



Terra-Dynamics Consulting Inc.

404 Queenston Street, St. Catharines, ON L2P 2Y2

Mr. Dan Bunz
53212 Winger Road
Wainfleet, ON L0S 1V0

Re: Hydrogeological Assessment, Winger Subdivision, Wainfleet, ON

Dear Mr. Bunz,

1.0 Introduction, Background Information and Purpose

Mr. Dan Bunz retained Terra-Dynamics Consulting Inc. to complete a Hydrogeological Assessment for a proposed residential subdivision to be developed on 9.3 hectares of Concession 4, Part Lot 32, Hamlet of Winger, Wainfleet (Site, Figure 1). The hydrogeological assessment is required by the Township of Wainfleet (Township), and Niagara Region, as lots will be proposed that are smaller than 1 hectare (Township, 2019). Township official plan policies (Township, 2016) to consider in the hydrogeological assessment include:

Policy 2.4.9 The minimum lot size for new lots within the Hamlets shall be 1 hectare unless it is demonstrated through a hydrogeological study that a smaller lot size can adequately support a private sustainable water and sewage disposal system, and protect surface and ground water features. In such case, the minimum lot size shall consider the matters set out in 3.3.2.8 and Section 4.2. Lot sizes shall be no less than 0.4 hectares (1 acre).

Policy 3.3.2.8 Where a smaller lot size is justified through a hydrogeological study, the minimum lot size shall be reflective of the results of the hydrogeological study including consideration of new septic disposal technologies along with the character and lot size pattern within each Hamlet, while also contributing where possible to a compact hamlet area.

Section 4.2 Water Resources, Intent: Water resources include both surface water, i.e. lakes, rivers and streams, and ground water, i.e. aquifers. The intent of this Plan is to protect, improve and restore the quality and quantity of ground and surface water resources.

Section 3.3.2.7 The hydrogeological study.... shall demonstrate that:

- a) Soil and land area capabilities are sufficient to meet the Ministry of the Environment's Procedure D-5-4 Technical Guideline.*
- b) Ground water quantity and quality for drinking water are capable of providing potable water supply; and*
- c) The septic system and well are situated a safe distance from each other.*

The following documents the hydrogeological assessment of the Site.

2.0 Methodology

The following methodologies were used to investigate the Site:

- A. Evaluation of Ministry of Environment, Conservation and Parks (MECP) water well and Ministry of Natural Resources and Forestry (MNRF) records located within 500 metres of the Site.
- B. Site visits that included a water use survey of properties within 100 m of the Site.
- C. Assessment of geological information using regional mapping of elevation, soils, sediments/overburden and bedrock.
- D. Preparation of a description of the hydrogeological setting using physical/geological information and water levels.
- E. Assessment of the aquifer vulnerability completed using (a) provincial procedure D-5-4 (MECP, 1996) and (b) groundwater vulnerability procedures described by the Niagara Peninsula Source Protection Authority (NPCA, 2013).

As the new lots will be provided potable water via cisterns, this report does not include a water supply assessment (MECP, 1996b), but it is recommended a development agreement indicate water supply by cisterns only.

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

MECP water well records within 500 m of the Site were reviewed and ten records identified (Figure 2 and Appendix A).

The well records identify water being taken from the 'contact zone aquifer' as described by Singer et al (2003), these are '*aquifers at the bedrock surface consisting of granular sediments and fractured bedrock overlain by clay*' (Niagara Peninsula Conservation Authority and AquaResource Inc., 2010). At and around the Site, this contact zone aquifer is generally beneath between 32 and 36.6 metres of clay (105 to 120 feet). Shallower granular units were also identified in three water well logs at between 18.3 and 25 metres (60 to 82 feet) but there is no record of use. The provincial water well records date from 1950 to 2005 and recorded as generally for domestic water supply. No water well records are recorded within 100 metres of the Site, the closest well record being over 150 metres northwest of the Site (6604910) (Figure 2).

Following construction, the water well records indicate water well contractors generally recorded the general water quality as fresh, with one log recording trace salty conditions (6602196).

One Ministry of Natural Resources and Forestry (MNRF) petroleum record was identified within 500 metres of the Site. This record is plotted as 425 metres northwest of the Site, however the location has a 200 metre well location accuracy (F014339, Figure 2, Appendix A). The petroleum well was drilled in 1917, plugged in 1964, and recorded by the MNRF in the plugging record as having been converted to a water well, but no further details are available.

3.0 Physical Setting

The Site slopes from approximately 178 metres above sea level (m ASL) at the two roadside entrances to the Site, Highway 3 and Pettit Road, to 176-175 m ASL at the McCallum Drain. The McCallum municipal drain flows from west to east through the middle of the Site (Figure 2), and is part of the Big Forks Creek subwatershed. The McCallum Drain is classified by the Department of Fisheries and Oceans (DFO) as Type F; intermittent flow, requiring no DFO authorization if the work is done when the drain is dry, frozen or there is no flow (Kavanagh et al, 2017).

3.1 Overburden Geology

The Site is located on the Haldimand Clay Plain physiographic region (Chapman and Putnam, 1984). The soils are mapped as imperfectly drained with some poorly drained portions; soils are mostly loam as well as silty clay/silty loam and very fine sandy loam (Ministry of Agriculture and Food, 1989). Surface water modelling for Big Forks Creek completed by NPCA estimate the infiltration rate for these soils as being on average 104 mm/year (AquaResource Inc. and NPCA, 2009), corresponding with a typical recharge rate for clayey silt (MECP, 1995). Tile drains have not been mapped at the Site (OMAFRA, 2019).

The surficial geology of the Site is mapped as clay and silt (Figure 2) associated with fine-textured glaciolacustrine deep water deposits (OGS, 2003). The thickness of these overburden materials are between 36 and 39 metres at the Site (NPCA, 2013). Sand and silt associated with the Dunnville Sand Plain are located about 100 m to the west (Figure 2). The proposed subdivision is east of OGS (1985) identified potential sand and gravel resource area of tertiary (lowest) significance.

A hydrogeologic section prepared for this project shows greater than 20 metres of clay aquitard underlying the Site protecting the contact-zone aquifer (Figure 3).

3.2 Bedrock Geology

The underlying bedrock is mapped as the Salina Formation (Armstrong and Dodge, 2007). The bedrock topography dips to the southeast, from a little less than 140 m beneath the Site (NPCA, 2013).

3.3 Hydrogeologic Setting

3.3.1 Overburden Aquitard and Water Table

Burt (2016) has mapped the surficial silty clay as the Upper Whittlesey Aquitard, consistent with classification of this upper glaciolacustrine unit as an overburden aquitard by Gartner Lee Limited (1987). The hydraulic conductivity of this silty clay aquitard is expected to be 7×10^{-7} m/s, or less (GLL, 1987), as these sediments “...are weathered, (and) they contain numerous interconnected fractures that can transmit very small amounts of groundwater” (GLL, 1987).

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.”

Groundwater flow in the overburden aquitard it is expected to follow topography while being limited in velocity by the low hydraulic conductivity.

3.3.2 Bedrock Aquifer and Groundwater Flow

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 is between 174 to 173 m ASL with flow towards east-northeast (NPCA, 2013).

Wainfleet water quality in Salina bedrock aquifer has been measured to have a number of water quality treatment challenges including hydrogen sulphide, sodium, sulphate, chloride, iron and manganese above Ontario drinking water aesthetic objectives (Campbell and Burt, 2016).

3.3.3 Confined Bedrock Aquifer Conceptual Model

The Section 3 information is summarized in the schematic below, as a conceptual model for the assessment of potential sewage system impacts to groundwater/surface water systems and private wells (Figure 4):

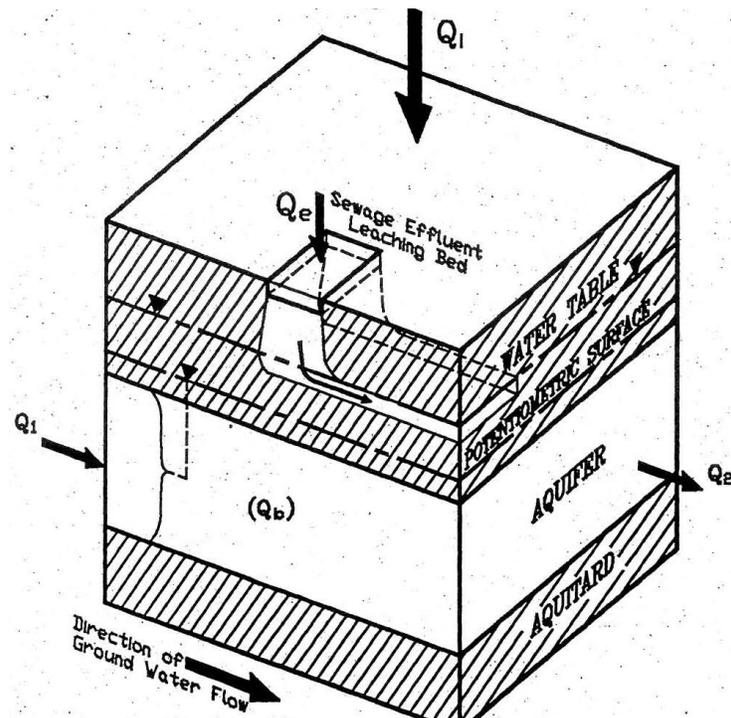


Figure 4 - Confined Aquifer Impact Assessment Subsurface Sewage System (MECP, 1995)

4.0 Assessment of Potential Sewage Impacts

Provincial procedure D-5-4 (MECP, 1996) 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, 1996).

This assessment process involves two main steps: (i) consideration of system isolation and (ii) contaminant attenuation, as visualized below in Figure 5.

