) (18 24) RC. (25) ELEVATION (26) RC. (30) BASIN CODE (31) II III IV (47)

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
PREVIOUS	BORED OR HAND		DUG	0	15
BLUE	CLAY			15	17
GREY	SAND & GRAVEL			17	18
BLUE	CLAY	SILT	LAYERS	18	44

31 (1 2) 32 (10 14 15 21 32 43 54 65 75 80)

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
17-18	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
48	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☒ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC	3	0	15
30	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☒ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC	3	14	16½
30	1 ☐ STEEL 2 ☒ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC	18	16½	46

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET

MATERIAL AND TYPE: GRAVEL

DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☐ BAILER

PUMPING RATE: GPM — DURATION OF PUMPING: HOURS MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING: 1 ☐ PUMPING 2 ☐ RECOVERY	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
8 FEET	FEET		FEET	FEET	FEET	FEET

IF FLOWING, GIVE RATE: GPM

PUMP INTAKE SET AT: FEET

WATER AT END OF TEST: 1 ☐ CLEAR 2 ☐ CLOUDY

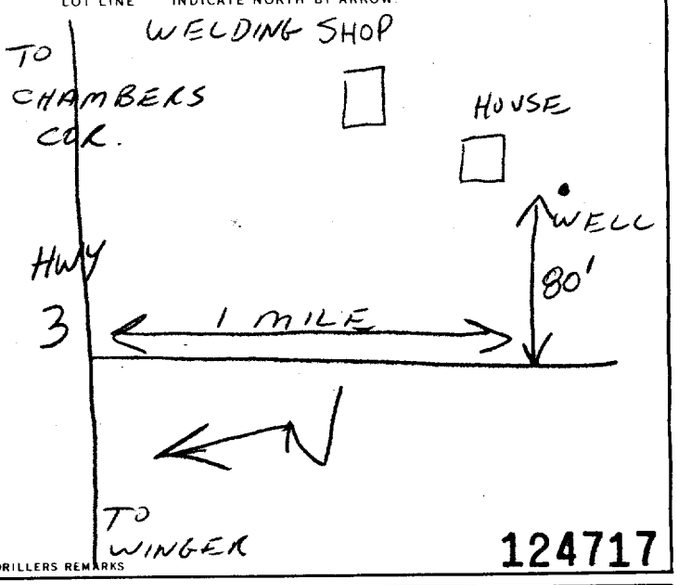
RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP

RECOMMENDED PUMP SETTING: 35 FEET

RECOMMENDED PUMPING RATE: 3INT GPM

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS: 124717

FINAL STATUS OF WELL

1 ☒ WATER SUPPLY; 2 ☐ OBSERVATION WELL; 3 ☐ TEST HOLE; 4 ☐ RECHARGE WELL; 5 ☐ ABANDONED, INSUFFICIENT SUPPLY; 6 ☐ ABANDONED, POOR QUALITY; 7 ☐ UNFINISHED; ☐ DEWATERING

WATER USE

1 ☒ DOMESTIC; 2 ☐ STOCK; 3 ☐ IRRIGATION; 4 ☐ INDUSTRIAL; ☐ OTHER; 5 ☐ COMMERCIAL; 6 ☐ MUNICIPAL; 7 ☐ PUBLIC SUPPLY; 8 ☐ COOLING OR AIR CONDITIONING; 9 ☐ NOT USED

METHOD OF CONSTRUCTION

1 ☐ CABLE TOOL; 2 ☐ ROTARY (CONVENTIONAL); 3 ☐ ROTARY (REVERSE); 4 ☐ ROTARY (AIR); 5 ☐ AIR PERCUSSION; 6 ☒ BORING; 7 ☐ DIAMOND; 8 ☐ JETTING; 9 ☐ DRIVING; ☐ DIGGING; ☐ OTHER

CONTRACTOR

NAME OF WELL CONTRACTOR: JOHNSON & BAETZ — WELL CONTRACTOR'S LICENCE NUMBER: 3030

ADDRESS: RR#1 MT. PLEASANT

NAME OF WELL TECHNICIAN: JOHN BAETZ — WELL TECHNICIAN'S LICENCE NUMBER: 7-0333

SIGNATURE OF TECHNICIAN/CONTRACTOR: J Baetz — SUBMISSION DATE: DAY ____ MO ____ YR. ____

OFFICE USE ONLY

DATA SOURCE — CONTRACTOR: 3030 — DATE RECEIVED: APR 28 1994

DATE OF INSPECTION — INSPECTOR

REMARKS: CSS.ES

MINISTRY OF THE ENVIRONMENT COPY

FORM NO. 0506 (11/86) FORM 9

Appendix C

Petroleum Well Data

2025 OGSR LIBRARY

Results for F014322 (Printable View)

LICENCE #: F014322

WELLNAME: Dominion Nat. Gas John Wills

OPERATOR: Unknown

CTY: Welland **TWP**: Wainfleet

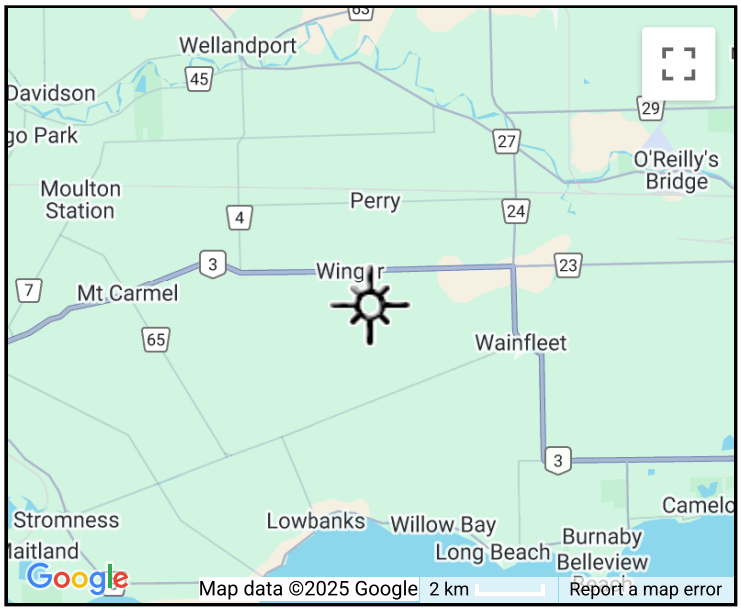
LOT: 30 **CON**: IV

LE BLOCK: **LE TRACT**:

