APPENDIX 1

Terra-Dynamics Consulting Inc.

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

October 29, 2020

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 6 lot residential development within the 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).

Relevant municipal policies to satisfy include:

1. Township of Wainfleet Official Plan policies (Township, 2016) 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 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.

2. Niagara Region policy 5.D.8 (Niagara Region, 2014)

   "*…The minimum lot size for new lots in Villages and Hamlets should be 1 hectare unless it is determined through a hydrogeological study that a smaller lot size will adequately accommodate private water and sewage treatment facilities for long term operation*."

The following documents the hydrogeological assessment 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.

B. 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.

C. Site visits that included a water use survey of properties within 100 m of the Site.

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

E. Preparation of a description of the hydrogeological setting using physical/geological information and water levels.

F. 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 (NPSPA) (NPCA, 2013).

Terra-Dynamics Consulting Inc. began the assessment once confirmation of the appropriateness of the Terms of Reference was received from Niagara Region (Niagara Region, 2020).

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 that a development agreement be provided that will indicate water supply by cisterns only.

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

MECP water well records within 500 m of the Site were reviewed and three 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 (NPCA) and AquaResource Inc., 2010). At and around the Site, the uppermost clay is 18.3 to 24.4 metres (60 to 75 to 80 feet) thick. The Provincial water well records date from 1958 to 1979 and recorded as for domestic, livestock and farm water supply.

Following construction, the water well contractors recorded the general water quality as fresh at two locations, with one log recording sulphur (6603376).

3.1 Ministry of Natural Resources and Forestry (MNRF) Oil and Gas Records

Five (5) Ministry of Natural Resources and Forestry (MNRF) petroleum records were identified within 500 metres of the Site. Three (3) are recorded as plugged and abandoned (T012104, F014323 and N002932) with two listed as active (T010397 and T009924) (OGSR Library, 2020).

4.0 Physical Setting

The Site is fairly flat with a ground surface elevation between 176.5 and 177.5 metres above sea level (m ASL). It is within the Big Forks Creek Watershed (AquaResource Inc. and NPCA, 2009), with Big Forks Creek located over 350 metres to the north. There are no natural watercourses on-site, only an open constructed ephemeral agricultural ditch along the north side of the Site that outlets to Wills Road. A swale along Wills Road directs roadside drainage to the north.

4.1 Overburden Geology

The Site is located on the Haldimand Clay Plain physiographic region (Chapman and Putnam, 1984).

The soils are loamy sediments over dense clay subsoil, poorly drained and slowly permeable (Ontario Ministry of Agriculture and Food (and Rural Affairs) (OMAFRA), 1989). OMAFRA (2020) has mapped the Site as tile-drained, however the property owner has indicated this is not correct.

Surface water modelling for Big Forks Creek completed by NPCA estimate the infiltration rate for these soils as being on average 125 mm/year (AquaResource Inc. and NPCA, 2009), corresponding with a high value for clayey silt (MECP, 1995).

The surficial geology of the Site is generally mapped as clayey silt (Figure 2) associated with fine-textured glaciolacustrine deep water deposits (OGS, 2003). Silty sand associated with the Dunnville Sand Plain is mapped on a small portion of the Site planned as roadway (Figure 2). Overall, the overburden thickness is between 42 and 44 metres at the Site (NPCA, 2013).

A hydrogeologic section prepared for this project shows greater than 15 metres of clay aquitard underlying the Site protecting the contact-zone/bedrock aquifer (Figure 3). Between the clay aquitard and the water supply aquifer a variety of materials are listed in the MECP water well records (primarily low permeability) including: clay and gravel, sand and clay, quicksand, sand and clay (Figure 3).

4.2 Bedrock Geology

The underlying bedrock is mapped as the Salina Formation (Armstrong and Dodge, 2007). The bedrock topography dips to the east (NPCA, 2013), at approximately 135 m ASL beneath the Site (Figure 3).

4.3 Hydrogeologic Setting

4.3.1 Overburden Aquitard and Water Table

The Ontario Geological Survey (OGS) (Burt, 2020, Appendix B, Figure 1) has mapped the surficial clayey silt as the Upper Whittlesey Aquitard, consistent with classification of this upper glaciolacustine unit as an overburden aquitard by Gartner Lee Limited (GLL) (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 (Haitjema and Mitchell-Bruker, 2005).

4.3.2 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 172 to 174 m ASL (Figure 3) with regional flow towards the south (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).

4.3.3 Confined Bedrock Aquifer Conceptual Model

The Section 3.0 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).

4.4 Aquifer Vulnerability

A small portion of the Site has been mapped as a Highly Vulnerable Aquifer (HVA) (NPSPA, 2013). An HVA is defined as:

> *An aquifer that can be easily changed or affected by contamination from both human activities and natural processes as a result of (a) intrinsic susceptibility, as a function of the thickness and permeability of overlaying layers, or (b) by preferential pathways to the aquifer.*

The NPSPA identified this area as highly vulnerable because of regional surficial geologic mapping of silty sand (Figure 2, OGS, 2003), corresponding with the Dunnville Sand Plain. This silty sand was identified as an HVA because of its potential use in shallow wells (i.e. less than 6 metres of casing). However, it does not require protection in the case of this development because (i) no wells have been identified constructed in this unit requiring protection, (ii) no nearby geologic logs have recorded a silty sand at surface, and the area mapped as an HVA is to become a roadway at the Site.

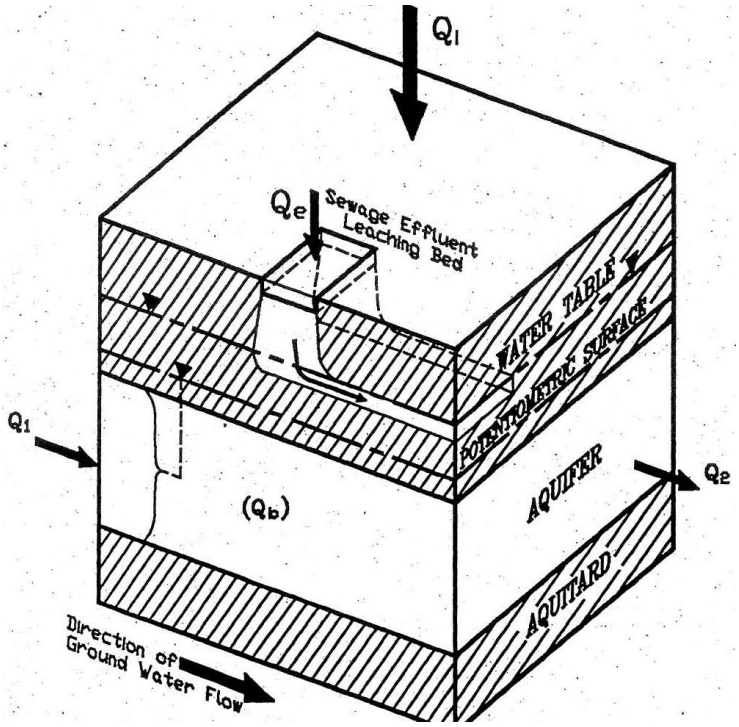

Figure 4 - Confined Aquifer Impact Assessment Subsurface Sewage System (MECP, 1995)

5.0 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.

5.1 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).