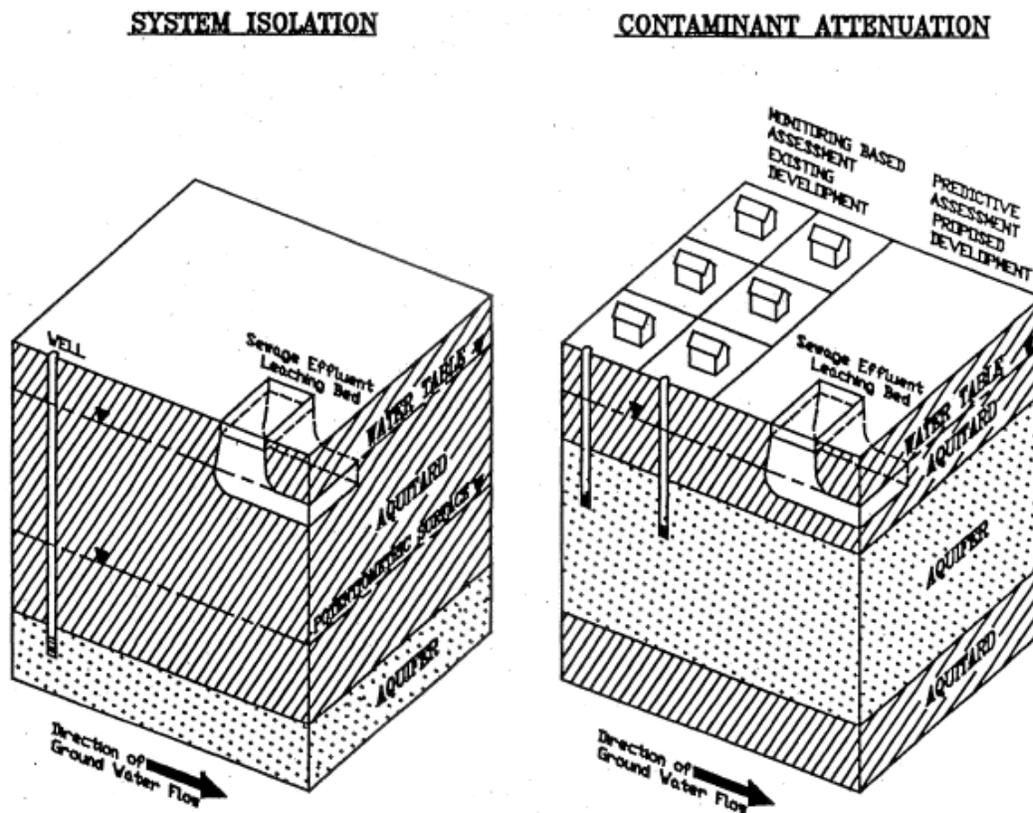


Figure 5 –Water Quality Assessment Process (MECP, 1995)

4.1 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)” (MOE, 1996a).

The Design Guidelines for Sewage Works (MOE, 2008a) provides a 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 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 surficial aquitard is expected to have a sufficiently low hydraulic conductivity (Section 3.3.1), and mapping of the aquitard thickness shows over 10 metres of material at the Site (Section 3.1).

Consequently, private sewage servicing at the proposed subdivision is a low risk to the water supply aquifer, and nearby water supply wells, because the Site is hydrogeologically isolated from the contact-zone aquifer. This conclusion is based upon the following:

- The bedrock/contact-zone aquifer having been mapped as having low intrinsic susceptibility (NPCA, 2005);
- The Site has not been identified as a Highly Vulnerable Aquifer by the Niagara Peninsula Source Protection Authority (NPSPA, 2013); and
- The thickness and extent of the underlying aquitard is greater than the 10 m MECP criterion for hydrogeologic isolation.

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

Further responding to the guidance of provincial procedure D-5-4 under Step 2, it is worth noting that the effluent will infiltrate into the surficial silty clay soils, become anaerobic, and consequently denitrify (Robertson et al, 1996). The “probable lower physical boundary” is expected to be between 3 to 5 metres below ground surface (Robertson et al, 1996) within the Upper Whittlesey Aquitard. This redoxcline was noted at similar depths (A. Burt, personal communication) at nearby OGS boreholes.

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, 1996). In this case that density is a minimum of 0.4 hectares or 1 acre (Wainfleet, 2016).

While there is a watercourse at the Site, the McCallum Drain, the native silty clay soils are predicted to attenuate effluent phosphorus within the first few meters of groundwater flow away from area/filter beds (Robertson, 2012), meaning the Ontario Building Code set-back of 15 metres from a watercourse is sufficient.

Consequently, no Step 3 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, 1996)

4.2 Sewage system effluent disposal location considerations

Future sewage system effluent disposal locations (e.g. raised leaching or filter bed) are constrained by a series of set-backs including:

- (i) Part 8 Ontario Building Code: at least 15 metres from a cistern (referred to as a reservoir in the code); and
- (ii) NPCA municipal drain set-back of 15 metres.

5.0 Water Use Survey Results

A water use and septic system survey was delivered to each roadside postal box between August 26 and August 28, 2019 for the twenty (20) developed parcels within 100 m of the Site (Figure 2). As of September 18, 2019, four completed surveys were returned with identifiable information and these surveys identified the use of cisterns for their home water needs (Appendix C), and another resident phoned in that they have a cistern (43284 Pettit Road). No water supplies were identified within 15 metres of the subdivision boundary. However, due to the uncertain locations of private sewage systems around the subdivision, it is recommended new cisterns for the development also be 15 m from the external subdivision property boundary.

6.0 Conclusions and Recommendations

6.1 Conclusions

The following conclusions are provided:

1. The proposed residential subdivision is isolated from the underlying water supply aquifer.
2. There were no hydrogeological-based impediments to site development as long as the following recommendations are implemented.

6.2 Recommendations

The following recommendations are provided for your consideration:

1. Lots on private sewage systems and cisterns may be sustainability created as small as 0.4 hectares (1 acre) as long as Ontario Building Code and NPCA set-backs are met, including a recommended 15 m set-back from the external subdivision property boundary.
2. The design of the Site layout can be completed during the Building Permit stage.
3. A development agreement should be completed with the Township indicated water supply by cisterns.

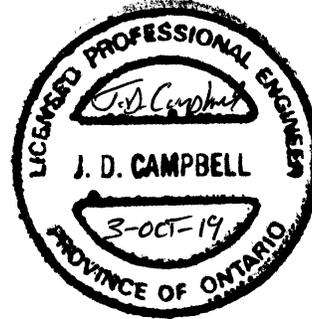
We trust this information is sufficient to your present needs. Please do not hesitate to contact the undersigned if you have any questions.

Yours truly,

TERRA-DYNAMICS CONSULTING INC.



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



Attachments

- Figure 1 - Location of Site
- Figure 2 – Site Details
- Figure 3 – Hydrogeologic Cross-Section
- Appendix A – Well Logs
- Appendix B - Water use and septic system surveys

7.0 References

AquaRsource Inc. and Niagara Peninsula Conservation Authority, 2009. Water Availability Study for the Central Welland River, Big Forks Creek and Beaverdams Shriners Creeks Watershed Plan Areas, Niagara Peninsula Source Protection Area.

Armstrong, D.K. and Dodge, J.E.P., 2007. Paleozoic geology of southern Ontario. Ontario Geological Survey, Miscellaneous Release – Data 219.

Burt, A., 2016. Project Unit 13-018. The Niagara Peninsula in Three Dimensions: A Drilling Update. Summary of Field Work and Other Activities 2016, Ontario Geological Survey, Open File Report 6323, p.30-1 to 30-13.

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.

Chapman, L.J., and Putnam, D.F., 1984. The Physiography of Southern Ontario. Ontario Geological Survey, Special Volume 2, 270 p.

Gao, C., Shiota, J., Kelly, R.I., Brunton, F.R., van Haaften, S., 2006. Bedrock topography and overburden thickness mapping, southern Ontario; Ontario Geological Survey, Miscellaneous Release – Data 207.

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.

Kavanagh, R.J., Wren, L. and Hoggarth, C.T., 2017. Guidance for maintaining and repairing municipal drains in Ontario. Version 1.0, Central and Arctic Region, Fisheries and Oceans Canada.

Ministry of Agriculture, Food and Rural Affairs, 2019. 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), 1989. The Soils of the Regional Municipality of Niagara.

Ministry of the Environment, Conservation and Parks, 2019. www.ontario.ca/environment-and-energy/map-well-records .

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

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

Ministry of Natural Resources and Forestry, 2019. <http://www.ogsrlibrary.com/wellcards/> .

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

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

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

OGS, 1985. Aggregate Resources Inventory of the Township of Wainfleet, Regional Municipality of Niagara; Ontario Geological Survey, Aggregate Resources Inventory Paper 115, 29p., 7 tables, 3 maps, scale 1:50000.

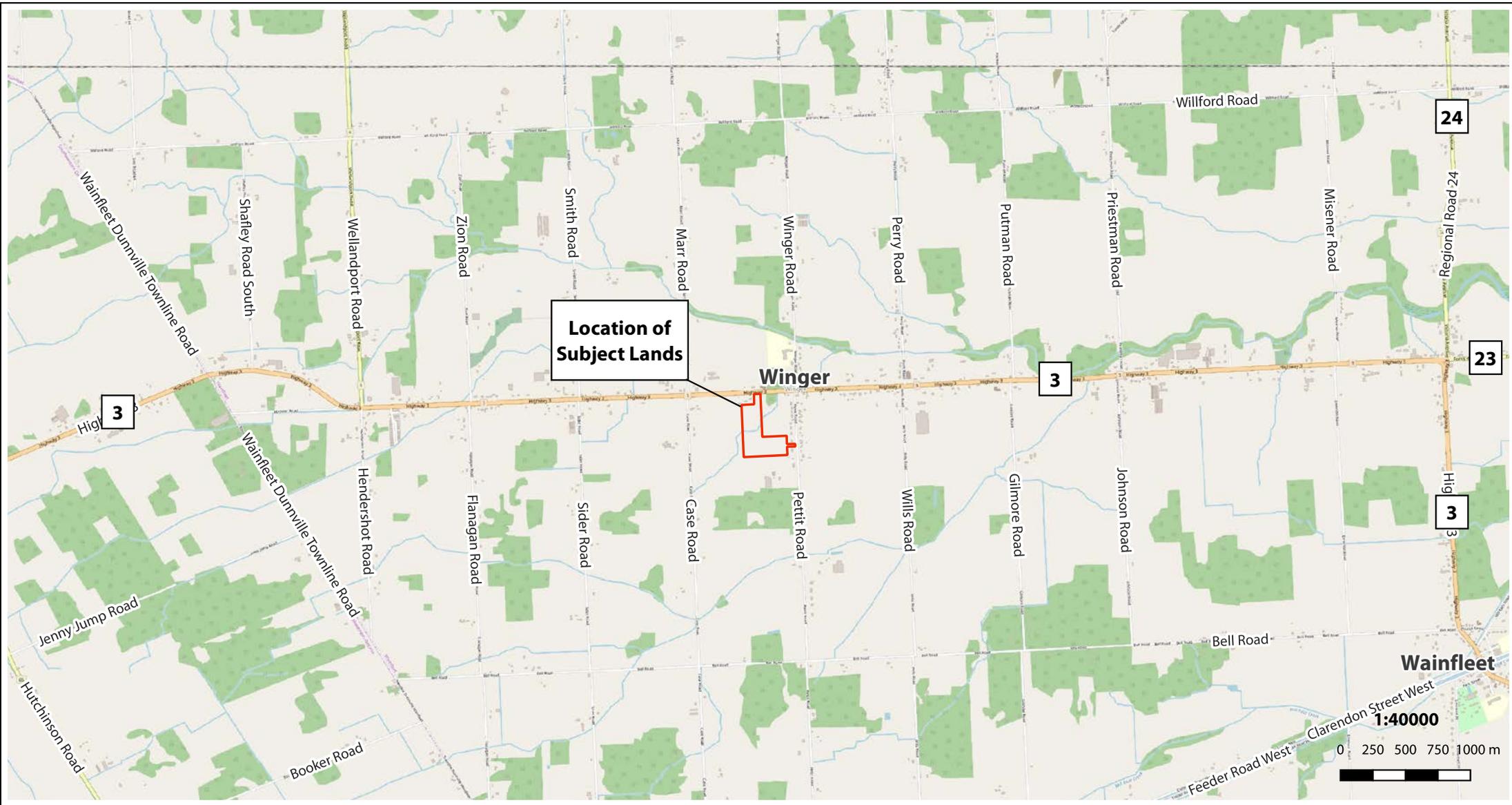
Robertson, W.D., 2012. Mobility of Phosphorus in Septic System Plumes, Lake Simcoe Basin, Final Report. Prepared for Environment Canada.