WELL TYPE: Natural Gas Well **CLASS**: DEV

WELL MODE: Abandoned Well **TARGET**: CLI

TD FORM: Queenston



DRILLING DATA		DATES		COORDINATES		SAMPLES
RIG TYPE:		LIC. ISSUED:		N/S BOUNDARY:	1100.20 S	TRAY:
GRND ELEV:		SPUD DATE:		E/W BOUNDARY:	200.62 W	
KB ELEV:		TD DATE:		**NAD 83**		**POOL**
TVD:		CMP DATE:		SUR LAT:	42.93349083	Welland Pool
PBTD:		WO DATE:		SUR LONG:	-79.43191500	
		PLUG DATE:	1941-10-11	BOT LAT:	42.93349083	
				BOT LONG:	-79.43191500	

LOCATION COMMENTS

DATE	ACCURACY	METHOD OBTAINED
2006-03-01	Unknown	Well Records (pre 1921)

INITIAL GAS RECORD - (0)

HOME

2025 OGSR LIBRARY

Search Advanced Search - Well Location Map - Ontario Petroleum KMZ

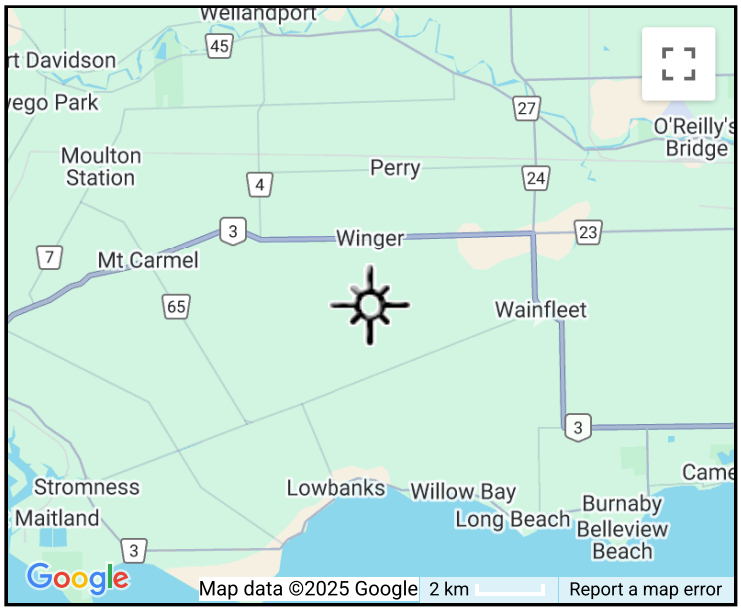
Results for F014331 (Printable View)

Well Card | More... | Plugging Record | Production Records | Geophysical Logs | Fluid Analyses | Scans

LICENCE #: F014331
WELLNAME: Salvatore Zavarella

OPERATOR: Unknown

CTY:	Welland	**TWP**:	Wainfleet
LOT:	32	**CON**:	III
LE BLOCK:		**LE TRACT**:	
WELL TYPE:	Natural Gas Well	**CLASS**:	DEV
WELL MODE:	Abandoned Well	**TARGET**:	CLI
		TD FORM:	Queenston



DRILLING DATA		DATES		COORDINATES		SAMPLES
RIG TYPE:		LIC. ISSUED:		N/S BOUNDARY:	21.34 S	TRAY:
GRND ELEV:	175.80	SPUD DATE:		E/W BOUNDARY:	15.24 W	
KB ELEV:	176.10	TD DATE:		**NAD 83**		**POOL**
TVD:		CMP DATE:		SUR LAT:	42.92442306	Haldimand Pool
PBTD:		WO DATE:		SUR LONG:	-79.43961056	
		PLUG DATE:	1967-09-13	BOT LAT:	42.92442306	
				BOT LONG:	-79.43961056	

LOCATION COMMENTS

DATE	ACCURACY	METHOD OBTAINED
	Within 20 metres	Well Records (1954 to 1997)

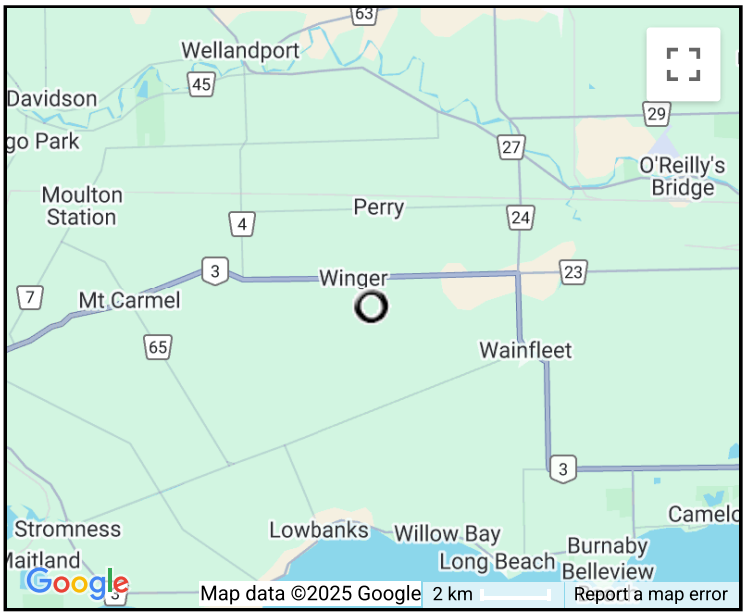
INITIAL GAS RECORD - (0)

Results for F019945 (Printable View)

LICENCE #: F019945
WELLNAME: Unknown

OPERATOR: Dominion Natural Gas Co. Ltd.

