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

September 12, 2022

Amy Parks, Manager, Planning Ecology
Niagara Peninsula Conservation Authority
250 Thorold Road, 3rd Floor
Welland, ON L3C 3W2

Re: Wetland Catchment Assessment, 9304 McLeod Road, Niagara Falls, ON

Dear Ms. Parks,

1.0 Introduction and Background Information

Terra-Dynamics Consulting Inc. (Terra-Dynamics) respectfully submits this wetland catchment assessment of 800480 Ontario Limited's 9304 McLeod Road development, located in Niagara Falls, Ontario (Site) (Figure 1). The proposed development of the 22.82 hectares includes townhouses, single residential and apartments (Upper Canada Consultants, 2021, Appendix A).

The Niagara Peninsula Conservation Authority (NPCA) (City of Niagara Falls, 2022) had initially indicated that they "*may require a small scale water balance report*" and have since clarified that "*a water balance is not required*" (NPCA, 2022). However, a technical memo is to be provided describing "*how the surface water catchments of the development are separate from those of the Thompson Creek Wetland Complex to the southeast*" (Terra-Dynamics, 2022). Consequently, this work includes a wetland catchment assessment for the nearby swamp polygons of the Thompson Creek Wetland Complex located to the southeast (MNRF, 2009, Figure 2).

2.0 Methodology

Tasks completed as part of the surface water catchment assessment included:

A. Characterization of the physical setting using published information from the following government agencies: (i) the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA), (ii) the Ministry of the Environment, Conservation and Parks (MECP), (iv) the Niagara Peninsula Conservation Authority (NPCA), (v) the Ontario Geological Survey (OGS) and (vi) the Ministry of Natural Resources and Forestry. The Summary of Headwater Drainage Feature Assessment (LCA Environmental Consultants, 2022) was also reviewed; and

B. Modelling of the surface water catchments for the on-site watercourses and the nearby wetlands was completed using the most recent NPCA Digital Terrain Model (2018).

3.0 Physical Setting

The Site is located on the Haldimand Clay Plain (Chapman and Putnam, 1984). The Site was historically used for agricultural and growing grain crops.

3.1 Topography

Overall, the topography of the Site generally slopes towards the south (Figure 2). The elevation of the Site is about 184 metres above sea level (m ASL) in the northwest corner to about 180 m ASL in the southwest corner of the Site (Figure 2).

3.2 Surface Water

The Site is located within the Thompson's Creek subwatershed of the Lower Welland River Watershed Planning Area (Figure 1) (AquaResource Inc. and NPCA, 2009). The Thompson's Creek watershed has a total area of 1,458 hectares (Catchments), making the Site 1.6% of the Thompson's Creek watershed. NPCA historically modelled two catchments for Thompson's Creek, the Lower Welland River Thompson Creek catchment W200 (LWR_TSC_W200) and catchment W100 (LWR_TSC_W100) (Figure 1).

Within the Site, two southwards flowing watercourses have been mapped as part of a Headwater Drainage Feature Assessment (LCA Environmental Consultants, 2022): a natural ephemeral agricultural drainage channel (EBW-03), and a constructed open ephemeral agricultural drainage channel (BRE-04) (Figure 2 and Appendix C). The easternmost on-site watercourse (BRE-04) was recently realigned in February 2021 under NPCA Permit 202001142 (LCA Environmental Consultants, 2022).

To the east of the Site (i.e. off-site), within the nearby northern wetland polygon, NPCA (2017) have mapped the watercourse GRE-01 (Appendix C) as a natural ephemeral slough (Section 3.7), and within the nearby southern wetland as a natural ephemeral watercourse, identifier BRE-01 (Figure 2, Appendix C). The off-site watercourses converge downstream with the on-site watercourses at a culvert at Brown Road.

The NPCA (2018) digital terrain model was processed in a Geographic Information System (GIS) to determine the surface water catchments for the watercourses as shown on Figure 2. There is a topographic/surface water divide roughly along the western boundary of the northern wetland and through the central portion of the southern wetland (Figure 2).

3.3 Soils

The on-site soils are of low permeability and are not tile-drained (OMAFRA, 2022). The soils consist of (Kingston and Presant, 1989, Figure 3):

1. Beverly – Loamy Phase (approximately 50% of the Site), developed on silty clays, imperfectly drained, 50% hydrologic soil group (HSG) C/50% HSG D (Table 1);
2. Peel (approximately 50% of the Site), developed on glacial till, imperfectly drained, 70% HSG C/30% HSG D (Table 1); and
3. Chinguacousy – Loamy Red Phase (<1% of the Site), also developed on glacial till, imperfectly drained, HSG C (Table 1).