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.

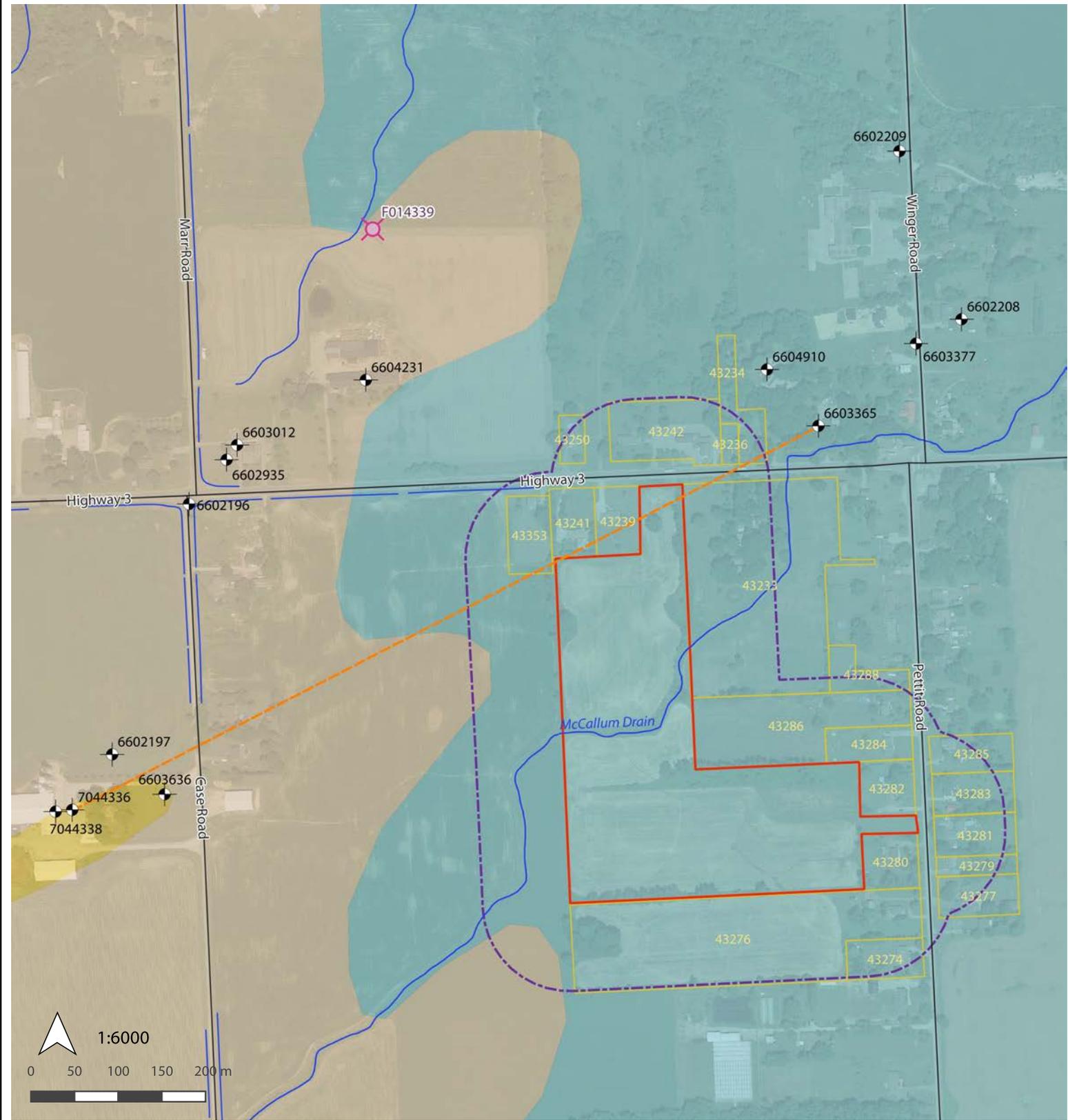
Singer, S.N., Cheng, C.K. and Scafe, M.G., 2003. The Hydrogeology of Southern Ontario, 2nd Edition. Environmental Monitoring and Reporting Branch, Ministry of the Environment.

Township of Wainfleet (Township), 2019. Record of Pre-Consultation, Vacant Lot, Roll Number 27140000912401, Con 4 Pt Lot 32. Meeting date Thursday, May 9, 2019, amended on June 11, 2019.

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



Location of Site	
Winger Subdivision	
	Figure 1



- Water Well Record
- Petroleum Well Record
- Watercourse
- Geological Cross Section
- Proposed Subdivision
- 100m Site Buffer
- Well Survey Delivered
- Surficial Geology**
- Clay and silt
- Sand
- Sand and silt

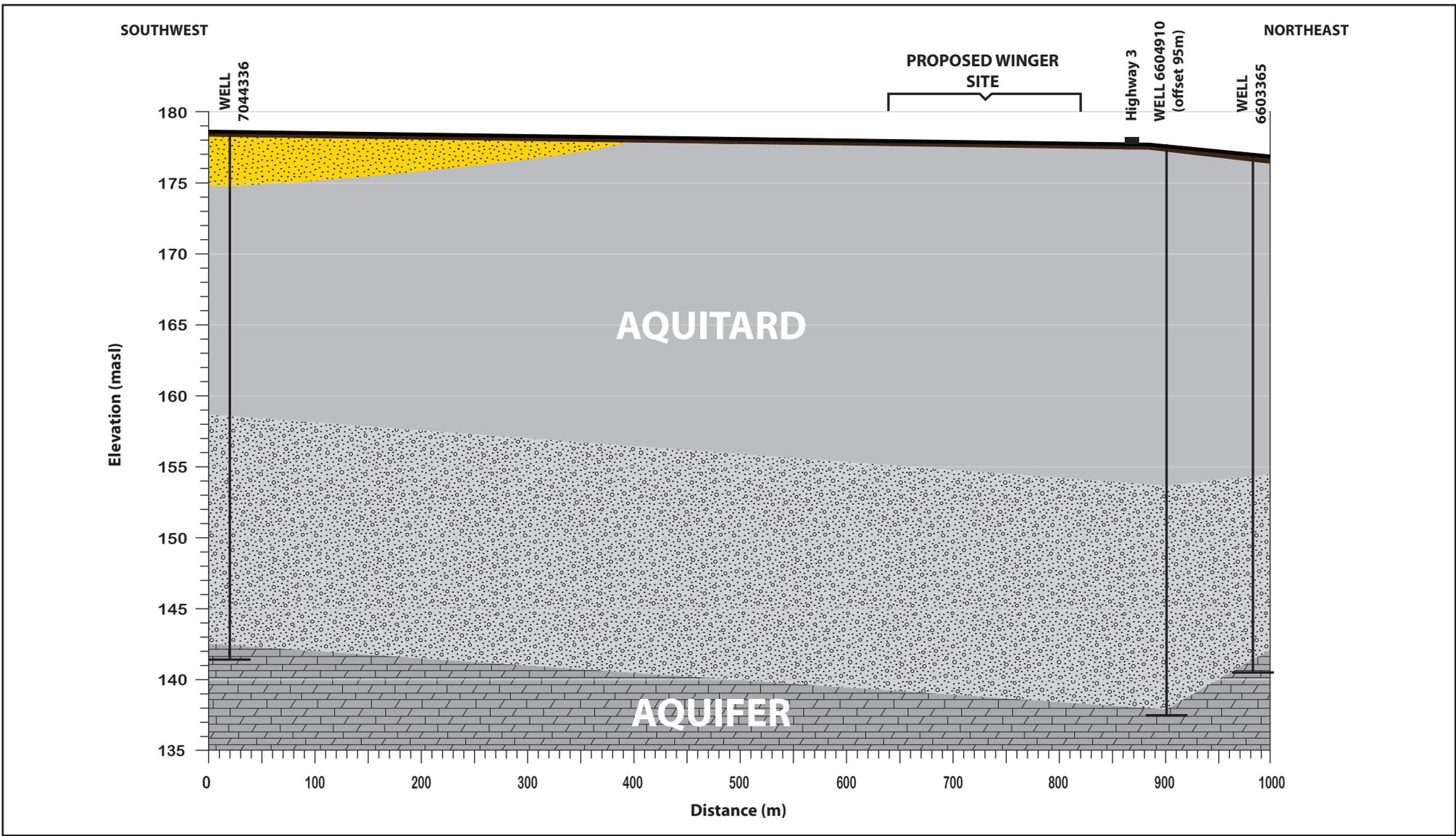
Site Details

Winger Subdivision



References: Ministry of Environment, Conservation and Parks: Drilled Water Well, 2018. Ministry of Energy, Northern Development and Mines, Mines and Minerals Division, Ontario Geological Survey: Ontario Geotechnical Boreholes, Surficial Geology, 2003. Niagara Peninsula Conservation Authority: Watercourse 1:2000, 2006.
Map Date: 2019-09-16
D:\TerraDynamics\Projects\WingerSubdivision\ProjectFiles\Figure 2 - Site Details.qgz

Figure 2



- TOPSOIL
- SAND, fine, brown
- CLAY
- CLAY with gravel to SILTY SAND with gravel
- BEDROCK

See Figure 2 for line of cross-section

Hydrogeologic Cross-Section	
Winger Subdivision	
	Terra-Dynamics Consulting Inc.
	Figure 3

Appendix A

Well Logs

UTM 5 Z 0585 E
4 R 0585 N
 Elev. 4 R 0585
 Basin 24 UTM



66 No. 2196
 GROUND WATER BRANCH
 MAR 27 1961
 ONTARIO WATER RESOURCES COMMISSION

The Ontario Water Resources Commission Act, 1957

WATER WELL RECORD

County or District Welland Township, Village, Town or City Wainfleet
 Date completed 16 Oct. 60
 (day month year)
 Address

Casing and Screen Record

Inside diameter of casing 2"
 Total length of casing 120'
 Type of screen
 Length of screen
 Depth to top of screen
 Diameter of finished hole 2"

Pumping Test

Static level 8'
 Test-pumping rate 2 G.P.M.
 Pumping level 115'
 Duration of test pumping 2 hrs
 Water clear or cloudy at end of test clear
 Recommended pumping rate 2 G.P.M.
 with pumping level of 119'

Well Log

Water Record

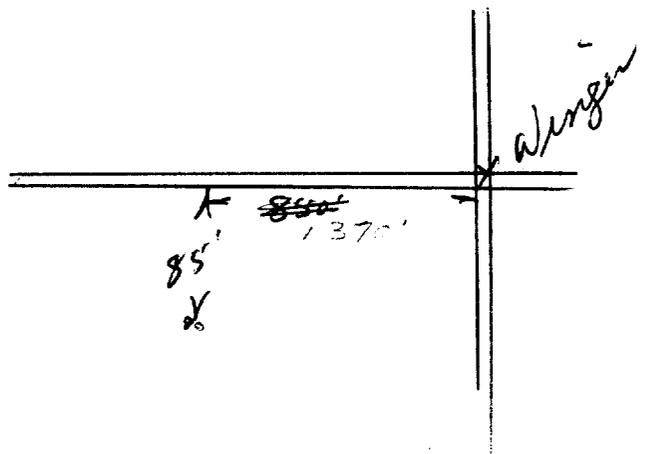
Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	No. of feet water rises	Kind of water (fresh, salty, sulphur)
<u>soft brown clay</u>	<u>0</u>	<u>45'</u>			
<u>blue clay</u>	<u>45'</u>	<u>105'</u>			
<u>gravel</u>	<u>105'</u>	<u>120</u>	<u>105'-120</u>	<u>112</u>	<u>fresh trace of salt</u>

For what purpose(s) is the water to be used?
farm
 Is well on upland, in valley, or on hillside?