CTY:	Welland	**TWP**:	Wainfleet
LOT:	30	**CON**:	IV
LE BLOCK:		**LE TRACT**:	
WELL TYPE:	Location	**CLASS**:	
WELL MODE:	Abandoned Well	**TARGET**:	
		TD FORM:	



DRILLING DATA		DATES		COORDINATES		SAMPLES
RIG TYPE:		LIC. ISSUED:		N/S BOUNDARY:	X	TRAY:
GRND ELEV:	175.84	SPUD DATE:		E/W BOUNDARY:	X	
KB ELEV:	176.14	TD DATE:		**NAD 83**		**POOL**
TVD:		CMP DATE:		SUR LAT:	42.93467750	
PBTD:		WO DATE:		SUR LONG:	-79.43224306	
		PLUG DATE:	1949-02-10	BOT LAT:	42.93467750	
				BOT LONG:	-79.43224306	

LOCATION COMMENTS

DATE	ACCURACY	METHOD OBTAINED
	Within 50 metres	Well Records (1921 to 1954)

INITIAL GAS RECORD - (0)

Appendix D

Water Use and Septic System Survey

Terra-Dynamics inc.
432 Niagara Street, Unit 2 St. Catharines, ON L2M 4W3

Survey No. 2025-004

June 2025

Dear Resident:

On behalf of TD Greenhouses Ltd., Terra-Dynamics Inc. is completing a water well and septic system survey as part of a Hydrogeological Study of a proposed severance. This is a survey of properties in the vicinity of 43237 Pettit Road, 100 metres from the proposed severance envelope, as shown on the attached map. We are seeking to map nearby private wells in order to ensure protection of water quantity and quality as part of a future residential severance. This well and septic system survey is a recommended part of a hydrogeologic, or groundwater, study of the subject lands which informs water supplies and septic system designs and locations. This is a standard questionnaire for properties on private services.

The purpose of this survey is to collect information on water wells, cisterns and septic systems within approximately 100 metres of the Site (as shown by the outline on the attached map). **Participation is voluntary.** Participation involves completing the attached questionnaire or completing an online version using the QR code below or by going to the following link "https://forms.office.com/r/CZnGBitWuX".The questionnaire is on well and/or cistern use, groundwater quantity, quality and your septic system. Please complete it as best as you can. If you are completing the survey with the enclosed questionnaire, please fill out and mail it back to Terra-Dynamics Inc. in the self-addressed and stamped envelope. The information you provide will be summarized in our report and personal information (e.g. name, address, etc.) will be kept confidential and will not be included in our report.

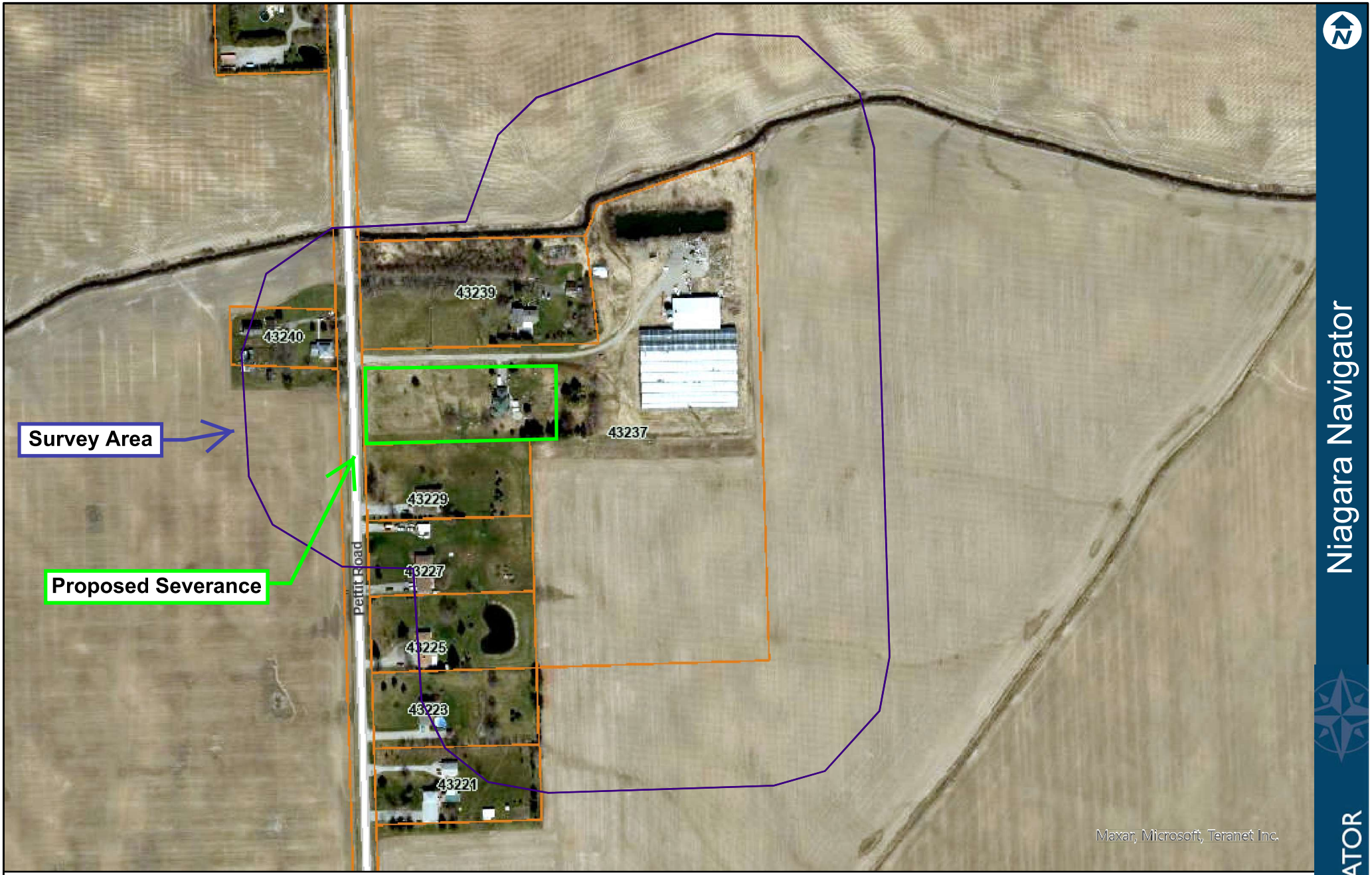
If you have any questions about the questionnaire, please contact Dan Baker at 905-741-1666 or via email at dbaker@terra-dynamics.com.