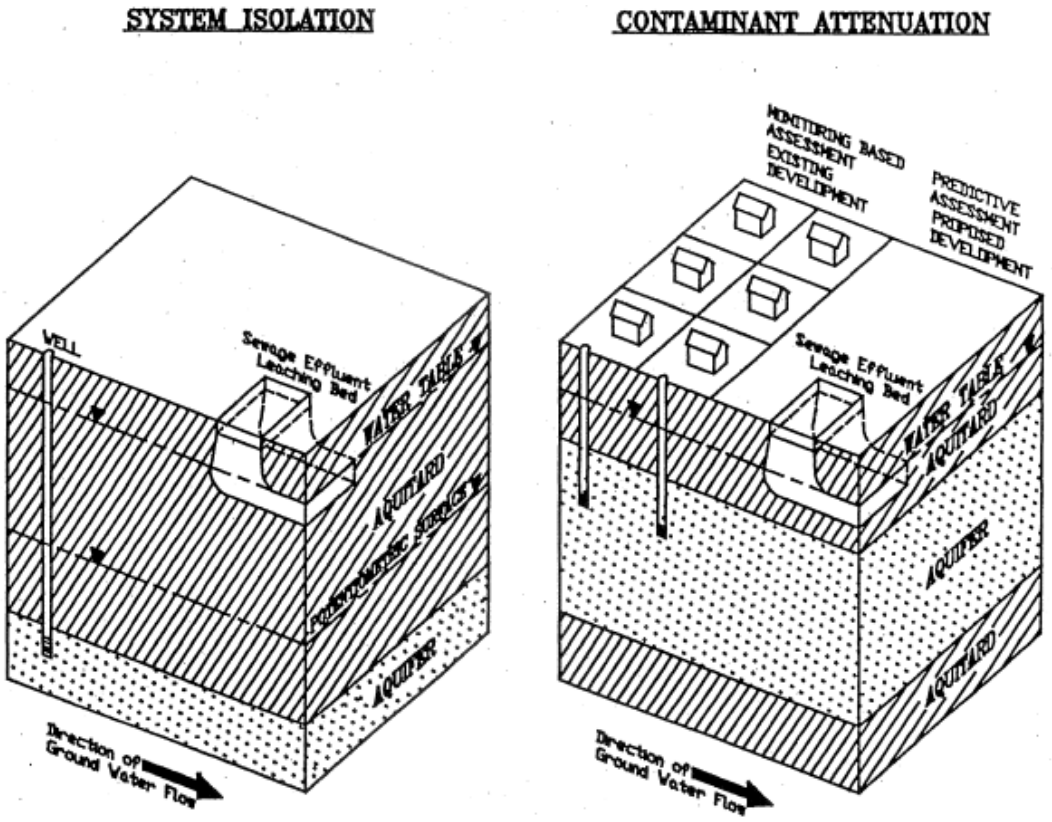

Figure 5 –Water Quality Assessment Process (MECP, 1995)

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

- The contact-zone/bedrock aquifer has been mapped as having low intrinsic susceptibility (NPCA, 2005); 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 clayey silt soils, become anaerobic, and consequently denitrify (Robertson et al, 1996). The "probable lower physical boundary" for effluent attenuation is expected to be between 3 to 5 metres below ground surface (Robertson et al, 1996) within the Upper Whittlesey Aquitard.

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 native clayey silt 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)

5.2 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 Part 8 Ontario Building Code set-backs including at least 15 metres from (i) a cistern (referred to as a reservoir in the code) and (ii) the agricultural ditch.

6.0 Water Use Survey Results

A water use and septic system survey was mailed September 9, 2020 to the fourteen (14) parcels within 100 m of the Site (Figure 2). The use of cisterns for home water needs was identified in four (4) completed surveys (Appendix C): (i) 43047 Highway 3, (ii) 43069 Wills Road, (iii) 43093 Wills Road and (iv) 43157 Highway 3. However, a fifth survey response for 43092 Wills Road, identified their non-potable water needs are met by a shallow well. However, given the location of the shallow well the 30 metre Ontario Building Code set-back does not affect the proposed development because it only extends to the proposed roadway.

No water supplies were identified to exert building code set-backs on development at the Site.

7.0 Conclusions and Recommendations

7.1 Conclusions

The following conclusions are provided:

1. The proposed residential development 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.

7.2 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 indicating water supply by cisterns.

4. If any tile drains are located during site development they should be closed off and removed.

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 – MECP Water Well Logs
Appendix B – OGS Information
Appendix C - Water Use and Septic System Surveys

8.0 References

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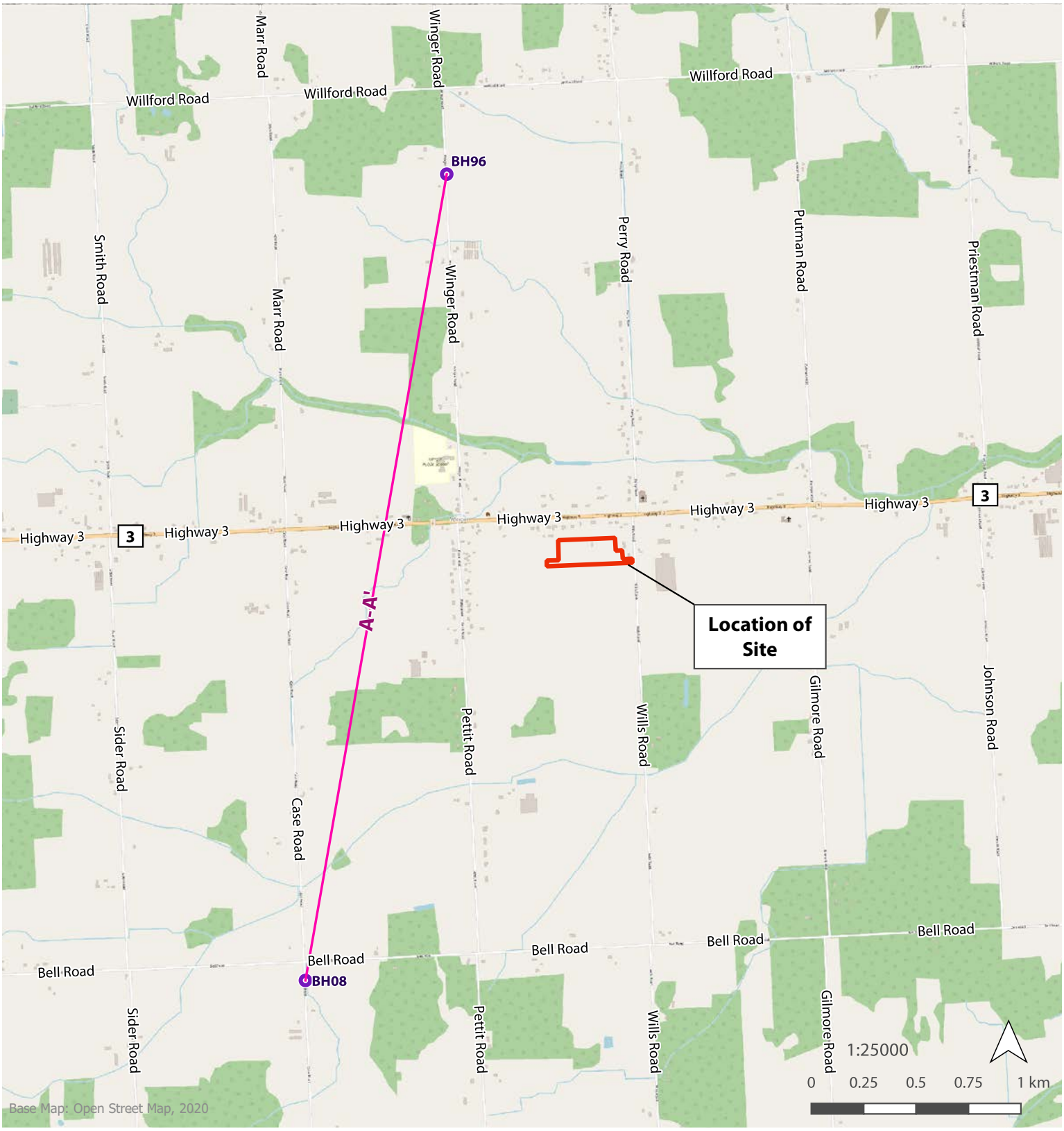
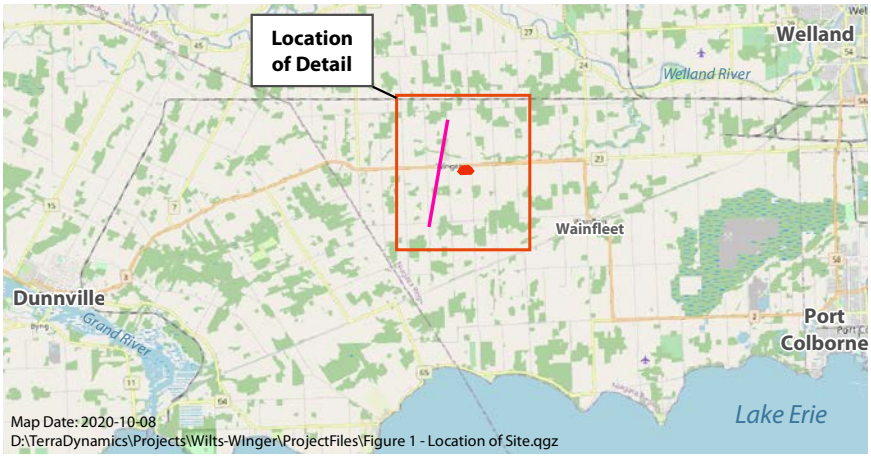