 Drilling Firm M. Deshaies
 Address R.R. 1 Wainfleet
 Licence Number
 Name of Driller M. Deshaies
 Address R.R. 1 Wainfleet
 Date Mar. 16/61
Real Deshaies
 (Signature of Licensed Drilling Contractor)

Location of Well

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



UTM 9 Z 0580 E
9 R 0580 N
 Elev 9 R 0580
 Basin 24 51



66 No 2208
 JUN 1958
 ONTARIO
 RECORDS

The Water-well Drillers Act, 1954
 Department of Mines

Water-Well Record

County or Territorial District Welland Township, Village, Town or City Wainfleet Twp.
 Village, Town or City Wainfleet Twp.
 Address Munger Ontario
 (day) (month) (year)

Pipe and Casing Record

Pumping Test

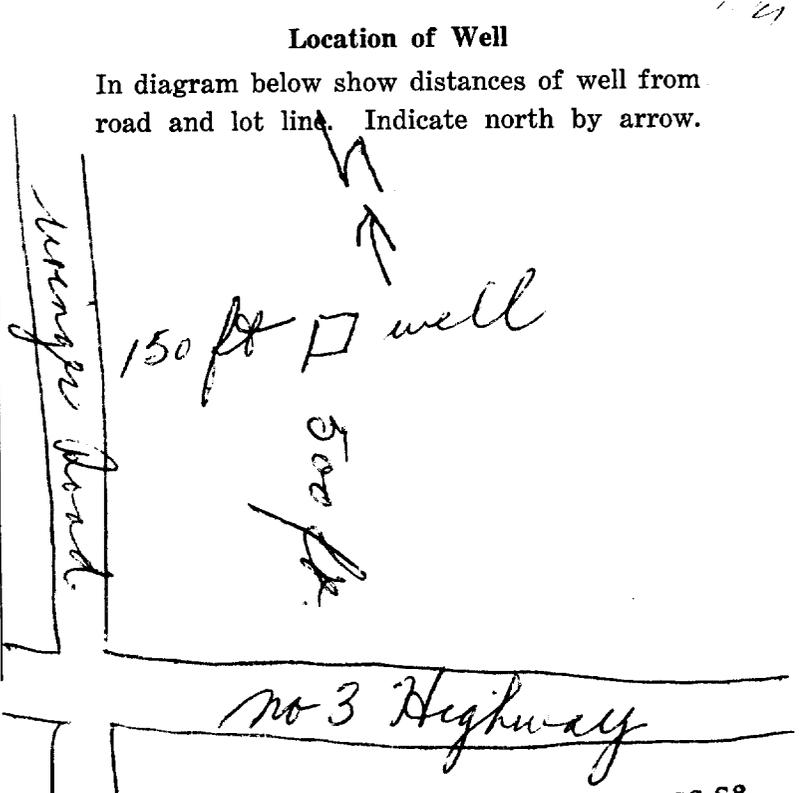
Casing diameter(s) 5 5/8
 Length(s) 1208 ft.
 Type of screen /
 Length of screen /
 Static level 9 ft.
 Pumping rate 1600 gal per hr.
 Pumping level 15 ft.
 Duration of test 1 hr.

Well Log

Water Record

Overburden and Bedrock Record	From ft.	To ft.	Depth (s) at which water (s) found	No. of feet water rises	Kind of water (fresh, salty, or sulphur)
clay	0	60			
sands	60	95			
red clay	95	110			
sand	110	119			
gravel	119	123	123	114 ft	fresh

For what purpose(s) is the water to be used? domestic
 Is water clear or cloudy? clearing
 Is well on upland, in valley, or on hillside? hill
 Drilling firm Glenn Hallborg
 Address R.R. 1, Port Colborne Ontario
 Name of Driller same
 Address same
 Licence Number 738



I certify that the foregoing statements of fact are true.
 Date Dec 1 Leonard Hallborg
 Signature of Licensee

no 3 Highway

CSS.S8



WATER WELL RECORD

200/14e

Ontario White Oaks Apt

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

11

6602935

MUNICIP. 66.007

CON. C4N

05

COUNTY OR DISTRICT Welland	TOWNSHIP, BOROUGH, CITY, TOWN OR VILLAGE Wainfleet	CON., BLOCK, TRACT, SURVEY, ETC. Con 5	LOI 033
NAME (FIRST) SHOALTS CONST.	ADDRESS RR #1 Wainfleet	DATE COMPLETED DAY 15 MO. 04 YR. 74	
ZONE 17	NORTHING 626471	EASTING 4755466	ELEVATION 4 0584
RC 4	RC 4	BASIN CODE 24	

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
brown	topsoil		loose	0	2
brown	clay		packed	2	15
grey	clay		dense	15	50
brown	clay		dense	50	65
brown	clay	gravel	packed	65	105
brown	gravel	sand	packed	105	117
grey	limestone		layered	117	160

31	0002602	0015605	0050205	0065605	010560511	011761128	1
32	0160215						

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
10-13 0117	1 <input checked="" type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
15-18 0158	1 <input checked="" type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input checked="" type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
20-23	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
25-28	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
30-33	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET	
			FROM	TO
10-11 06	1 <input checked="" type="checkbox"/> STEEL 2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE	188	0	117
17-18 06	1 <input type="checkbox"/> STEEL 2 <input checked="" type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input checked="" type="checkbox"/> OPEN HOLE		117	160
24-25	1 <input type="checkbox"/> STEEL 2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE			

SCREEN

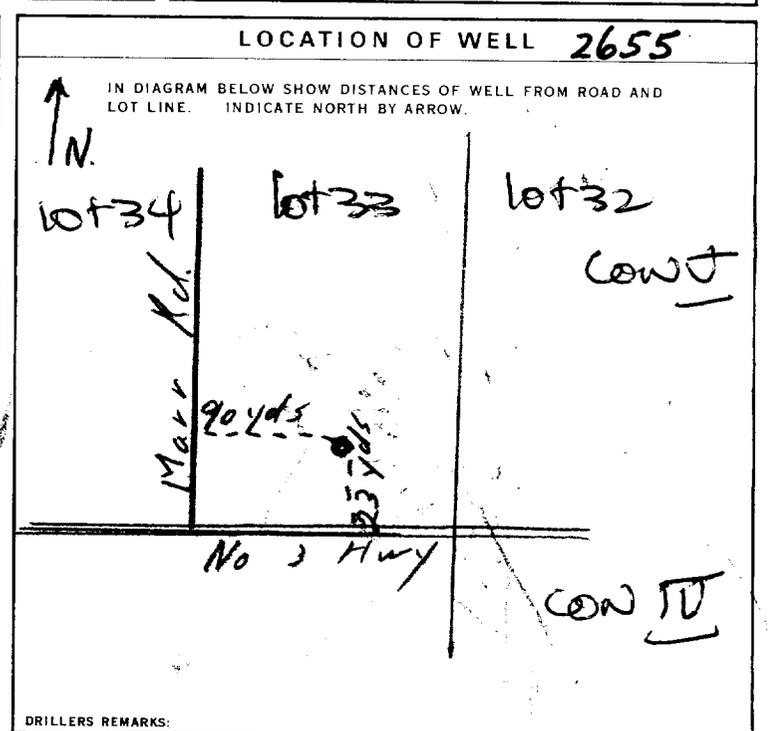
SIZE (S) OF OPENING (SLOT NO.)	DIAMETER	LENGTH
	INCHES	FEET
MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN	
	INCHES	FEET

61 PLUGGING & SEALING RECORD

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

71 PUMPING TEST

PUMPING TEST METHOD 1 <input type="checkbox"/> PUMP 2 <input checked="" type="checkbox"/> BAILER	PUMPING RATE 0006 GPM	DURATION OF PUMPING 15-16 HOURS 01 17-18 MINS 30
STATIC LEVEL 020 FEET	WATER LEVEL END OF PUMPING 140 FEET	WATER LEVELS DURING 15 MINUTES 140 30 MINUTES 140 45 MINUTES 140 60 MINUTES 140
IF FLOWING GIVE RATE GPM	PUMP INTAKE SET AT FEET	WATER AT END OF TEST 1 <input type="checkbox"/> CLEAR 2 <input checked="" type="checkbox"/> CLOUDY
RECOMMENDED PUMP TYPE <input type="checkbox"/> SHALLOW <input checked="" type="checkbox"/> DEEP	RECOMMENDED PUMP SETTING 130 FEET	RECOMMENDED PUMPING RATE 0005 GPM



FINAL STATUS OF WELL

1 <input checked="" type="checkbox"/> WATER SUPPLY	5 <input type="checkbox"/> ABANDONED, INSUFFICIENT SUPPLY
2 <input type="checkbox"/> OBSERVATION WELL	6 <input type="checkbox"/> ABANDONED POOR QUALITY
3 <input type="checkbox"/> TEST HOLE	7 <input type="checkbox"/> UNFINISHED
4 <input type="checkbox"/> RECHARGE WELL	

WATER USE

1 <input checked="" type="checkbox"/> DOMESTIC	5 <input type="checkbox"/> COMMERCIAL
2 <input type="checkbox"/> STOCK	6 <input type="checkbox"/> MUNICIPAL
3 <input type="checkbox"/> IRRIGATION	7 <input type="checkbox"/> PUBLIC SUPPLY
4 <input type="checkbox"/> INDUSTRIAL	8 <input type="checkbox"/> COOLING OR AIR CONDITIONING
<input type="checkbox"/> OTHER	9 <input type="checkbox"/> NOT USED

METHOD OF DRILLING

1 <input checked="" type="checkbox"/> CABLE TOOL	6 <input type="checkbox"/> BORING
2 <input type="checkbox"/> ROTARY (CONVENTIONAL)	7 <input type="checkbox"/> DIAMOND
3 <input type="checkbox"/> ROTARY (REVERSE)	8 <input type="checkbox"/> JETTING
4 <input type="checkbox"/> ROTARY (AIR)	9 <input type="checkbox"/> DRIVING
5 <input type="checkbox"/> AIR PERCUSSION	

CONTRACTOR

NAME OF WELL CONTRACTOR Donald Merritt	LICENCE NUMBER 3640
ADDRESS RR #1 Smithville	
NAME OF DRILLER OR BORER Donald Merritt	LICENCE NUMBER 3640
SIGNATURE OF CONTRACTOR Donald Merritt	SUBMISSION DATE DAY 6 NO. May YR. 74

OFFICE USE ONLY

DATA SOURCE 1	CONTRACTOR 3640	DATE RECEIVED 140574
DATE OF INSPECTION		INSPECTOR
REMARKS:		
CSS.58		P 15
		WI



Ontario

WATER WELL RECORD

White Oaks Apt.