Thank you in advance for your assistance.

Yours truly,

TERRA-DYNAMICS INC.

Dan Baker, G.I.T
Geologist-in-Training



Niagara Navigator

Legend

Parcel Boundary

100 m Survey Buffer Area

43237 Address Points

Proposed Severance

0 0.05 0.1 0.19 0.29 0.38 km

Date: 2025-06-11 Time: 4:40 PM

Water Well and Septic System Survey Area - 100m from 43237 Pettit Road

Niagara Region NAVIGATOR

Terra-Dynamics inc.
432 Niagara Street, Unit 2 St. Catharines, ON L2M 4W3

WATER WELL SURVEY FORM

Date:_____ Survey No.: 2025-004

Contact Person:_____

Property Address:_____

Telephone: _____

Email (if further information requested): _____

1.0 GENERAL QUESTIONS

Do you know your drinking water source? Please circle one or more of the following three options:

1.Well (20+ feet casing) 2.Shallow Well (less than 20 feet of casing)
3.Cistern 4. Municipal

Further comments:

_____

_____

Use page 3 or a separate sheet of paper for additional comments.

If your water supply is from a cistern, the rest of the questions do not apply. If you have both a cistern and a well, please complete the well questionnaire (Section 2.0 or 3.0). Please let us know where your place is located either on the supplied map or the area for a sketch on the second last page of this form. Please mail the completed form back to Terra-Dynamics in the provided envelope. Thank you for your assistance.

- If you have a drilled deep well (20+ feet of casing) please complete Sections 2 & 4
- If you have a shallow well (less than 20 feet of casing), please complete Sections 3&4

2.0 DRILLED WELL (greater than 20 feet of casing)

How deep is your well?_____

Is your well drilled into rock?_____What is the well casing diameter?_____

Do you know when your well was drilled?_____

Do you know the name of the well driller?_____

905-646-7931 Fax: 905-935-0397 www.terra-dynamics.com

Do you have a well log? (i.e. a description of the geology encountered when drilling your well and if yes, can you supply a copy or write down the information in the Comments Section).

_____

What is the use of your well water? (i.e. drinking water for house, garden irrigation, etc.)

_____

Has your well ever run dry? _____

Do you experience problems with taste, colour or odour? (if yes, please explain).

_____

Do you have any water purification systems for your well water? (i.e. water softeners, UV Light for bacteria, Sulphur/Iron Filter for odour or staining, etc.).

_____

Do you perform regular maintenance on your well? (i.e. pump service, silt removal, etc.)

_____

3.0 SHALLOW WELL (less than 20 feet of casing)

What is the well casing material and diameter? _____

What is the expected age of the well? _____

How deep is the well? _____

Does you utilize a jet pump or a submersible pump?_____

Is there problems with water quality (colour, odour, etc.)? Yes_____ No_____

If yes, please explain_____

Do you have any water purification systems for your dug well water? (i.e. water softeners, UV Light for bacteria, Sulphur/Iron Filter for odour or staining, etc.).

_____

Have you ever experienced freeze-up during the winter?_____

What is the use of your shallow dug well water? (i.e. drinking water for house, irrigation, etc.)

_____

Has your dug well ever run dry?

_____

Do you perform regular maintenance on your pump? (i.e. pump service, silt removal)

_____

Additional comments:_____

4.0 LOCATION MAP

Can you please draw a sketch map of the location of your well(s), septic tank and sewage bed on your property (please show the location relative to buildings and roads).

SKETCH MAP OF WELL(S) and SEWAGE SYSTEM LOCATIONS

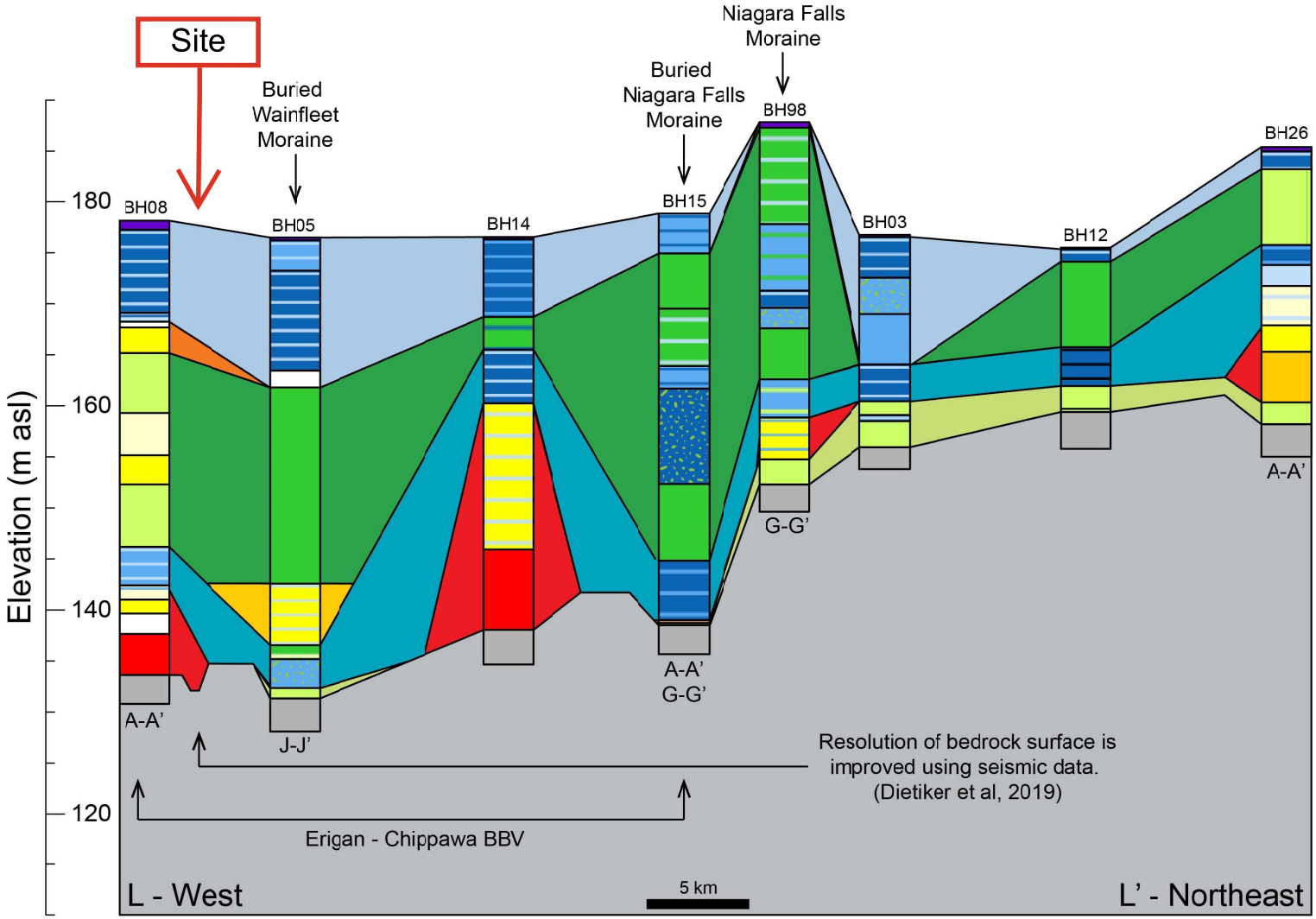
Other Comments: (Use a separate sheet, if required)