Parcel

Ontario Geological Survey Boreholes

Line of Geologic Cross-Section A-A'
(see Appendix B, Section A-A, Burt, 2020)



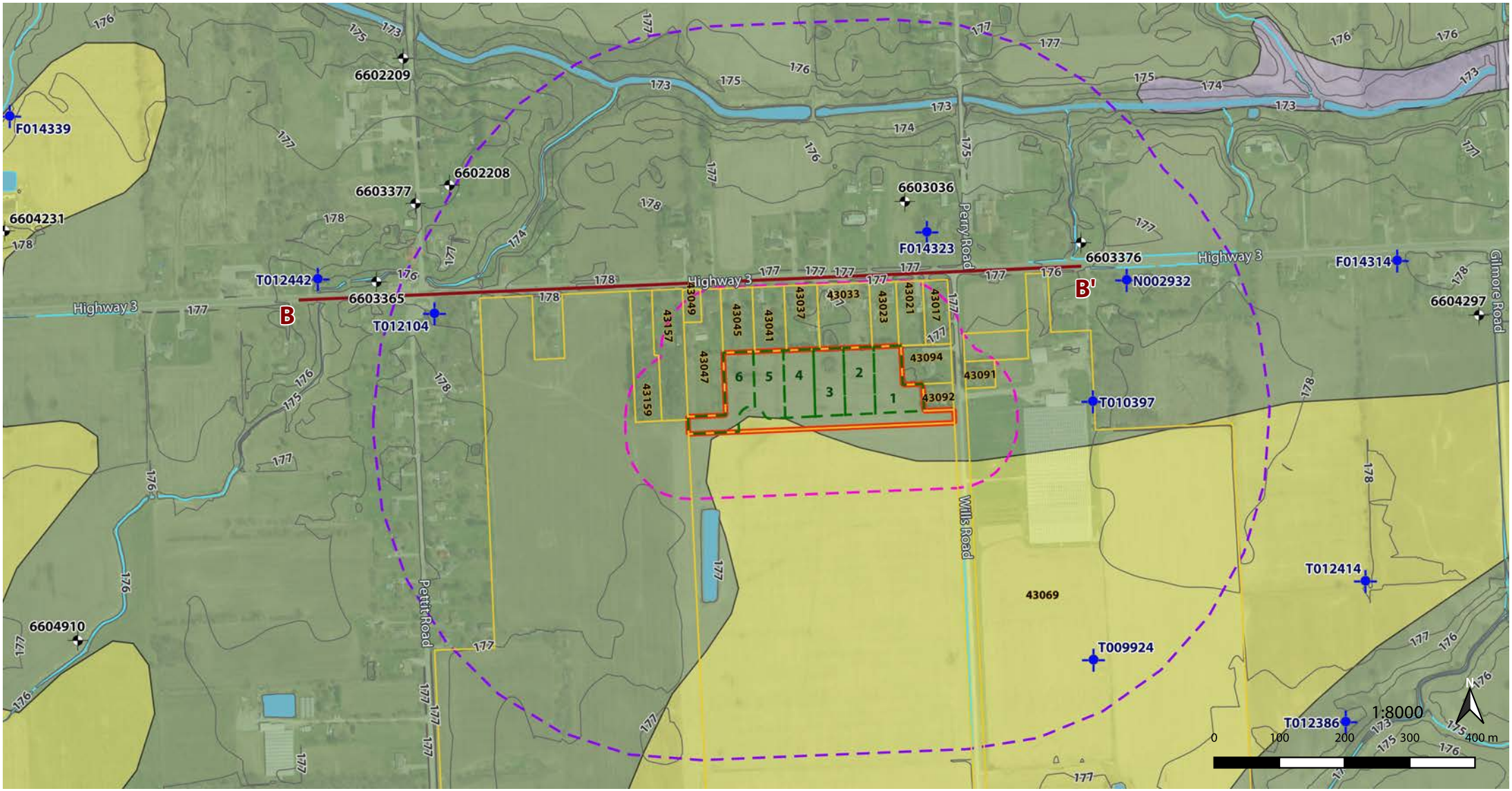
Location of Site

Wills - Winger Hydrogeological Assessment

Terra-Dynamics Consulting Inc.

Prepared for:
Dan Bunz

Figure 1



MECP Water Well Records

Petroleum_Well

Contour (1m)

Watercourse

Waterbody

Site

Proposed Lots

100m Buffer of Site

500m Buffer of Site

Parcels Within 100m of Site

Line of Geologic Cross-Section B-B'

Surficial Geology

Clayey Silt

Silty Sand

Alluvial (Clay, SIlt, Sand, Gravel)

Ministry of Environment, Conservation and Parks: Drilled Water Wells, 2018. Ontario Geologic Survey: Surficial Geology. Niagara Peninsula Conservation Authority: Watercourse, Waterbody 1:2000; Conour (1m) 2010.
Map Date: 2020-10-08 D:\TerraDynamics\Projects\Wilts-WInger\ProjectFiles\Figure 2 - Site Details.qgz