11

6603012

MUNICIP. 66007

CON. CON

301/14e

COUNTY OR DISTRICT: **Welland** TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: **Wainfleet** CON., BLOCK, TRACT, SURVEY, ETC.: **Con 5** LOT: **33**

OWNER (SURNAME FIRST): **Shoalts Construction** ADDRESS: **RR#1 Wainfleet** DATE COMPLETED: DAY **24** MO. **09** YR. **74**

6603012 17 626483 4755483 4 584 4 24 JUN 15, 1977 282

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
brown	top soil		loose	0	2
brown	clay		packed	2	10
grey	clay		dense	10	60
brown	clay		dense	60	105
brown	gravel	sand	packed	105	114
grey	shale		layered	114	115

31 0002602 0010605 0060205 0105605 011461128 0115217

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
10-13	1 <input checked="" type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
15-18	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
20-23	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
25-28	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
30-33	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL

51 CASING & OPEN HOLE RECORD

WIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET	
			FROM	TO
06 1/4	1 <input checked="" type="checkbox"/> STEEL 2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE	.188	0	0114
06	1 <input type="checkbox"/> STEEL 2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input checked="" type="checkbox"/> OPEN HOLE		114	0115

SCREEN

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

MATERIAL AND TYPE: _____ DEPTH TO TOP OF SCREEN: _____

61 PLUGGING & SEALING RECORD

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

71 PUMPING TEST

PUMPING TEST METHOD: PUMP 2 BAILER

PUMPING RATE: **009 8 1/2** GPM. DURATION OF PUMPING: **01 15** HOURS

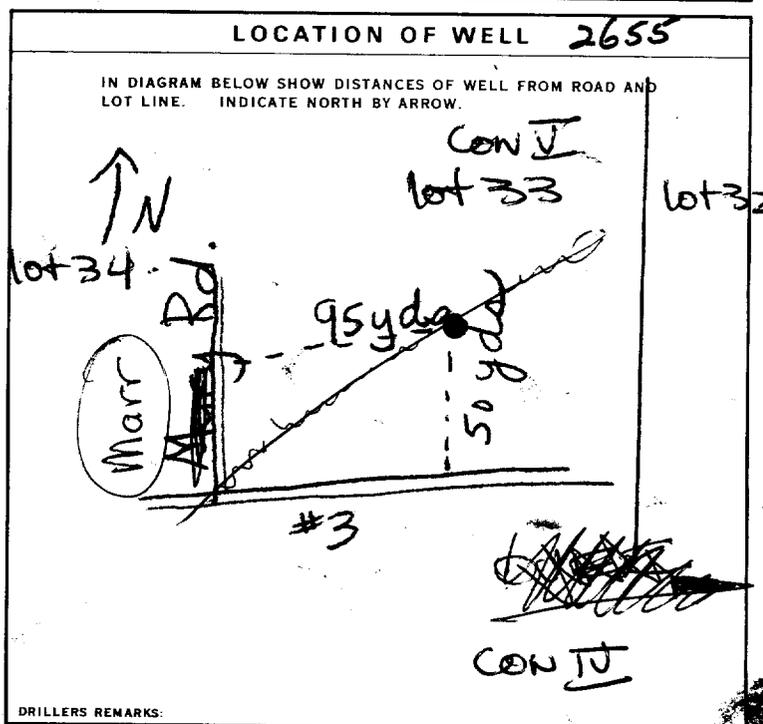
STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING	1 <input type="checkbox"/> PUMPING 2 <input checked="" type="checkbox"/> RECOVERY
012	070	15 MINUTES: 015 30 MINUTES: 012 45 MINUTES: 012 60 MINUTES: 012	

IF FLOWING, GIVE RATE: _____ PUMP INTAKE SET AT: _____ WATER AT END OF TEST: _____

RECOMMENDED PUMP TYPE: SHALLOW DEEP

RECOMMENDED PUMP SETTING: **110** FEET

RECOMMENDED PUMPING RATE: **0008** GPM.



FINAL STATUS OF WELL

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

WATER USE

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

METHOD OF DRILLING

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

CONTRACTOR

NAME OF WELL CONTRACTOR: **Donald Merritt** LICENCE NUMBER: **3640**

ADDRESS: **RR#1 Smithville**

NAME OF DRILLER OR BORER: **Donald Merritt** LICENCE NUMBER: **3640**

SIGNATURE OF CONTRACTOR: _____ SUBMISSION DATE: DAY **4** NO. **Nov** YR. **74**

OFFICE USE ONLY

DATA SOURCE: **1** CONTRACTOR: **3640** DATE RECEIVED: **16/12/74**

DATE OF INSPECTION: **12/10/74** INSPECTOR: _____

REMARKS: _____

CSS.58

P **KS**
WI

304/142

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

11 6603365 66007 CON 05
 COUNTY OR DISTRICT: [redacted] TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: Wainfleet CON. BLOCK, TRACT, SURVEY, ETC: Con 5 LOT 25-27: 032
 DATE COMPLETED: DAY 28 MO Oct YR 79
 HING: 755480 RC: 4 ELEVATION: 0570 RC: 4 BASIN CODE: 24

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
black	top soil		soft	0	3
grey	clay		dense	3	65
brown	clay		dense	65	75
brown	clay	gravel	packed	75	117 1/2
grey	shale		layered	117 1/2	120
grey	limestone		layered	120	

31 [redacted] 32 [redacted]

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER			
10-13	<input checked="" type="checkbox"/> FRESH	<input type="checkbox"/> SALTY	<input type="checkbox"/> SULPHUR	<input type="checkbox"/> MINERAL
15-18	<input type="checkbox"/> FRESH	<input type="checkbox"/> SALTY	<input type="checkbox"/> SULPHUR	<input type="checkbox"/> MINERAL
20-23	<input type="checkbox"/> FRESH	<input type="checkbox"/> SALTY	<input type="checkbox"/> SULPHUR	<input type="checkbox"/> MINERAL
25-28	<input type="checkbox"/> FRESH	<input type="checkbox"/> SALTY	<input type="checkbox"/> SULPHUR	<input type="checkbox"/> MINERAL
30-33	<input type="checkbox"/> FRESH	<input type="checkbox"/> SALTY	<input type="checkbox"/> SULPHUR	<input type="checkbox"/> MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET	
			FROM	TO
10-11	<input checked="" type="checkbox"/> STEEL	.188	0	119 1/2
17-18	<input checked="" type="checkbox"/> GALVANIZED		119 1/2	120
24-25	<input type="checkbox"/> STEEL			

SCREEN

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

61 PLUGGING & SEALING RECORD

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

71 PUMPING TEST

PUMPING TEST METHOD	PUMPING RATE GPM	DURATION OF PUMPING HOURS
<input type="checkbox"/> PUMP <input checked="" type="checkbox"/> BAILER	78	1 15-16 30
STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING
19-21: 87 FEET	22-24: 85 FEET	15 MINUTES: 90 FEET
		30 MINUTES: 88 FEET
		45 MINUTES: 87 FEET
		60 MINUTES: 87 FEET
IF FLOWING GIVE RATE	PUMP INTAKE SET AT	WATER AT END OF TEST
	75 FEET	
RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
<input type="checkbox"/> SHALLOW <input checked="" type="checkbox"/> DEEP	75 FEET	666 GPM

LOCATION OF WELL

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

DRILLERS REMARKS

FINAL STATUS OF WELL

WATER USE

METHOD OF DRILLING

CONTRACTOR

NAME OF WELL CONTRACTOR: Donald Merritt LICENCE NUMBER: 3640
 ADDRESS: RR #1 Smithville
 NAME OF DRILLER OR BORER: Donald Merritt LICENCE NUMBER: 3640
 SIGNATURE OF CONTRACTOR: Donald Merritt SUBMISSION DATE: DAY 6 MO Nov YR 79

OFFICE USE ONLY

DATA SOURCE: 1 CONTRACTOR: 3640 DATE RECEIVED: 141179
 DATE OF INSPECTION: May 27, 1980 INSPECTOR: [signature]
 REMARKS: [signature] CSS.S8

304/14e

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

11 6603377
MUNICIP 66.007 CON. CON. 05
COUNTY OR DISTRICT TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE
WELLAND WINDY FLEET WINGER RD. 5 032
DATE COMPLETED 7 6 79
MING 255600 RC 4 ELEVATION 0570 RC 4 BASIN CODE 24

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
BROWN	CLAY LOAM			0	4
GREY	SAND Y CLAY			4	8
"	CLAY			8	82
RED	SAND			82	90
"	CLAY & GRAVEL			90	126
	GRAVEL			126	129

31 32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER			
10-13	1 <input checked="" type="checkbox"/> FRESH	3 <input type="checkbox"/> SULPHUR	4 <input type="checkbox"/> MINERAL	
15-18	1 <input type="checkbox"/> FRESH	3 <input type="checkbox"/> SULPHUR	4 <input type="checkbox"/> MINERAL	
20-23	1 <input type="checkbox"/> FRESH	3 <input type="checkbox"/> SULPHUR	4 <input type="checkbox"/> MINERAL	
25-28	1 <input type="checkbox"/> FRESH	3 <input type="checkbox"/> SULPHUR	4 <input type="checkbox"/> MINERAL	
30-33	1 <input type="checkbox"/> FRESH	3 <input type="checkbox"/> SULPHUR	4 <input type="checkbox"/> MINERAL	

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET	
			FROM	TO
6.75	STEEL	0.231	138	129
7.00	STEEL			