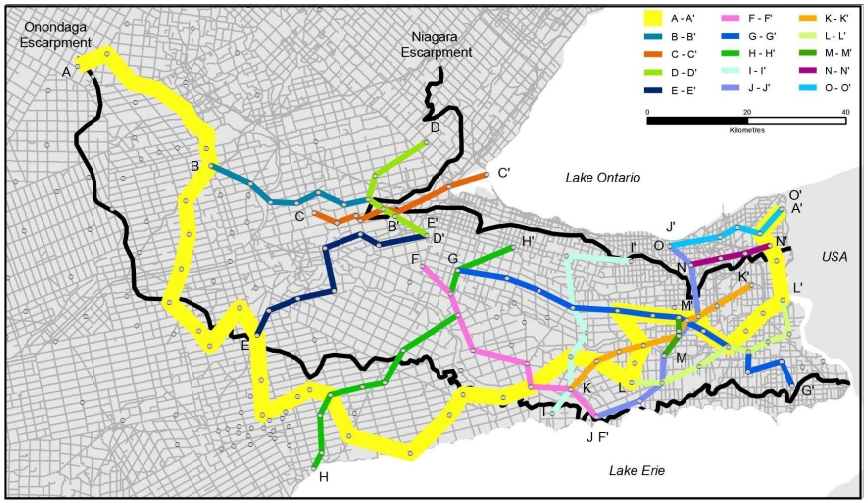
Please mail the completed form back to Terra-Dynamics in the provided envelope.
Thank you for your help.

Dan Baker, G.I.T., Geologist-in-Training
432 Niagara Street, Unit 2, St. Catharines, ON L2M 4W3
905-741-1666

Appendix E

Supporting Information





Hydrostratigraphic Units

- Regressive aquifer
- Upper Whittlesey aquitard
- Upper Halton aquitard
- Halton aquifer
- Lower Halton aquitard
- Pre-Halton aquifer
- Lower Whittlesey aquitard
- Whittlesey / Ypsilanti Low aquifer
- Wentworth Till aquitard
- Maumee-Arkona aquitard
- Caledon - Grand River Outwash aquifer
- Upper Till / Port Bruce Phase aquitard
- Waterloo / Orangeville moraines aquifer
- Maryhill Diamicton / Erie Phase aquitard
- Lower Erie Phase aquifer
- Catfish Creek aquitard
- Pre-Catfish aquifer
- Pre-Catfish aquitard
- Lower Pre-Catfish aquifer
- Canning / Older Drift aquitard
- Pre-Canning / Older Drift aquifer
- Pre-Canning aquitard
- Paleozoic Bedrock