The Provincially Significant Wetland polygons to the east, and southeast of the Site (Figure 2), are underlain by less permeable silty clay Welland soils of hydrologic soil group 70% D/ 30% C.

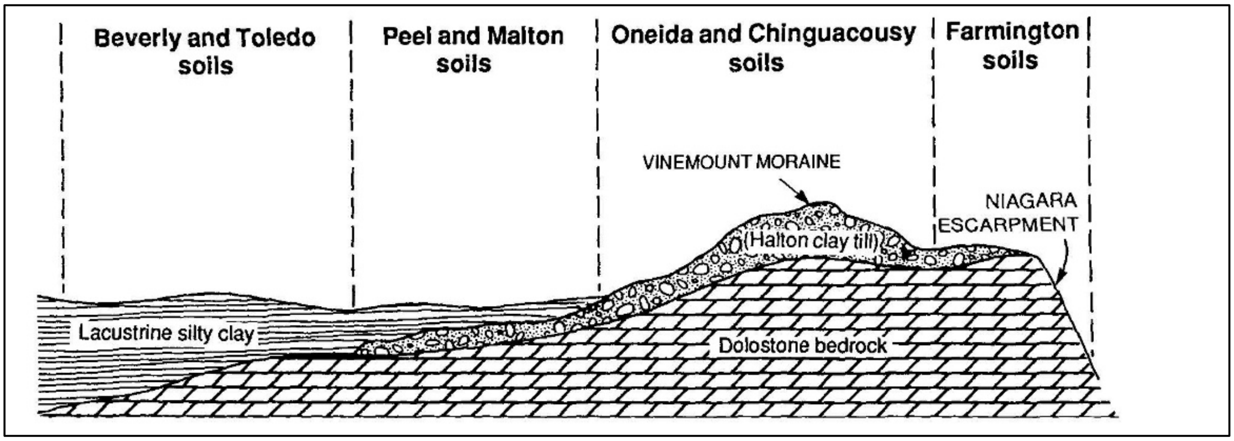

Figure 3 - Schematic landscape cross-section showing the relationship of soils in the area of the Vinemount Moraine, between the Niagara Escarpment and the Haldimand Clay Plain (Kingston and Presant, 1989).

Table 1 - Hydrologic Soil Groups (USDA, 1986)

HSG Group	Soil description	Infiltration Rates (mm/hour)
A	sand, loamy sand or sandy loam	>7.6
B	silt loam or loam	7.6-3.8
C	sandy clay loam	3.8-1.3
D	clay loam, silty clay loam, sandy clay, silty clay or clay	<1.3

3.4 Surficial Geology

The Site is underlain by low permeability silty clay (Feenstra, 1984). For example, the geologic log for a water well record at the Site (6604452, Appendix B) recorded 8.5 metres (28 feet) of stoney clay over 0.6 metres (2 feet) of gravel on bedrock (MECP, 2022) (Figure 2). Regional modelling of the overburden thickness provides an average value of 13 metres over bedrock for the Site (NPSPA, 2013). The relative position of the Site over the sequence of low permeability glaciogenic deposits is shown on regional cross-section Figure 4.

The nearby wetlands are also underlain by silty clay (Feenstra, 1984) as is documented by the adjacent Ministry of the Environment, Conservation and Parks geotechnical record 7345789 (Appendix B), where a minimum of 12.2 metres (40 feet) of silty clay was documented (MECP).