SCREEN

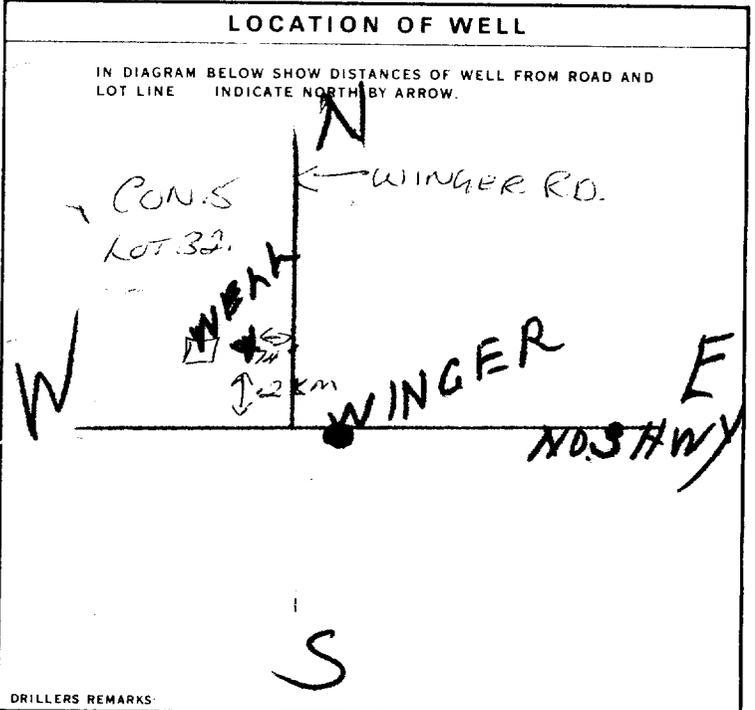
SIZE(S) OF OPENING (SLOT NO)	DIAMETER	LENGTH
	INCHES	FEET
MATERIAL AND TYPE		DEPTH TO TOP OF SCREEN
		FEET

61 PLUGGING & SEALING RECORD

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

71 PUMPING TEST

PUMPING TEST METHOD 1 <input type="checkbox"/> PUMP 2 <input checked="" type="checkbox"/> BAILEY	PUMPING RATE 15 GPM	DURATION OF PUMPING 3 HOURS
STATIC LEVEL 16 FEET	WATER LEVEL END OF PUMPING 72 FEET	WATER LEVELS DURING 15 MINUTES: 26-28 FEET 30 MINUTES: 29-31 FEET 45 MINUTES: 32-34 FEET 60 MINUTES: 35-37 FEET
IF FLOWING GIVE RATE	PUMP INTAKE SET AT 80 FEET	WATER AT END OF TEST 1 <input type="checkbox"/> CLEAR 2 <input checked="" type="checkbox"/> CLOUDY
RECOMMENDED PUMP TYPE 1 <input checked="" type="checkbox"/> SHALLOW 2 <input checked="" type="checkbox"/> DEEP	RECOMMENDED PUMP SETTING RATE 80 FEET	RECOMMENDED PUMPING RATE 8 GPM



FINAL STATUS OF WELL

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

WATER USE

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

METHOD OF DRILLING

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

CONTRACTOR

NAME OF WELL CONTRACTOR: W. R. FIELD LICENCE NUMBER: 2123
ADDRESS: R.R. 1 WINDY FLEET
NAME OF DRILLER OR BORER: MARSHALL FIELD LICENCE NUMBER: 2124
SIGNATURE OF CONTRACTOR: W. R. Field SUBMISSION DATE: DAY MO. YR.

OFFICE USE ONLY

DATA SOURCE: 1 CONTRACTOR: 2123 DATE RECEIVED: 28 02 80
DATE OF INSPECTION: May 27, 1980 INSPECTOR:
REMARKS: CS-209 JW.

Print only in spaces provided.
Mark correct box with a checkmark, where applicable.

WELLAND

11

6604231

Municipality 66007 Con. CON 05

County or District: [Redacted] Township/Borough/City/Town/Village: WAINFLEET
 Address: WILLFORD RD
 Date completed: 20 11 95
 Con. block tract survey, etc.: 5 Lot: 33

Northings: 10-17, 18-24, 25-31, 30-31, 31-47
 Elevation: RC, RC
 Basin Code: ii, iii, iv

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)					
General colour	Most common material	Other materials	General description	Depth - feet	
				From	To
BLACK	TOPSOIL		PACKED	0	2
GREY	CLAY		PACKED	2	30
BROWN	CLAY		PACKED	50	70
RED	CLAY		PACKED	70	83
BROWN	CLAY	FINE GRAVEL	PACKED	83	112
BROWN	CLAY		PACKED	112	113
GREY	GRAVEL		PACKED	113	117
GREY	LIMESTONE		LAYERED	117	123

31
32

WATER RECORD			
Water found at - feet	Kind of water		
120	<input checked="" type="checkbox"/> Fresh	<input type="checkbox"/> Sulphur	<input type="checkbox"/> Minerals
	<input type="checkbox"/> Salty	<input type="checkbox"/> Gas	

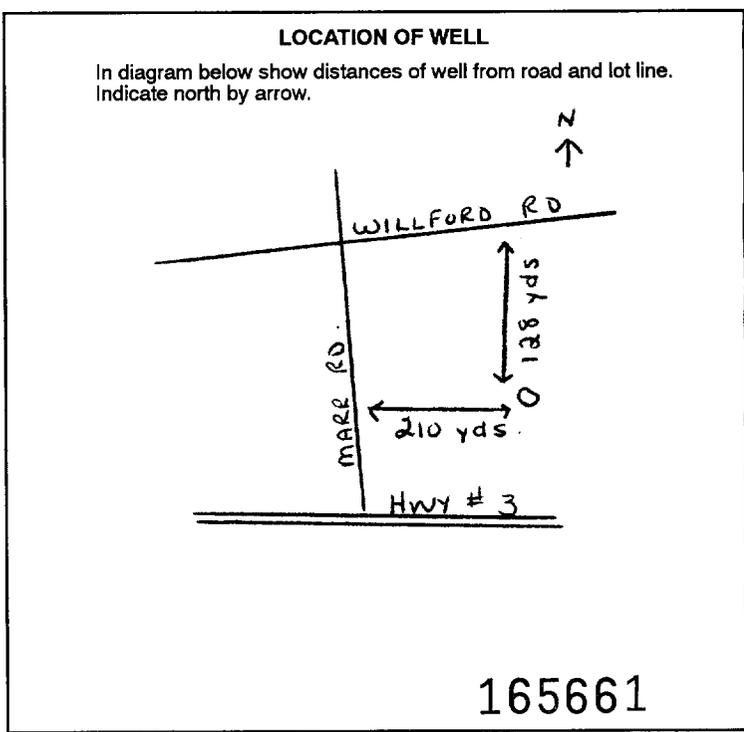
CASING & OPEN HOLE RECORD				
Inside diam inches	Material	Wall thickness inches	Depth - feet	
			From	To
6 5/8	Steel	1.88	0	118
6	Galvanized Concrete		118	123

SCREEN	Sizes of opening (Slot No.)	Diameter inches	Length feet

PLUGGING & SEALING RECORD			
Annular space		Abandonment	
From	To	Material and type (Cement grout, bentonite, etc.)	
10-13	14-17		

PUMPING TEST		Pumping rate	Duration of pumping
<input checked="" type="checkbox"/> Pump	<input type="checkbox"/> Bailor	18 GPM	45 Mins

Static level	Water level end of pumping	Water levels during			
15 feet	17 feet	15 feet	15 feet	15 feet	15 feet



FINAL STATUS OF WELL

WATER USE

METHOD OF CONSTRUCTION

Name of Well Contractor: KEN SCHOOLEY
 Well Contractor's Licence No.: 4795
 Address: RR#1, PORT COLBORNE
 Name of Well Technician: KEN SCHOOLEY
 Well Technician's Licence No.: T-0351
 Submission date: 29 11 95

MINISTRY USE ONLY

Data source: 4795
 Date received: DEC 04 1995
 Date of inspection: _____
 Inspector: _____
 Remarks: _____

Instructions for Completing Form

- For use in the **Province of Ontario** only. This document is a permanent **legal** document. Please retain for future reference.
- All Sections **must** be completed in full to avoid delays in processing. Further instructions and explanations are available on the back of this form.
- Questions regarding completing this application can be directed to the Water Well Management Coordinator at 416-235-6203.
- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Well Owner's Information and Location of Well Information

MUN		CON		LOT	
Mailing Address (Street Number/Name, RR, Lot, Concession) 32 W30 #3 Hwy					
County/District/Municipality Niagara Region		Township/City/Town/Village Wainfleet		Province Ontario	Postal Code L0S 1V0
Address of Well Location (County/District/Municipality) Same			Township 32	Concession 5	
RR#/Street Number/Name			City/Town/Village		Site/Compartment/Block/Tract etc.
GPS Reading	NAD 83	Zone 17	Easting 626757	Northing 4755154	Unit Make/Model Magella
Mode of Operation:			<input type="checkbox"/> Undifferentiated <input checked="" type="checkbox"/> Averaged <input type="checkbox"/> Differentiated, specify		

Log of Overburden and Bedrock Materials (see instructions)

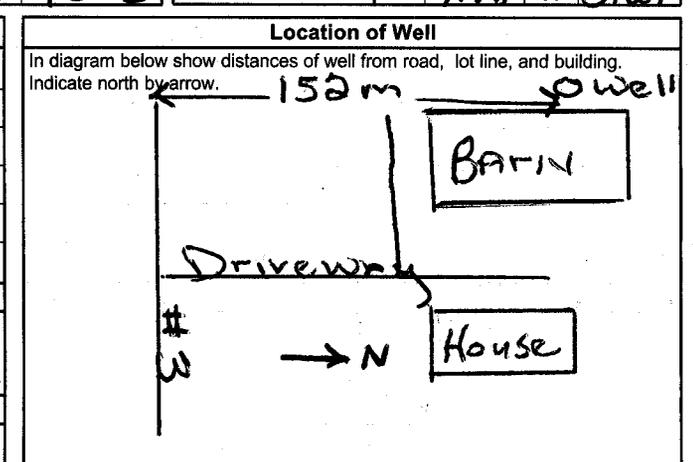
General Colour	Most common material	Other Materials	General Description	Depth From	Metres To
Brown	Topsoil			0	0.60
Grey	Clay (hard)			0.6	6
Grey	Silty Clay			6	24.3
Brown	Silty sand & Gravel			24.3	39.92
Grey	limestone			39.92	40.5

Hole Diameter		
Depth From	Metres To	Diameter Centimetres
0	40.5	15
Water Record		
Water found at 40 metres	Kind of Water	
<input checked="" type="checkbox"/> Fresh	<input type="checkbox"/> Sulphur	
<input type="checkbox"/> Gas	<input type="checkbox"/> Salty	<input type="checkbox"/> Minerals
<input type="checkbox"/> Other:		