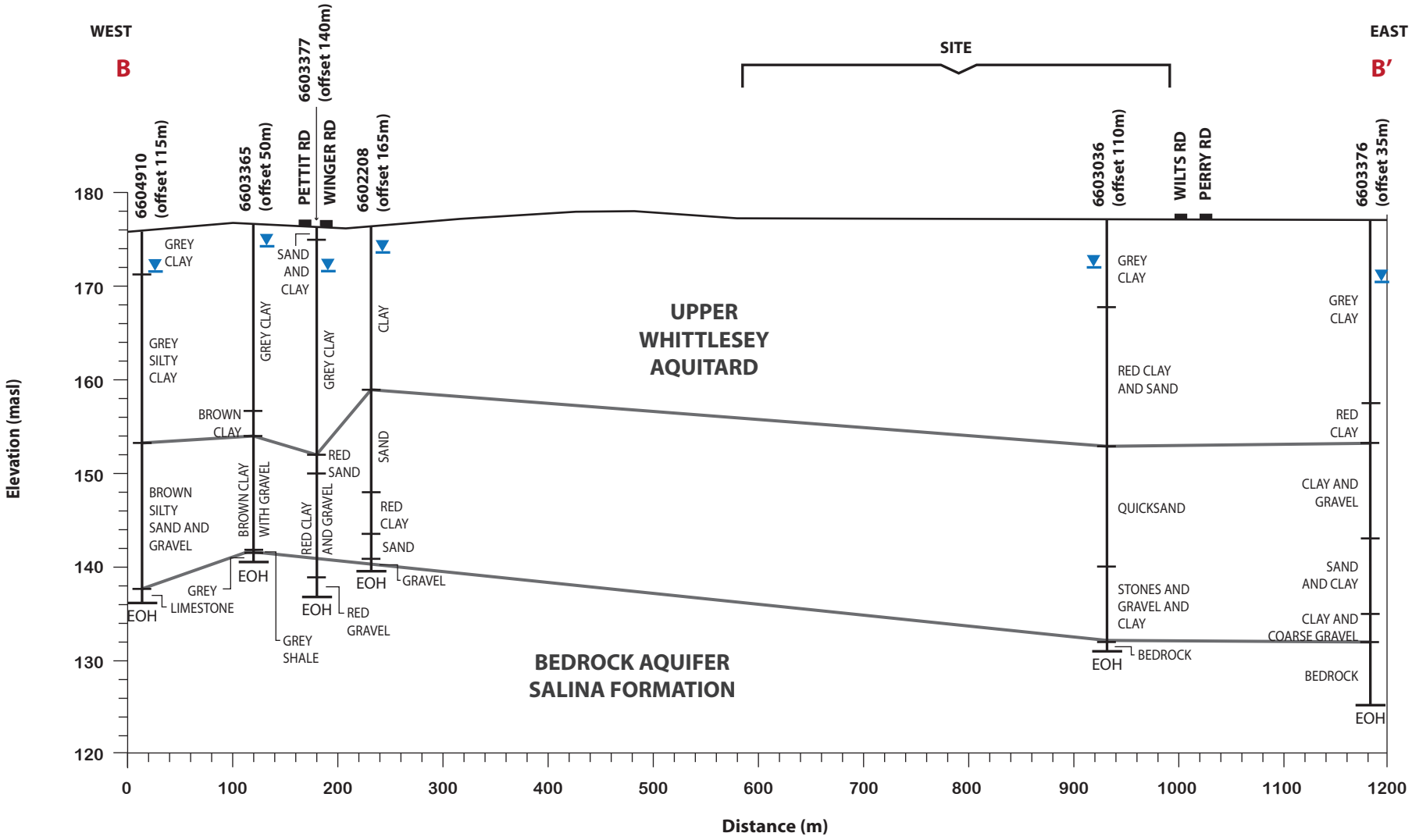
Site Details

Wills - Winger Hydrogeological Assessment

Terra-Dynamics Consulting Inc.

Prepared for: Dan Bunz

Figure 2



▼ **Well Water Level**

EOH - End of Hole

See Figure 2 for line of cross-section

Geologic Cross-Section B-B'

Wills - Winger Hydrogeological Assessment

Terra-Dynamics Consulting Inc.

Prepared For: Dan Bunz

Figure 3

Appendix A

MECP Water Well Logs

MINISTRY OF THE ENVIRONMENT

The Ontario Water Resources Act

WATER WELL RECORD

30 V/14 E.

Ontario

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

11

6603036 | MUNICIP. 66007 | CON. CON | LOT 05

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
Niagara, Reg. WELLAND	Wainfleet	5	030

[redacted] RR 1 Wainfleet

DATE COMPLETED: DAY 14 MO. 11 YR 74

RC. | ELEVATION | RC. | BASIN CODE | II | III | IV

4155603 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	DEPTH - FEET TO
Brown	Top soil.			0	5
gray	Clay			5	32
Red.	Clay & sand.			32	80
	Quick sand.			80	125
	stones & gravel & Clay			125	150
	sand. & white shale.			150	151

31 0005 02 | 0032 05 | 0080 70 S28 | 0125 07 | 0150 12 1105 | 0151 2817

32

41 **WATER RECORD**

WATER FOUND AT - FEET	KIND OF WATER
0151	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL

51 **CASING & OPEN HOLE RECORD**

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
06	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	5	0	0151
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

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.)
10-13	14-17	
18-21	22-25	
26-29	30-33	

71 **PUMPING TEST**

PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
1 ☐ PUMP 2 ☒ BAILER	0016 GPM	01 HOURS 30 MINS

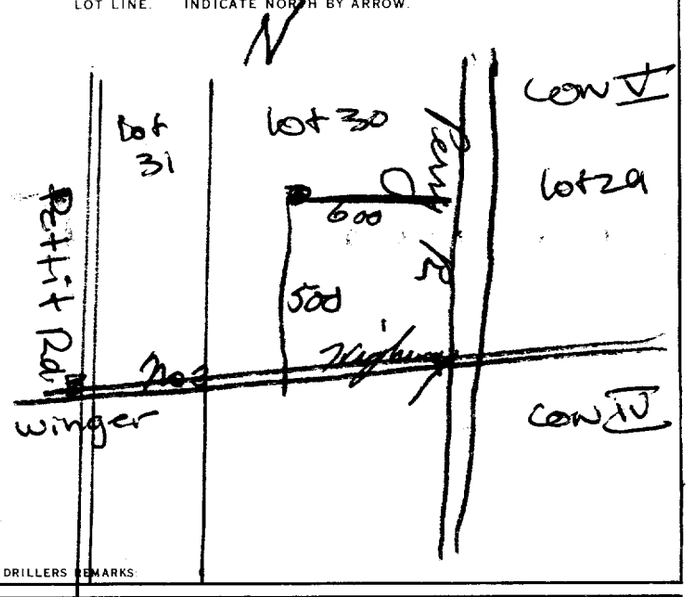
STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVEL DURING: 1 ☐ PUMPING 2 ☐ RECOVERY			
		15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
017 FEET	055 FEET	FEET	FEET	FEET	FEET

IF FLOWING, GIVE RATE	PUMP INTAKE SET AT	WATER AT END OF TEST
GPM	FEET	1 ☐ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
☐ SHALLOW ☒ DEEP	FEET	0060 - 80 GPM

LOCATION OF WELL 2755

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



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 12	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	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: S W Merritt — LICENCE NUMBER: 3609

ADDRESS: R.R.1 Smithville

NAME OF DRILLER OR BORER: S. Merritt — LICENCE NUMBER: 3609

SIGNATURE OF CONTRACTOR: Sid Merritt — SUBMISSION DATE: DAY 14 MO. Nov YR 74

OFFICE USE ONLY

DATA SOURCE 58: 1 | CONTRACTOR 59-62: 3609 | DATE RECEIVED 63-68: 170175

DATE OF INSPECTION | INSPECTOR

REMARKS: CSS.S8 B 9.