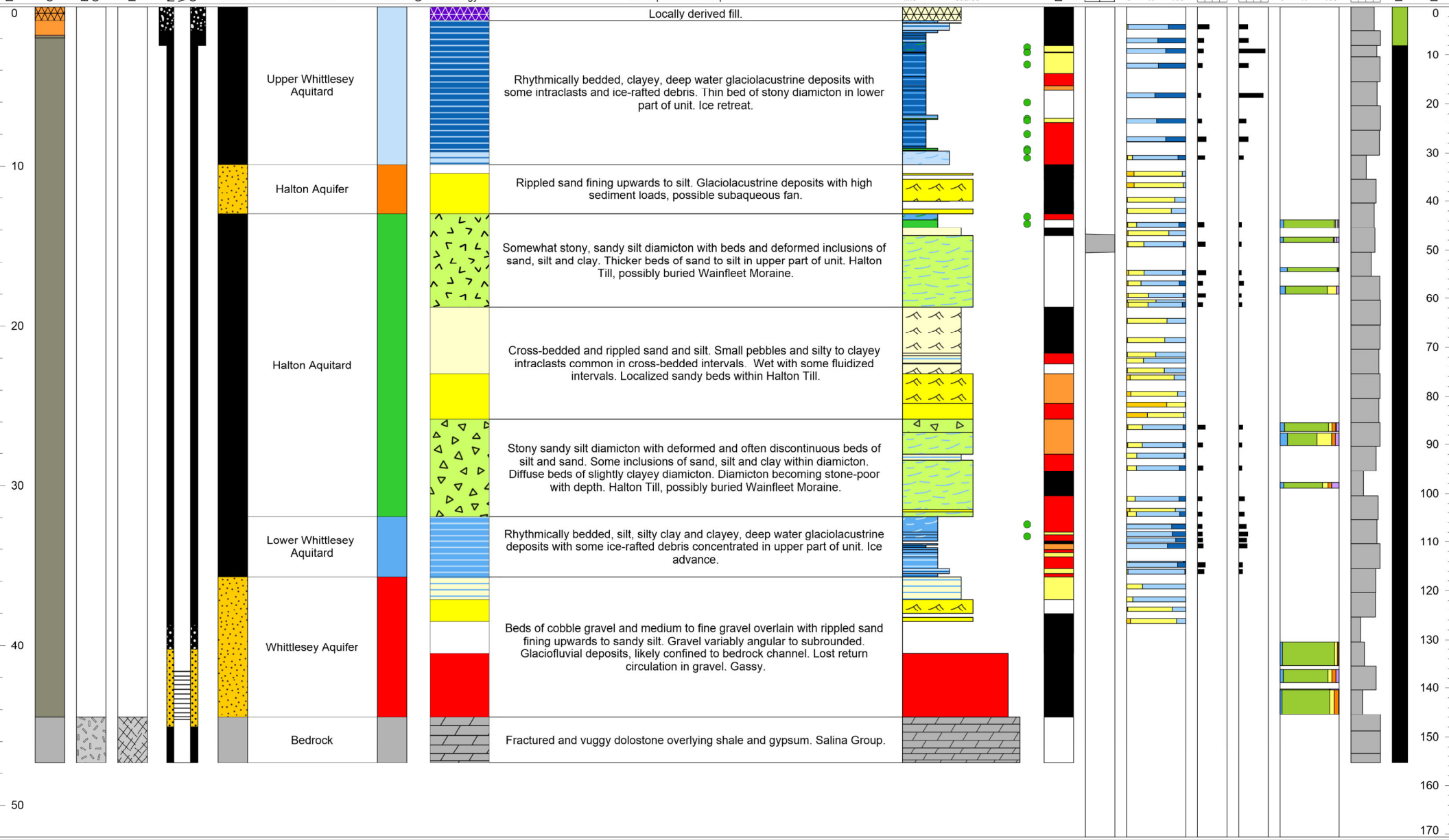
Lithology

- Silt / clay diamicton
- Sand / silt diamicton
- Dirty gravel
- Gravel
- Coarse sand
- Fine sand
- Sandy silt
- Silt
- Silty clay
- Clay
- Ice-rafted debris
- Rhythmic bedding
- Bedrock
- Fill
- No recovery

Borehole: BH08-NP-2014

Northing: 4753492.347
Easting: 626540.733
Elevation: 178.14 m asl

Conservation Authority: Niagara Peninsula Conservation Authority
Watershed / basin: Big Forks Creek
Subwatershed / subbasin: East Kelly Drain - Mill Race Creek



Oxidation
- Fill
- Oxidized
- Reduced
- Coarse layers oxidized
- Fracture planes oxidized
- Bedrock

Evaporite Crystals
- Macroscopic crystals in sediment
- Macroscopic crystals in bedrock
- Not observed

Fractures
- Fractures/desiccation cracks in sediment
- Fractures in bedrock
- Not observed

Well Construction
- Riser
- Screen
- Benseal - bentonite
- Concrete
- Quickgrout - bentonite grout
- Holeplug - bentonite chips
- Sand pack

Class
- Aquifer / potential Aquifer
- Aquitard
- Bedrock

Lithology
- No recovery
- Clay
- Clayey silt, silty clay
- Silt
- Fine sand to silt
- Fine to medium sand
- Medium to coarse sand
- Sand and gravel
- Gravel
- Sand and gravel with some silt/clay in matrix
- Clayey silt to clayey diamicton
- Sandy to silty diamicton
- Fill

- Fill
- Rhythmically bedded
- Interbedded
- Fragmented beds, intraclasts
- Ripples
- Cross-beds
- Grit
- Slightly to somewhat stony
- Stony to very stony
- Diamicton and other debris

- Rubble, fractured rock
- Ordovician bedrock
- Silurian bedrock
- Devonian bedrock

Symbols
- Rare ice-rafted debris
- Striated bedrock
- Polished bedrock
- Organic material
- Cold core
- Trace fossils
- Radiocarbon (C^{14}) date

Deformation
- Disturbed or low recovery intervals
- Not observed
- Slight
- Moderate
- High

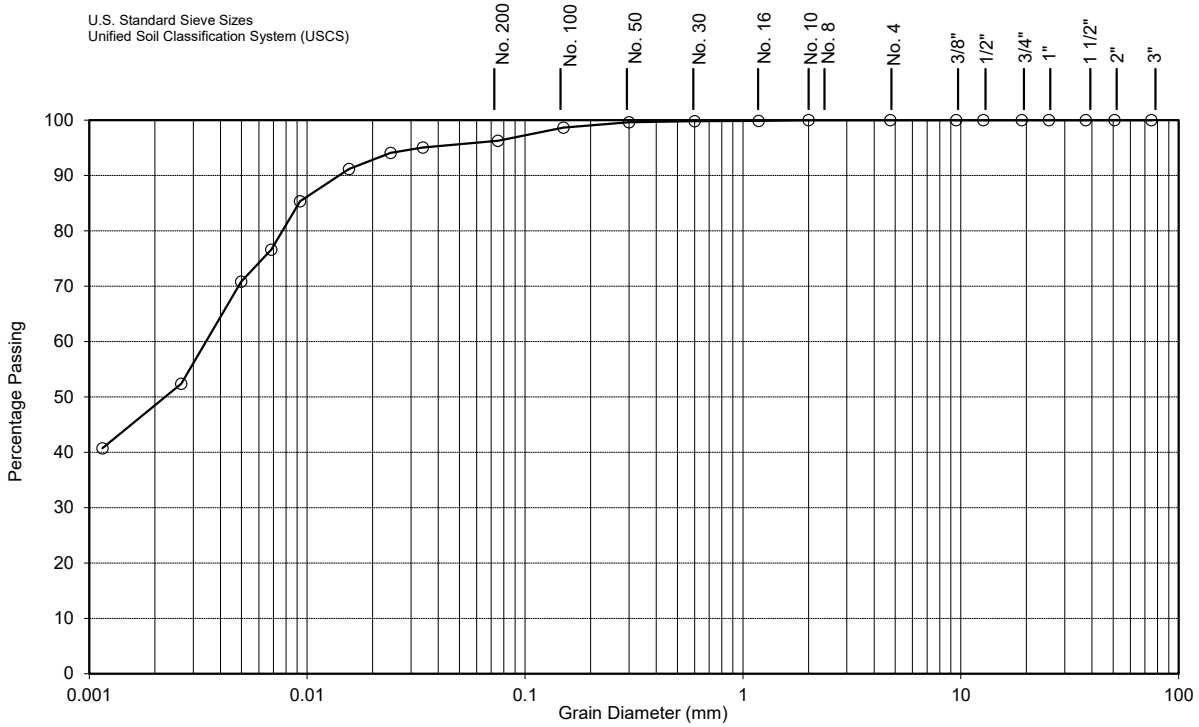
Grain Size
- Coarse to medium sand
- Fine to very fine sand
- Silt
- Clay