Construction Record				
Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Metres To
15	<input checked="" type="checkbox"/> Steel <input type="checkbox"/> Fibreglass	188	0	39.92
Casing				
<input type="checkbox"/> Plastic <input type="checkbox"/> Concrete <input type="checkbox"/> Galvanized <input type="checkbox"/> Steel <input type="checkbox"/> Fibreglass <input type="checkbox"/> Plastic <input type="checkbox"/> Concrete <input type="checkbox"/> Galvanized <input type="checkbox"/> Steel <input type="checkbox"/> Fibreglass <input type="checkbox"/> Plastic <input type="checkbox"/> Concrete <input type="checkbox"/> Galvanized				
Screen				
Outside diam	<input type="checkbox"/> Steel <input type="checkbox"/> Fibreglass	Slot No.		
No Casing or Screen				
<input checked="" type="checkbox"/> Open hole				

Test of Well Yield				
Pumping test method	Time min	Draw Down Water Level Metres	Recovery Time min	Water Level Metres
Submersible				
Pump intake set at - (metres)	39	Static Level 5.24		
Pumping rate - (litres/min)	97.85	1 6.73	1	6.85
Duration of pumping	1 hrs + min	2 7.58	2	6.24
Final water level end of pumping	metres	3 7.55	3	5.69
Recommended pump type	<input checked="" type="checkbox"/> Shallow <input type="checkbox"/> Deep	4 6.49	4	5.18
Recommended pump depth	39 metres	5 8.13	5	5.39
Recommended pump rate	37.85 (litres/min)	10 6.85	10	5.33
If flowing give rate - (litres/min)		15 7.74	15	5.24
If pumping discontinued, give reason.		20 8.16	20	
		25 7.01	25	
		30 8.29	30	
		40 7.98	40	
		50 7.98	50	
		60 7.98	60	5.24

Plugging and Sealing Record		
Depth set at - Metres	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0 to 6	Quick Grout	27 Gal



Method of Construction			
<input checked="" type="checkbox"/> Cable Tool	<input type="checkbox"/> Rotary (air)	<input type="checkbox"/> Diamond	<input type="checkbox"/> Digging
<input type="checkbox"/> Rotary (conventional)	<input type="checkbox"/> Air percussion	<input type="checkbox"/> Jetting	<input type="checkbox"/> Other
<input type="checkbox"/> Rotary (reverse)	<input type="checkbox"/> Boring	<input type="checkbox"/> Driving	
Water Use			
<input checked="" type="checkbox"/> Domestic	<input type="checkbox"/> Industrial	<input type="checkbox"/> Public Supply	<input type="checkbox"/> Other
<input type="checkbox"/> Stock	<input type="checkbox"/> Commercial	<input type="checkbox"/> Not used	
<input type="checkbox"/> Irrigation	<input type="checkbox"/> Municipal	<input type="checkbox"/> Cooling & air conditioning	
Final Status of Well			
<input checked="" type="checkbox"/> Water Supply	<input type="checkbox"/> Recharge well	<input type="checkbox"/> Unfinished	<input type="checkbox"/> Abandoned, (Other)
<input type="checkbox"/> Observation well	<input type="checkbox"/> Abandoned, insufficient supply	<input type="checkbox"/> Dewatering	
<input type="checkbox"/> Test Hole	<input type="checkbox"/> Abandoned, poor quality	<input type="checkbox"/> Replacement well	

Audit No. Z 33224	Date Well Completed 05 10 19
Was the well owner's information package delivered? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Date Delivered 05 10 20

Well Contractor/Technician Information	
Name of Well Contractor Circle Eddy's Drilling	Well Contractor's Licence No. 7294
Business Address (street name, number, city etc.) 108 Queen St South Thorold ON N3V 3N9	
Name of Well Technician (last name, first name) Gladney Edward	Well Technician's Licence No. T-2099
Signature of Technician/Contractor x Ed Gladney	Date Submitted 05/10/20

Ministry Use Only			
Data Source	Contractor 7294		
Date Received OCT 31 2005	YYYY	MM	DD
Remarks	Date of Inspection YYYY MM DD		
Well Record Number			

Instructions for Completing Form

- For use in the Province of Ontario only. This document is a permanent legal document. Please retain for future reference. All Sections must be completed in full to avoid delays in processing. Questions regarding completing this application can be directed to the Water Well Management Coordinator at 416-235-6203. All metre measurements shall be reported to 1/10th of a metre. Please print clearly in blue or black ink only.

Well Owner's Information and Location of Well Information

Table with columns: MUN, CON, LOT

RR#/Street Number/Name: Niagara Case Rd, City/Town/Village: Wainfleet, Site/Compartment/Block/Tract etc.: 34 Con 4

Log of Overburden and Bedrock Materials (see instructions)

Table with columns: General Colour, Most common material, Other Materials, General Description, Depth From, Depth To

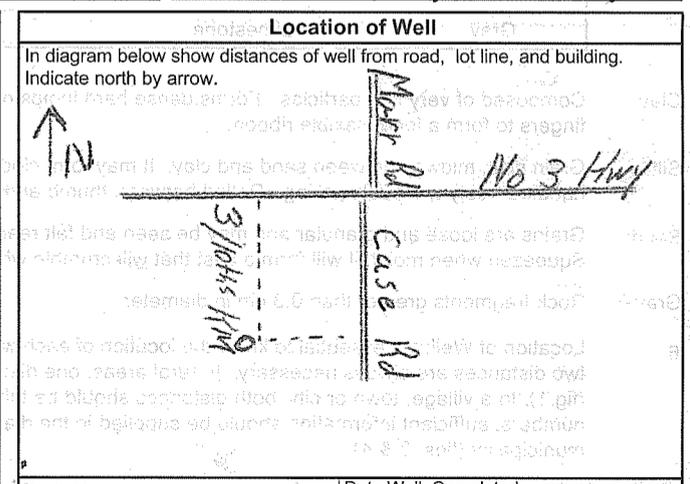
Hole Diameter table with columns: Depth, Diameter

Construction Record table with columns: Inside diam, Material, Wall thickness, Depth

Test of Well Yield table with columns: Pumping test method, Draw Down, Recovery

Water Record section with checkboxes for Fresh, Sulphur, Gas, Salty, Minerals

Plugging and Sealing Record table with columns: Depth set at, Material and type, Volume Placed



Method of Construction, Water Use, Final Status of Well sections

Audit No. 2 47576, Date Well Completed 2007 04 19

Well Contractor/Technician Information section with Name of Well Contractor: Don Merritt

Ministry Use Only section with Data Source, Contractor: 3640

CTY: Welland	TWP: Wainfleet	TRACT:	LOT: 33	CON: VI
WELL NAME: Provincial Gas No.582 D. R. Swayse			WELL ID: F014339	CLASS: DEV
OPERATOR: The Consumers' Gas Company		Target: CLI	STATUS: GP - ABD	

<u>DRILLING DATA</u>	<u>DATES</u>	<u>COORDINATES</u>	<u>SAMPLES</u>
RIG TYPE:	LICENCE ISSUED:	N/S BOUND: 304.80 N	TRAY:
GRND ELEV: 175.47	SPUD DATE:	E/W BOUND: 213.36 E	POOL
KB ELEV: 175.77	TD DATE: 1917-02-17	NAD 83	Welland Pool
TVD: 220.68 PBTD:	COMPLETE DATE:	SURF LAT: 42.94571556	
	WORKOVER DATE:	SURF LONG: -79.44752056	
	PLUG DATE: 1964-06-24	BOT LAT: 42.94571556	
		BOT LONG: -79.44752056	

FORMATION	TOP	TVD	ELEV	LOCATION COMMENTS						
				<table border="1"> <thead> <tr> <th>DATE</th> <th>ACCURACY</th> <th>METHOD OBTAINED</th> </tr> </thead> <tbody> <tr> <td></td> <td>Within 200 metres</td> <td>Well Records (pre 1921)</td> </tr> </tbody> </table>	DATE	ACCURACY	METHOD OBTAINED		Within 200 metres	Well Records (pre 1921)
DATE	ACCURACY	METHOD OBTAINED								
	Within 200 metres	Well Records (pre 1921)								

Some content could not be displayed because it requires a member login

Appendix B

Water survey results



Terra-Dynamics Consulting Inc.

404 Queenston Street, St. Catharines, ON L2P 2Y2

August, 2019

Dear Resident:

On behalf of Mr. Dan Bunz, Terra-Dynamics Consulting Inc. is performing a water supply and septic system survey of properties in the Hamlet of Winger near a proposed subdivision (vacant lot roll number 27140000912401 – map shown on page 2 of this letter). Mr. Bunz is making application to the Township of Wainfleet to develop his property as a residential subdivision. This water supply and septic system survey is a recommended part of a hydrogeologic, or groundwater, study of the subject lands. Part of the hydrogeological study is to assess the risk to neighbouring drinking water supplies from new septic beds. This is a standard questionnaire for building homes on private services.

The purpose of this survey is to collect information on private or residential water wells, cisterns and septic systems within approximately 100 metres of the subject property. **Participation is voluntary.** Participation involves completing the attached questionnaire on well and/or cistern use, groundwater quantity, quality and your septic system. Please complete it as best as you can. Please fill out the questionnaire and mail it back to Terra-Dynamics Consulting Inc. in the self-addressed and stamped envelope. The information you provide will be summarized in our report to the Township of Wainfleet 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 Jayme Campbell at 289-407-0915 or via email at jcampbell@terra-dynamics.com.

Thank you in advance for your assistance.

Yours truly,

TERRA-DYNAMICS CONSULTING INC.

A handwritten signature in blue ink that reads 'Jayme D. Campbell'. The signature is fluid and cursive, with the first letters of each word being capitalized and prominent.

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



Terra-Dynamics Consulting Inc.