MINISTRY OF THE ENVIRONMENT COPY

FORM 7 07-091

304/142

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

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

11 | 6603365 | MUNICIP. 66007 | CON. C&W | 05

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
[redacted]	Wainfleet	Con 5	032

ADDRESS OF WELL LOCATION (STREET AND NUMBER) R#1 Wainfleet — DATE COMPLETED DAY 28 MO Oct YR 79

UTM ZONE | EASTING 755480 | NORTHING | RC | ELEVATION 0570 | RC | BASIN CODE 24

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
black	topsoil		soft	0	3
grey	clay		dense	3	65
brown	clay		dense	65	75
brown	clay	gravel	packed	75	117½
grey	shale		layered	117½	120
grey	limestone		layered	120	

31
32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
119-120	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
6¼	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	.188	0	119½
6¼	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE		119½	120
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

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	TO	MATERIAL AND TYPE (CEMENT GROUT LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☒ BAILER — PUMPING RATE 8 GPM — DURATION OF PUMPING 1 HOURS — MINS

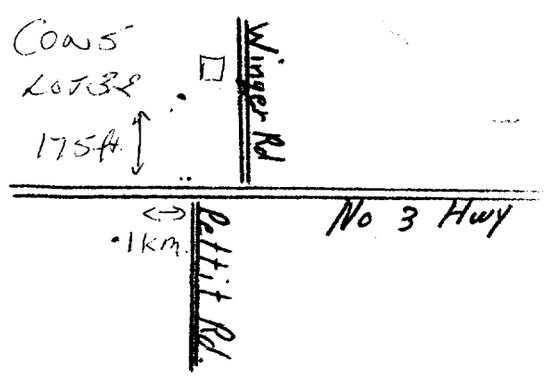
STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING (1 ☐ PUMPING 2 ☒ RECOVERY)	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
107 FEET	185 FEET		10 FEET	8 FEET	7 FEET	7 FEET

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 175 FEET | RECOMMENDED PUMPING RATE 6 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: 1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED

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 DRILLING: 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: 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 | CONTRACTOR | DATE RECEIVED 14 11 79

DATE OF INSPECTION: May 27, 1980 — INSPECTOR

REMARKS: CSS.88

MINISTRY OF THE ENVIRONMENT COPY

FORM NO. 0506—4—77

304/14e

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

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

11 | 6603376 | MUNICIP 66007 | CON. CON | 05

COUNTY OR DISTRICT: [redacted]
TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: WINFLEET / WAINFLEET RR 1
CON., BLOCK, TRACT, SURVEY, ETC: 4
LOT: 029
DATE COMPLETED: DAY 26 MO 07 YR 79
UTM ZONE 17 | 55540 | 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	DEPTH - FEET TO
BROWN	CLAY LOAM			0	5
GREY	CLAY			5	62
RED	CLAY			62	75
	CLAY & GRAVEL			75	110
	SAND & CLAY			110	135
	CLAY & COARSE GRAVEL			135	145
	ROCK			145	170

31 | 32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
150-165	1 ☐ FRESH 3 ☑ SULPHUR; 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR; 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR; 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR; 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR; 2 ☐ SALTY 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
8	1 ☑ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	.250	145	170
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

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

MATERIAL AND TYPE: | DEPTH TO TOP OF SCREEN FEET:

61 PLUGGING & SEALING RECORD

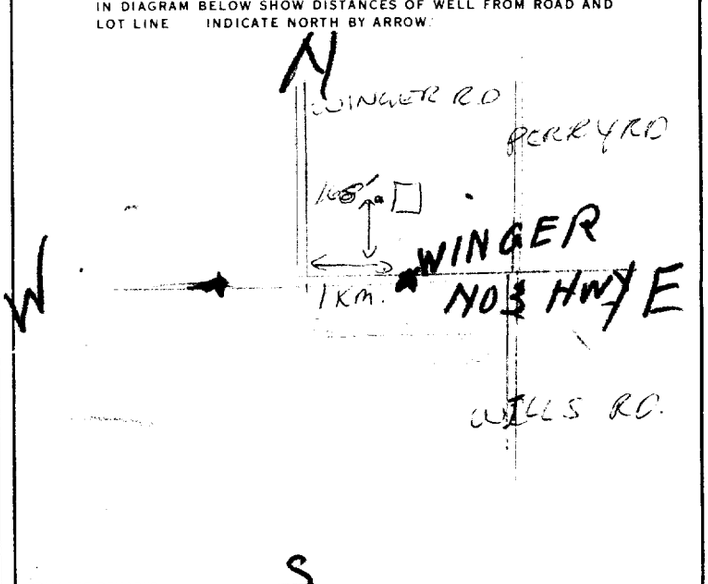
DEPTH SET AT - FEET FROM	DEPTH SET AT - FEET TO	MATERIAL AND TYPE (CEMENT GROUT LEAD PACKER, ETC.)
10-13	14-17	
18-21	22-25	
26-29	30-33	

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☑ BAILER
PUMPING RATE: 25 GPM
DURATION OF PUMPING: 2 HOURS ___ MINS
STATIC LEVEL: 20 FEET
WATER LEVEL END OF PUMPING: 120 FEET
WATER LEVELS DURING: 1 ☐ PUMPING 2 ☐ RECOVERY
15 MINUTES ___ FEET | 30 MINUTES ___ FEET | 45 MINUTES ___ FEET | 60 MINUTES ___ 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: 160 FEET
RECOMMENDED PUMPING RATE: 20 GPM

LOCATION OF WELL

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



DRILLERS REMARKS: S

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

WATER USE

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

METHOD OF DRILLING

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: J. R FIELD — LICENCE NUMBER: 2123
ADDRESS: RR1 VINELAND
NAME OF DRILLER OR BORER: MARSHALL FIELD — LICENCE NUMBER: 2124
SIGNATURE OF CONTRACTOR: J. R Field
SUBMISSION DATE: DAY ___ MO ___ YR ___

OFFICE USE ONLY

DATA SOURCE 1 | CONTRACTOR 2123 | DATE RECEIVED 28 02 80
DATE OF INSPECTION: May 20, 80 | INSPECTOR
REMARKS: CSSA RJ

MINISTRY OF THE ENVIRONMENT COPY

FORM NO. 0506—4—77

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

30H/14e

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

11 6603377

MUNICIP 66007 CON. CON 05

COUNTY OR DISTRICT: WELLAND
TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: MAIN FLEET
CON., BLOCK, TRACT, SURVEY, ETC: WINGER RD. 5
LOT: 032
DATE COMPLETED: DAY 7 MO 6 YR 79
WINGER.
NORTHING 755600 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	DEPTH - FEET TO
BROWN	CLAY	LOAM		0	4
GREY	SAND	& 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
129	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
6 5/8	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	231	138	129
7.00	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

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

61 PLUGGING & SEALING RECORD

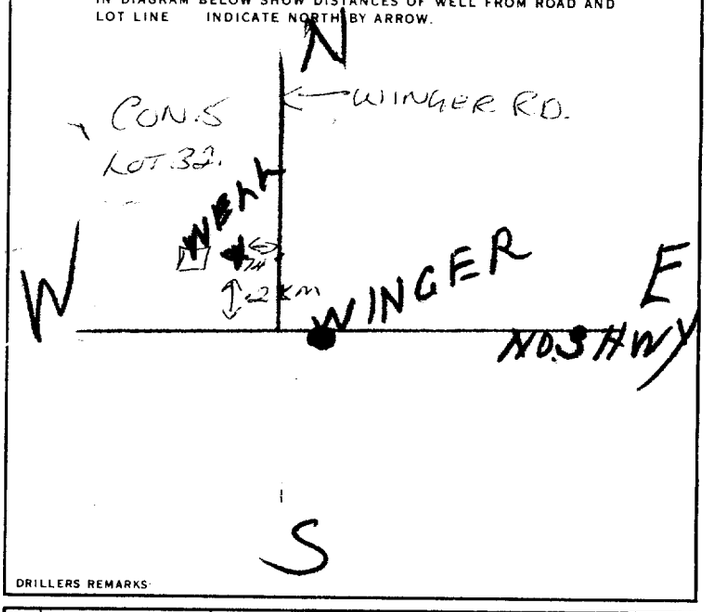
DEPTH SET AT - FEET FROM	DEPTH SET AT - FEET TO	MATERIAL AND TYPE (CEMENT GROUT LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☒ BAILER
PUMPING RATE: 15 GPM
DURATION OF PUMPING: 3 HOURS ___ MINS
STATIC LEVEL: 16 FEET
WATER LEVEL END OF PUMPING: 72 FEET
WATER LEVELS DURING: 1 ☐ PUMPING 2 ☐ RECOVERY
15 MINUTES ___ FEET
30 MINUTES ___ FEET
45 MINUTES ___ FEET
60 MINUTES ___ 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: 80 FEET
RECOMMENDED PUMPING RATE: 8 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
1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED

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 DRILLING
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: W. R FIELD — LICENCE NUMBER: 2123
ADDRESS: R.R.1 WELLAND
NAME OF DRILLER OR BORER: MARSHALL FIELD — LICENCE NUMBER: 2124
SIGNATURE OF CONTRACTOR: M. R. Field
SUBMISSION DATE: DAY ___ MO ___ YR ___

OFFICE USE ONLY

DATA SOURCE: 1
CONTRACTOR:
DATE RECEIVED: 28 02 80
DATE OF INSPECTION: May 27/1980
INSPECTOR:
REMARKS:

MINISTRY OF THE ENVIRONMENT COPY

FORM NO. 0506-4-77

Ontario Ministry of the Environment

Well T A 030776 imber below)
A030776

Well Record
Regulation 903 Ontario Water Resources Act

page 1 of 1

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.