Pebble Lithology
- Limestone
- Dolostone
- Sandstone
- Shale
- Chert, evaporite
- Precambrian

Drilling Method
- Hollow-stem auger
- PQ coring
- Split spoon
- Tricone
- Hydrovac

*Hydrostratigraphic units are intended to reflect regional-scale sediment packages that will be modeled in three dimensions. The units are time-transgressive and may group lithologic packages.

Mechanical & Hydrometer Analyses



CLAY	SILT	FINE	MEDIUM	COARSE	FINE	COARSE
		SAND			GRAVEL	

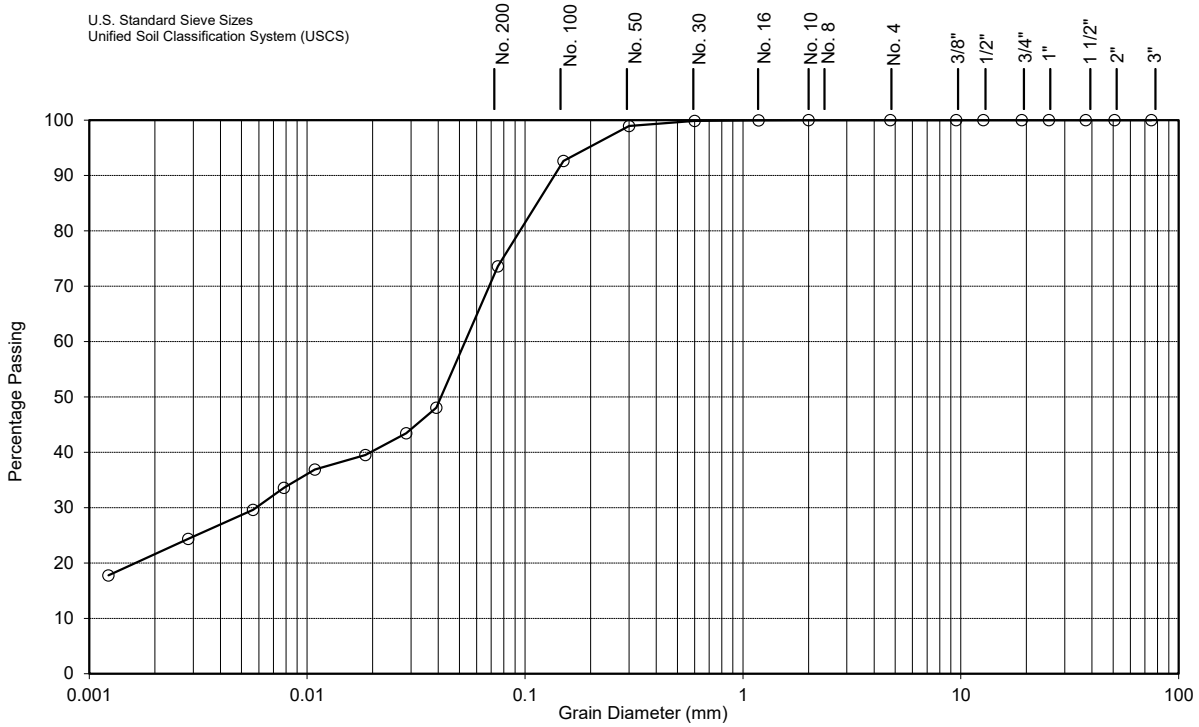
Lab No.:	**25-194**	Notes: Depth: 70cm to 90cm			
Borehole No.:					
Sample No.:	**HA-2**				
CLAY [%]:	**49**	Soil Description: **Light Brown Clay and Silt w/ a trace of Sand**			
SILT [%]:	**47**	**C.L. - Inorganic clays of low to medium plasticity to M.L. - Inorganic silts and very fine sands**			
SAND [%]:	**4**				
GRAVEL [%]:	**0**	Estimated Infiltration Rate [mm/hr] :	**< 10**	Estimated Permeability, k [cm/s]:	**10^{-8}**
D_{10} (Effective Diam. in mm):	**0.0002**	Coefficient of Uniformity C_U:	**17.5**	Coefficient of Curvature C_C:	**0.5**

SOIL-MAT ENGINEERS & CONSULTANTS LTD.

43237 Pettit Road, Wainfleet ON

Date Tested: June 20, 2025	Grain Size Analysis No. 1	Project No.: SM 230001-T

Mechanical & Hydrometer Analyses



CLAY	SILT	FINE	MEDIUM	COARSE	FINE	COARSE
		SAND			GRAVEL	

Lab No.:	**25-202**	Notes: Depth: 75cm to 90cm			
Borehole No.:					
Sample No.:	**HA-5**				
CLAY [%]:	**22**	Soil Description: **Brown Sandy and Clayey Silt**			
SILT [%]:	**52**	**M.L. - Inorganic silts and very fine sands, clayey silts with slight plasticity, clayey fine sands**			
SAND [%]:	**26**				
GRAVEL [%]:	**0**	Estimated Infiltration Rate [mm/hr] :	**< 10**	Estimated Permeability, k [cm/s]:	**10^{-7}**
D_{10} (Effective Diam. in mm):	**0.0005**	Coefficient of Uniformity C_U:	**106.0**	Coefficient of Curvature C_C:	**1.2**

SOIL-MAT ENGINEERS & CONSULTANTS LTD.