404 Queenston Street, St. Catharines, ON L2P 2Y2

August, 2019

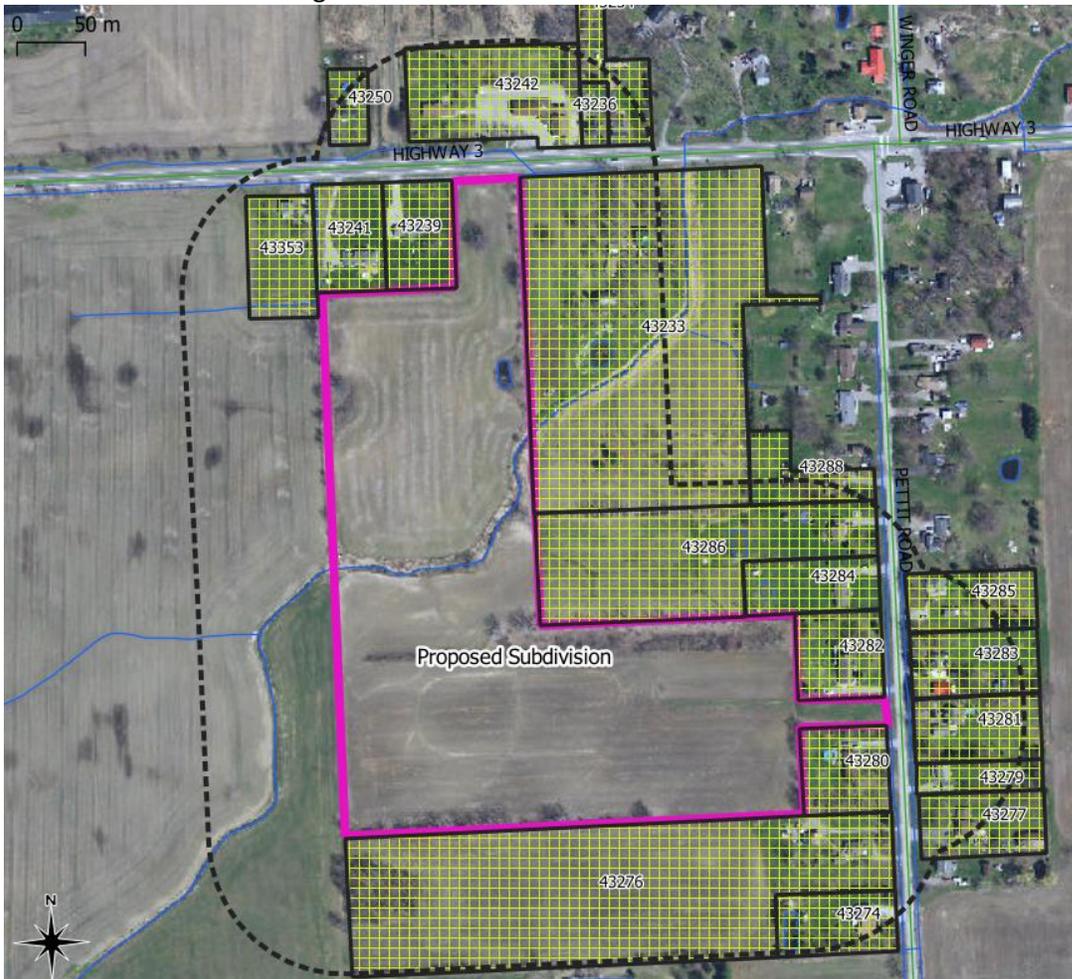
Dear Resident:

My apologies, the letter delivered earlier this week should have included a map of the proposed subdivision, it is shown below. The dashed line is a 100 m buffer from the proposed subdivision for which existing developments are being surveyed. If you have any questions about the questionnaire, please contact Jayme Campbell at 289-407-0915 or via email at jcampbell@terra-dynamics.com.

Yours truly,

TERRA-DYNAMICS CONSULTING INC.

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





WATER WELL SURVEY FORM

Date: _____

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

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? _____

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?

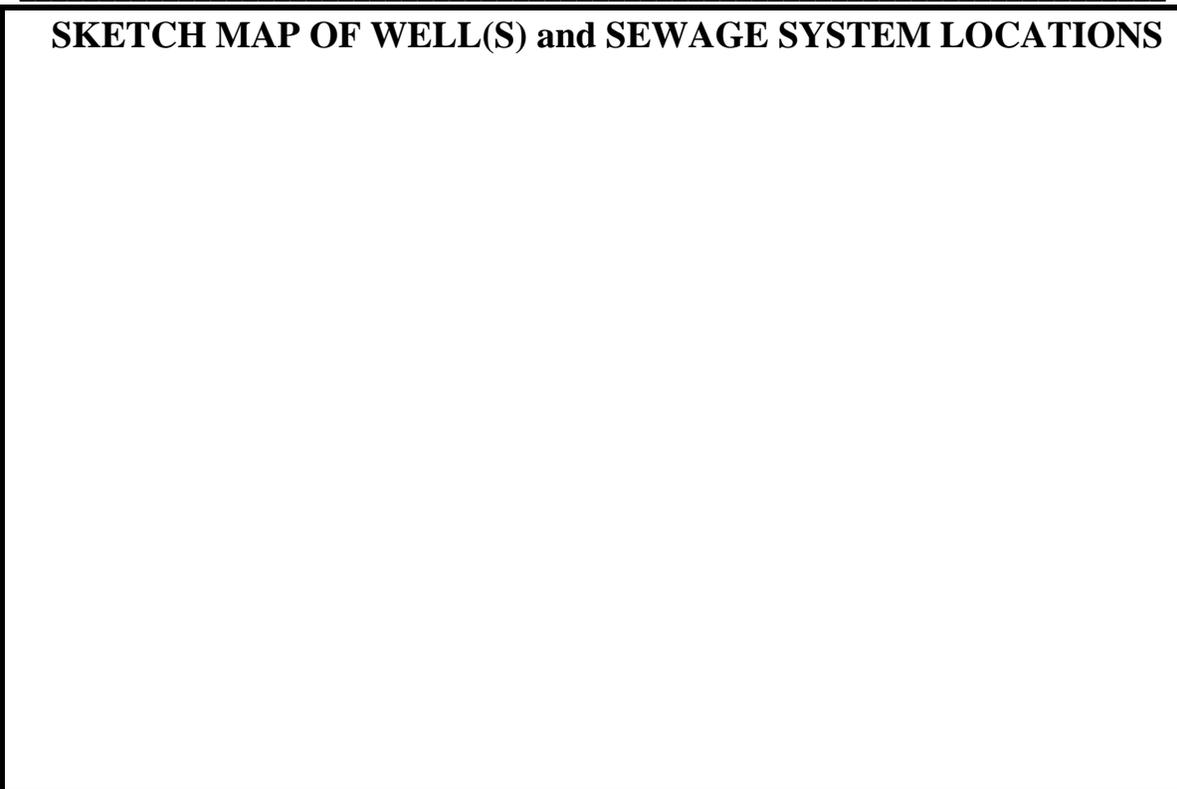
Do you perform regular maintenance on your pump? (i.e. pump service, silt removal)

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.

Jayne Campbell, P. Eng., Senior Water Resource Engineer
404 Queenston Street, St. Catharines, ON L2P 2Y2
289-407-0915



WATER WELL SURVEY FORM

Date: Sept. 3 2019

Contact Person: _____

Property Address: 43220 Pettit Road

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

Further comments: See page 3

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? _____

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.)

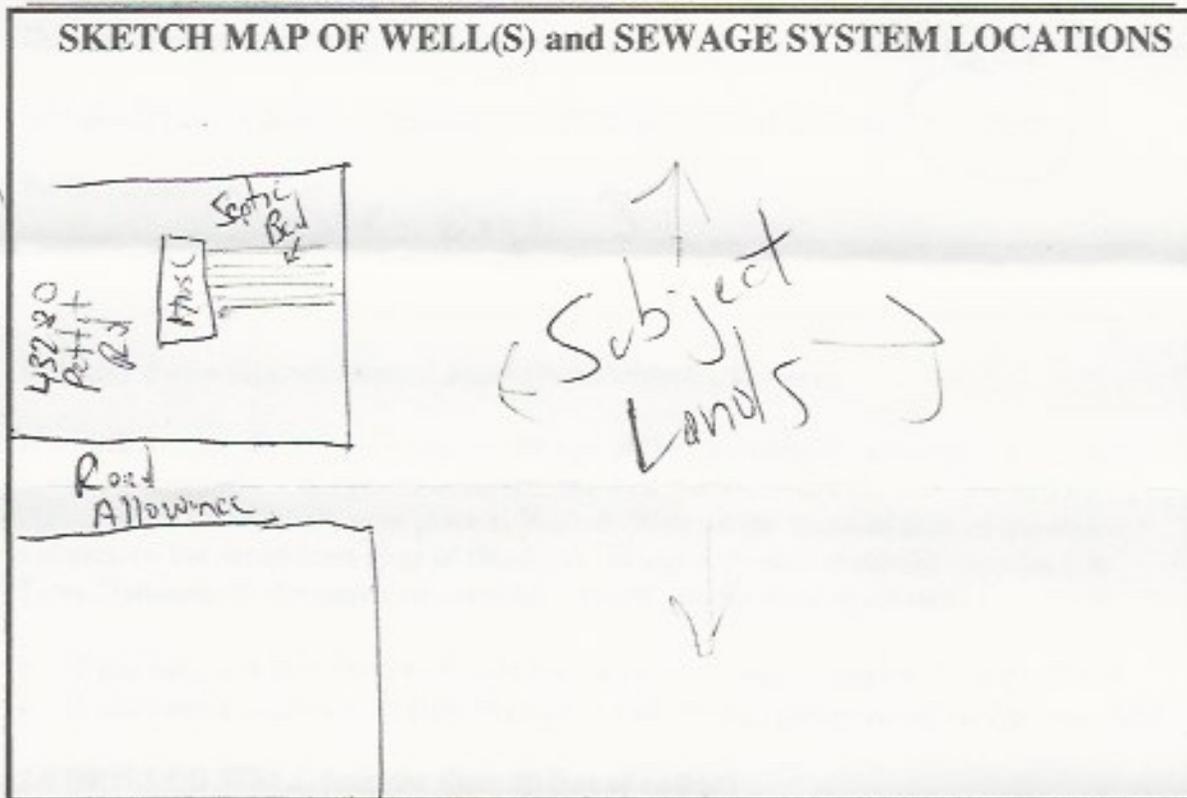
Has your dug well ever run dry?

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).



Other Comments: (Use a separate sheet, if required) — Subject lands has poor drainage!

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

Jayne Campbell, P. Eng., Senior Water Resource Engineer
404 Queenston Street, St. Catharines, ON L2P 2Y2
289-407-0915



WATER WELL SURVEY FORM

Date: Aug 27 / 19

Contact Person: _____

Property Address: 43283 Pettit Rd

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

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? _____



WATER WELL SURVEY FORM

Date: Sept 2, 2019

Contact Person: [Redacted]

Property Address: 43239 Hwy 3

Telephone: [Redacted]

Email (if further information requested): [Redacted]

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

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? _____

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.

Jayne Campbell, P. Eng., Senior Water Resource Engineer
404 Queenston Street, St. Catharines, ON L2P 2Y2
289-407-0915



WATER WELL SURVEY FORM

Date: Aug. 28, 2019

Contact Person: _____

Property Address: 43353 Hwy #3 Wainfleet

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

Further comments:

have been told well on property but do not know where. Just purchased property August 2019

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? _____

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

We were told this is where weeping Bed is.

The sketch map shows a rectangular house with a small square holding tank on its roof. To the left of the house is a cistern marked with an 'X'. Below the house is a shaded area labeled 'Flower Beds'. To the right of the house, a dashed line indicates a 'weeping Bed', with several asterisks (*) representing pine trees along its length.

* Pine trees
= are weeping Bed
X = cistern
O = Holding tanks

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.

Jayme Campbell, P. Eng., Senior Water Resource Engineer
404 Queenston Street, St. Catharines, ON L2P 2Y2
289-407-0915



WATER WELL SURVEY FORM

Date: _____

Contact Person: _____

Property Address: PETTIT ROAD

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

Further comments: BUY DRINKING WATER

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? _____

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.)