Ministry Use Only
MUN | CON | LOT

Well Owner's Information and Location of Well Information

[redacted]

Mailing Address (Street Number/Name, RR,Lot,Concession): 32W30 #3 Hwy

County/District/Municipality	Township/City/Town/Village	Province	Postal Code
Niagra Region	Wainfleet	Ontario	L0S 1V0

Address of Well Location (County/District/Municipality)	Township	Lot	Concession
Same		32	5

RR#/Street Number/Name	City/Town/Village	Site/Compartment/Block/Tract etc.

GPS Reading	NAD	Zone	Easting	Northing	Unit Make/Model	Mode of Operation
	83	17	626757	4755154	Magella	☐ Undifferentiated ☑ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To
Brown	Topsoil			0	.60
Grey	Clay (hard)			.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 ... Metres / Kind of Water

40 m	☑ Fresh	☐ Sulphur	☐ Gas ☐ Salty ☐ Minerals ☐ Other:
___ m	☐ Fresh	☐ Sulphur	☐ Gas ☐ Salty ☐ Minerals ☐ Other:
___ m	☐ Fresh	☐ Sulphur	☐ Gas ☐ Salty ☐ Minerals ☐ Other:

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

Chlorinated ☑ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Metres To
Casing				
15	☑ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	188	0	39.92
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No.		
No Casing or Screen				
	☑ Open hole		39.92	40.5

Test of Well Yield

Pumping test method: Submersible

Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Static Level	5.24		
1	6.73	1	6.85
2	7.58	2	6.24
3	7.55	3	5.69
4	6.49	4	5.18
5	8.13	5	5.39
10	6.85	10	5.33
15	7.74	15	5.24
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

Pump intake set at - (metres): 39
Pumping rate - (litres/min): 37.85
Duration of pumping: 1 hrs + ___ min
Final water level end of pumping: ___ metres
Recommended pump type: ☑ Shallow ☐ Deep
Recommended pump depth: 39 metres
Recommended pump rate: 37.85 (litres/min)
If flowing give rate - (litres/min): /
If pumping discontinued, give reason: /

Plugging and Sealing Record

☑ Annular space ☐ Abandonment

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

Method of Construction

☑ Cable Tool ☐ Rotary (air) ☐ Diamond ☐ Digging
☐ Rotary (conventional) ☐ Air percussion ☐ Jetting ☐ Other
☐ Rotary (reverse) ☐ Boring ☐ Driving

Water Use

☑ Domestic ☐ Industrial ☐ Public Supply ☐ Other
☐ Stock ☐ Commercial ☐ Not used
☐ Irrigation ☐ Municipal ☐ Cooling & air conditioning

Final Status of Well

☑ Water Supply ☐ Recharge well ☐ Unfinished ☐ Abandoned, (Other)
☐ Observation well ☐ Abandoned, insufficient supply ☐ Dewatering
☐ Test Hole ☐ Abandoned, poor quality ☐ Replacement well

Well Contractor/Technician Information

Name of Well Contractor	Well Contractor's Licence No.
Circle Eddy's Drilling	7294

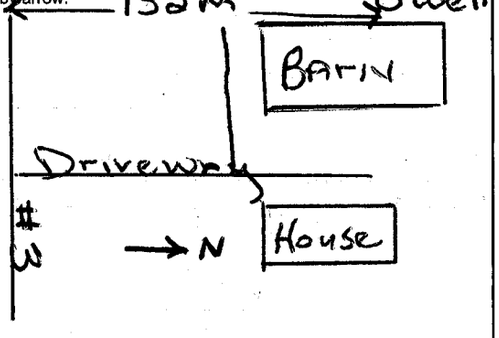
Business Address (street name, number, city etc.): 108 Queen St South Thorold L2V3N9

Name of Well Technician (last name, first name)	Well Technician's Licence No.
Gladney Edward	T-2099

Signature of Technician/Contractor: x Ed Gladney
Date Submitted: 2005/10/25

Location of Well

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



Audit No. Z 33224
Date Well Completed: 2005/10/19
Was the well owner's information package delivered? ☑ Yes ☐ No
Date Delivered: 2005/10/24

Ministry Use Only

Data Source	Contractor
	7294
Date Received: OCT 31 2005	Date of Inspection
Remarks	Well Record Number

0506E (09/03) Contractor's Copy ☐ Ministry's Copy ☑ Well Owner's Copy ☐ *Cette formule est disponible en français*

UTM Z E
9 R N
Elev. 9 P 0580
Basin 24 31

ONTARIO

The Water-well Drillers Act, 1954
Department of Mines

66 No 2208

Water-Well Record

County or Territorial District Welland Township, Village, Town or City Wainfleet Twsp
Village, Town or City)
[redacted] ddress Munger Ontario

(day) (month) (year)

Pipe and Casing Record

Casing diameter(s) 5 5/8
Length(s) 120 ft.
Type of screen
Length of screen

Pumping Test

Static level 9 ft.
Pumping rate 100 gal per hr.
Pumping level 15 ft
Duration of test 1 hr.

Well Log

Overburden and Bedrock Record	From ft.	To ft.
clay	0	60
sand	60	95
red clay	95	110
stone	110	119
gravel	119	123

Water Record

Depth(s) at which water(s) found	No. of feet water rises	Kind of water (fresh, salty, or sulphur)
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 Lloyd Halbourg
Address R.R.1 Fort Colborne
Ontario
Name of Driller
Address Same

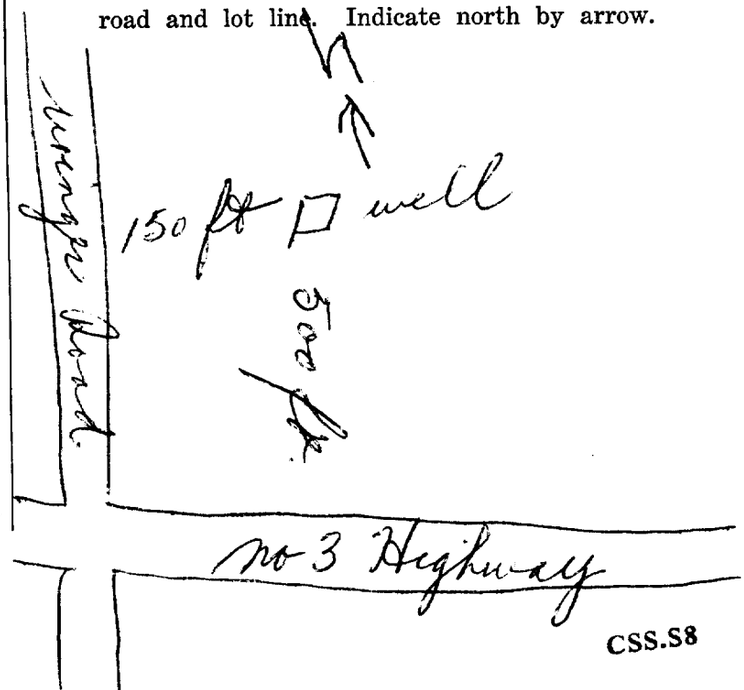
Licence Number 738

I certify that the foregoing statements of fact are true.