43237 Pettit Road, Wainfleet ON

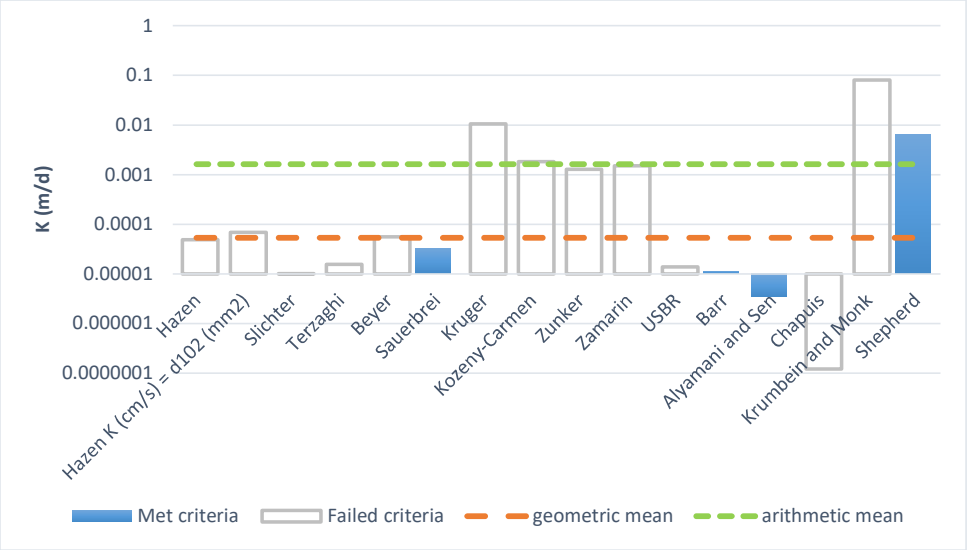
Date Tested: June 24, 2025	Grain Size Analysis No. 2	Project No.: SM 230001-T

K from Grain Size Analysis Report Date: 24-Jun-25

Sample Name: HA-2 (70-90cm) - 43237 Pettit Road, Wainfleet ON

Mass Sample (g): 100 T (oC) 20

Poorly sorted clay with fines



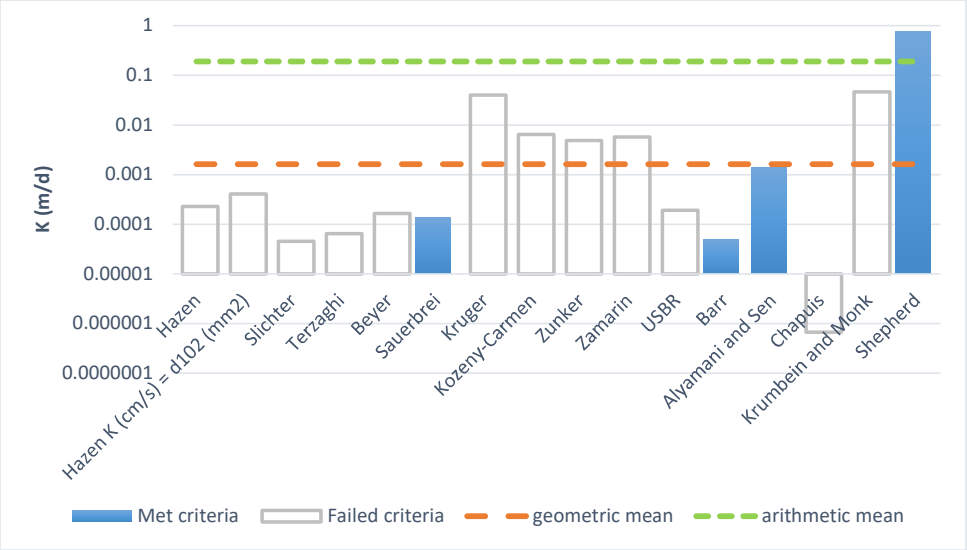
Estimation of Hydraulic Conductivity	cm/s	m/s	m/d	de
Hazen	6.E-08	6.E-10	0.00	
Hazen K (cm/s) = d_{10} (mm)	8.E-08	8.E-10	0.00	
Slichter	1.E-08	1.E-10	0.00	
Terzaghi	2.E-08	2.E-10	0.00	
Beyer	7.E-08	7.E-10	0.00	
Sauerbrei	4.E-08	4.E-10	0.00	
Kruger	1.E-05	1.E-07	0.01	
Kozeny-Carmen	2.E-06	2.E-08	0.00	
Zunker	1.E-06	1.E-08	0.00	
Zamarin	2.E-06	2.E-08	0.00	
USBR	2.E-08	2.E-10	0.00	
Barr	1.E-08	1.E-10	0.00	
Alyamani and Sen	4.E-09	4.E-11	0.00	
Chapuis	1.E-10	1.E-12	0.00	
Krumbein and Monk	9.E-05	9.E-07	0.08	
Shepherd	8.E-06	8.E-08	0.01	
geometric mean	6.E-08	6.E-10	0.00	
arithmetic mean	2.E-06	2.E-08	0.00	

K from Grain Size Analysis Report Date: 27-Jun-25

Sample Name: HA-5 (70-90cm) - 43237 Pettit Road, Wainfleet ON

Mass Sample (g): 100 T (oC) 20

Poorly sorted sandy silt with fines



Estimation of Hydraulic Conductivity	cm/s	m/s	m/d	de
Hazen	3.E-07	3.E-09	0.00	
Hazen K (cm/s) = d_{10} (mm)	5.E-07	5.E-09	0.00	
Slichter	5.E-08	5.E-10	0.00	
Terzaghi	8.E-08	8.E-10	0.00	
Beyer	2.E-07	2.E-09	0.00	
Sauerbrei	2.E-07	2.E-09	0.00	
Kruger	5.E-05	5.E-07	0.04	
Kozeny-Carmen	8.E-06	8.E-08	0.01	
Zunker	6.E-06	6.E-08	0.00	
Zamarin	7.E-06	7.E-08	0.01	
USBR	2.E-07	2.E-09	0.00	
Barr	6.E-08	6.E-10	0.00	
Alyamani and Sen	2.E-06	2.E-08	0.00	
Chapuis	8.E-10	8.E-12	0.00	
Krumbein and Monk	5.E-05	5.E-07	0.05	
Shepherd	9.E-04	9.E-06	0.76	
geometric mean	2.E-06	2.E-08	0.00	
arithmetic mean	2.E-04	2.E-06	0.19	