Date Oct 1 Leonard Halbourg
Signature of Licensee

Location of Well

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

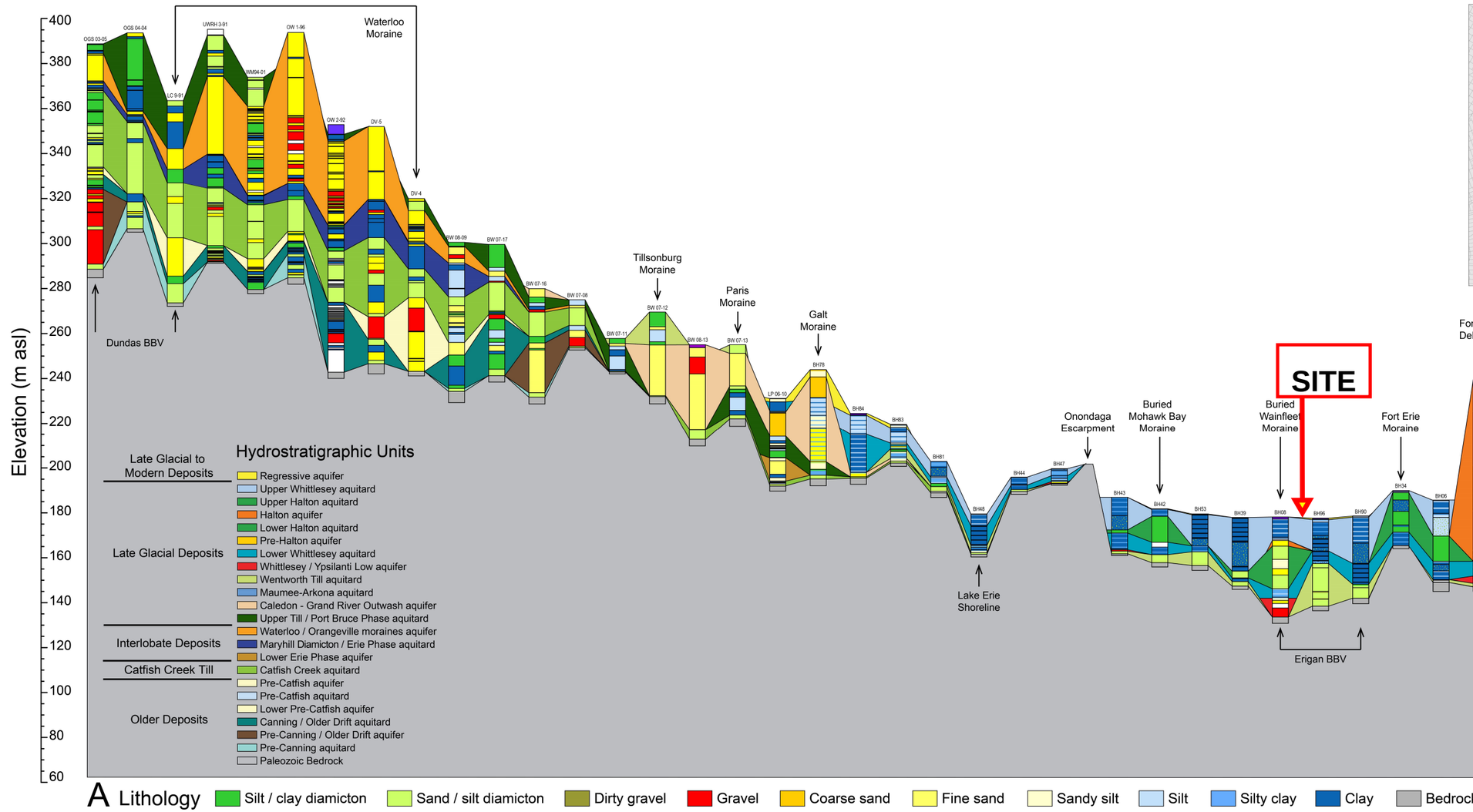


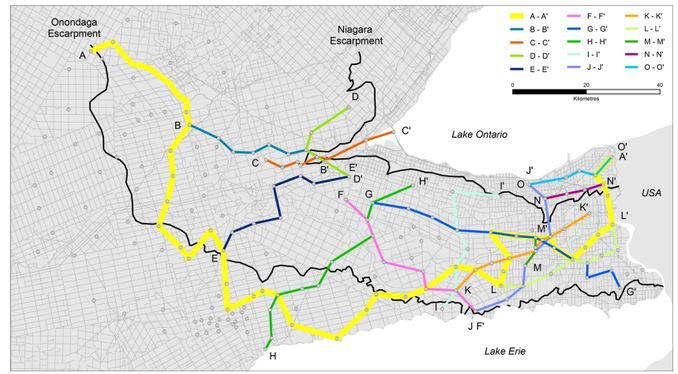
CSS.S8

Form 5

Appendix B

OGS Information


Elevation (m asl)
400
380
360
340
320
300
280
260
240
220
200
180
160
140
120
100
80
60
Waterloo Moraine
Tillsonburg Moraine
Paris Moraine
Galt Moraine
Dundas BBV
Lake Erie Shoreline
Onondaga Escarpment
Buried Mohawk Bay Moraine
Buried Wainfleet Moraine
SITE
Fort Erie Moraine
Fonthill Ice-Contact Delta-Fan Complex
Fort Erie Moraine
Niagara Escarpment
Erigan BBV
Erigan BBV
Chippawa BBV
St Davids BBV
Hydrostratigraphic Units
Late Glacial to Modern Deposits
Late Glacial Deposits
Interlobate Deposits
Catfish Creek Till
Older Deposits
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
A
A Lithology
Silt / clay diamicton
Sand / silt diamicton
Dirty gravel
Gravel
Coarse sand
Fine sand
Sandy silt
Silt
Silty clay
Clay
Bedrock
Fill
No recovery
A’


Onondaga Escarpment
Niagara Escarpment
Lake Ontario
Lake Erie
USA
A - A'
B - B'
C - C'
D - D'
E - E'
F - F'
G - G'
H - H'
I - I'
J - J'
K - K'
L - L'
M - M'
N - N'
O - O'
0
20
40
Kilometres

Appendix C

Water well and septic system survey

Terra-Dynamics Consulting Inc.

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

September, 2020

Dear Resident:

On behalf of the property owner, Terra-Dynamics Consulting Inc. is completing a water well and septic system survey. This is a survey of the properties in the vicinity of their Concession 4, Part lot 30, Hamlet of Winger property, as shown on the attached map (Site). They are making application to the Township of Wainfleet and Niagara Region to residentially develop the Site. This well and septic system survey is a recommended part of a hydrogeologic, or groundwater study of the subject lands. This is a standard questionnaire for properties 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 (as shown by the outline on the attached map). **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 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.

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

This map should not be relied on as a precise indicator of routes or locations, nor as a guide to navigation. The Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) shall not be liable in any way for the use or any information on this map. of, or reliance upon, this map.

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Map Created: 9/9/2020
Map Center: 42.94176 N, -79.43238 W

Terra-Dynamics Consulting Inc.
404 Queenston Street, St. Catharines, ON L2P 2Y2

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 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?_____

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.

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

Terra-Dynamics Consulting Inc.
404 Queenston Street, St. Catharines, ON L2P 2Y2

WATER WELL SURVEY FORM

Date: Sept 14/20

Contact Person: [redacted]

Property Address: 43069 Wells Road.

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 four 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?

Terra-Dynamics Consulting Inc.

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

WATER WELL SURVEY FORM

Date: Sept. 15 2020

Contact Person: [redacted]

Property Address: 43093 Wills Road

Telephone: [redacted]

Email (if further information requested): _____

1.0 GENERAL QUESTIONS

Do you know your drinking water source? Please circle one or more of the following four 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?_____

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

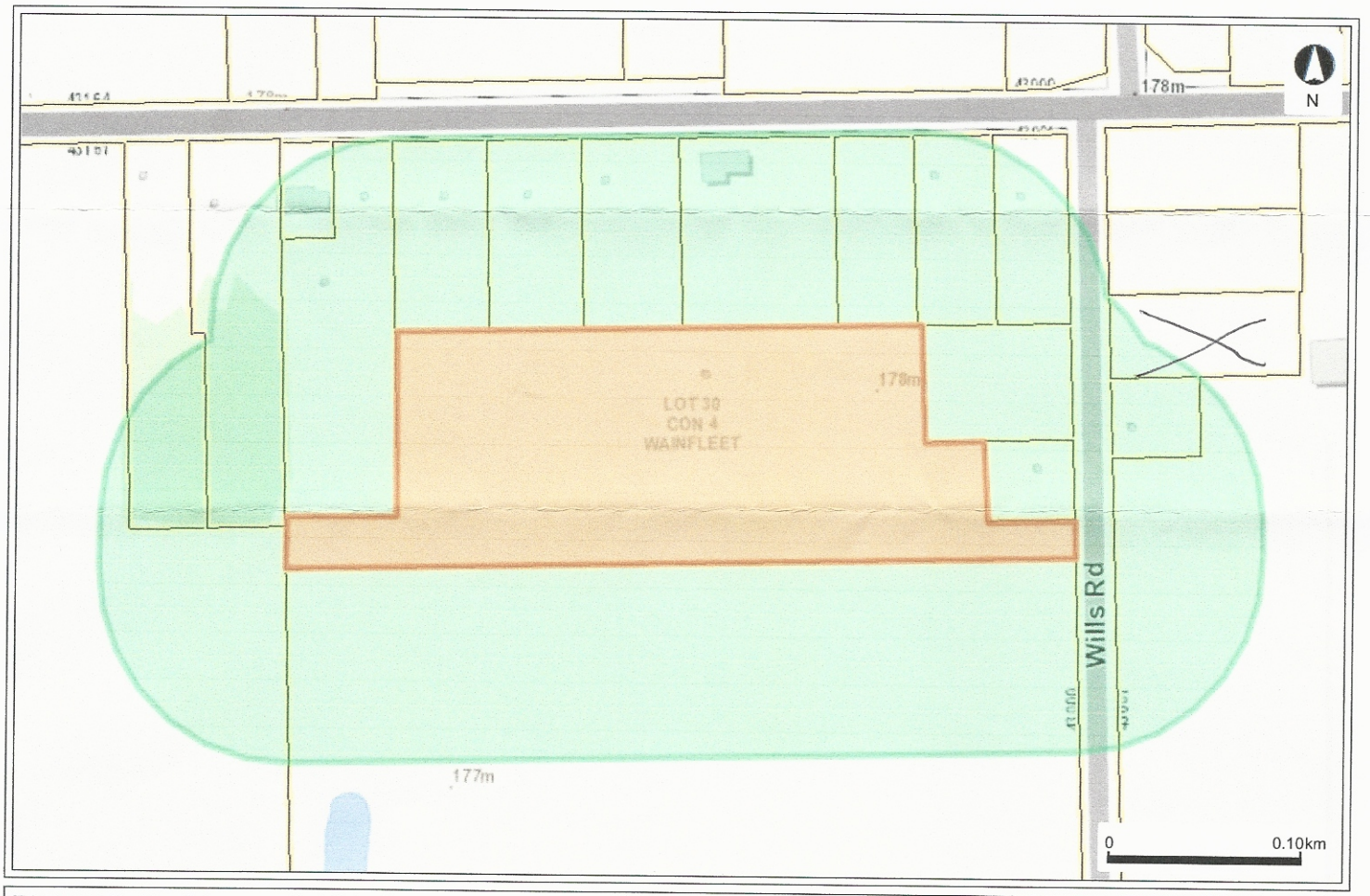
Can you please draw a sketch map of the location of your well(s), septic tank and sewage bed on your property (please show the location relative to buildings and roads).

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.

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



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Map Created: 9/9/2020
Map Center: 42.94176 N, -79.43238 W

Terra-Dynamics Consulting Inc.

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

WATER WELL SURVEY FORM

Date: Oct 04/20

Contact Person: [redacted]

Property Address: 43157 Hwy 3 Wainfleet.

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 four 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?_____

Terra-Dynamics Consulting Inc.

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

WATER WELL SURVEY FORM

Date: Oct 22

Contact Person: [redacted]

Property Address: 43092 Wills Rd

Telephone: [redacted]

Email (if further information requested): _____

1.0 GENERAL QUESTIONS

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

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

Further comments: don't drink this water, drink only bottled 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? block walls, 13 Ft aprox

What is the expected age of the well? early 1960's

How deep is the well? about 20 ft

Does you utilize a jet pump or a submersible pump? Jet 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.).

10 micron filter, then a 1 micron filter

Have you ever experienced freeze-up during the winter? NO

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

water for house, but it is not for drinking

Has your dug well ever run dry?

Yes

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

no

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

Terra-Dynamics Consulting Inc.

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

WATER WELL SURVEY FORM

Date: Sept 14-2020

Contact Person: [redacted]

Property Address: 43047 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 four 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?

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?

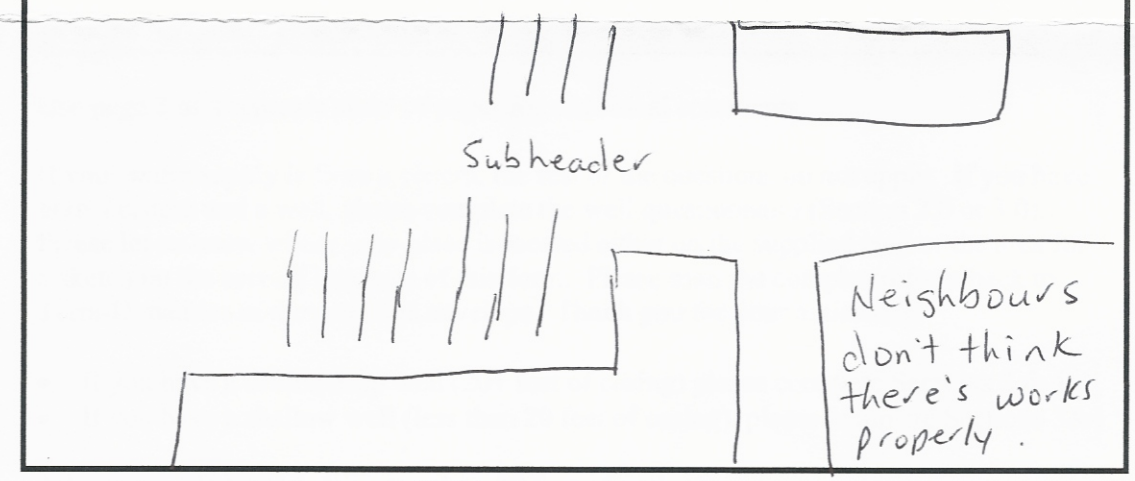
Do you perform regular maintenance on your pump? (i.e. pump service, silt removal)

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.

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