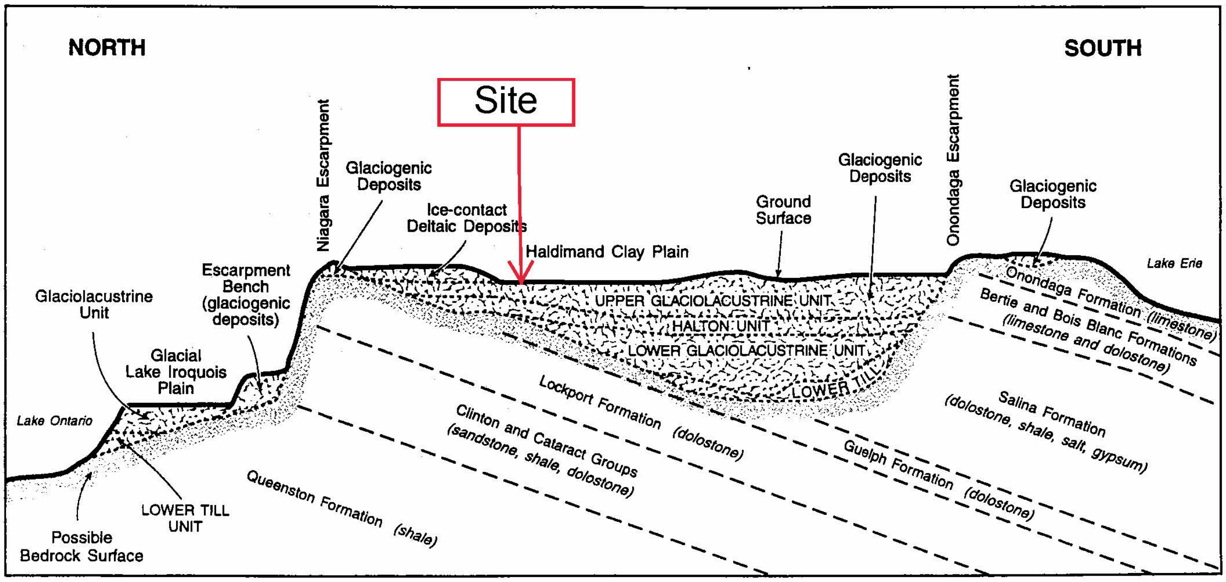

Figure 4 -
Cross-section of Surface geology in Region Niagara from North to South (Menzies and Taylor, 1998)

3.5 Hydrogeologic Setting

The underlying silty clay is an aquitard with a hydraulic conductivity of 10^{-7} m/s or less (Gartner Lee Limited (GLL), 1987). This is further supported by the low infiltration rates modelled for the Site (see Section 3.5.1 below).

The limited groundwater flow in the overburden aquitard is expected to follow topography (Haitjema and Mitchell-Bruker, 2005), being limited in velocity by the low hydraulic conductivity. The surface water catchments (Figure 2) are consequently an acceptable surrogate for shallow groundwater flow.

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

"*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 regional vertical groundwater gradient is downwards from the overburden aquitard to the bedrock aquifer (WHI, 2005) and this is observed at MECP water well record 6604452 with a static water level of 7.6 metres below ground surface (MECP, 2022).

3.5.1 Modelled Recharge and Runoff

NPCA previously completed water balance modelling for 1991-2005, as part of provincial water budgeting for the source water protection program (AquaResource Inc. and NPCA, 2009). This modelling was completed at 1-hour time steps with a filled-in meteorological dataset including solar radiation and a crop coefficient for improved calculation of evapotranspiration.

Modelled annual water balance results for the Lower Welland River Thompson's Creek catchment W100 (LWR_TSC_W100) are shown in Table 2 (AquaResource Inc. and NPCA, 2009). The groundwater recharge rates for the catchment are low with 74% (229 mm/year) of the annual water surplus being modelled as direct runoff. The annual surplus is precipitation minus evapotranspiration which is then partitioned according to site conditions between runoff and infiltration. The average infiltration rate for the Site is calculated as 75 mm/year reflecting (i) the appropriateness of the catchment calculations for consideration of the Site, (ii) the low infiltration potential of the Site and (iii) the modelled results match expected infiltration rates for the silty clay geology (Table 3).

Table 2 - Water Balance 15-year (1991-2005) Averages

Catchment	Precipitation	Actual Evapotranspiration	Annual Surplus	Infiltration*	Recharge	Runoff
	(mm/year)					
LWR_TSC_W100	881	572	309	79	39	229

Notes: * - Infiltration is interflow plus recharge

Table 3 – Typical Infiltration Rates (MECP, 1995)

Soil Texture	Infiltration Rate (mm/year)
Coarse sand and gravel	>250
Fine to medium sand	200-250
Silty sand to sandy silt	150-200
Silt	125-150
Clayey silt	100-125
Clay	<100

3.6 Wetlands

There are no wetlands mapped at the Site, however, two swamp polygons associated with the Provincially Significant Thompson Creek Wetland Complex are located 50 metres to the east and 430 metres southeast of the Site (MNRF, 2009, Figure 2, Table 4). These northern and southern wetlands are listed by the MNRF as Ontario Wetland Evaluation System (OWES) polygons 5 and 6, respectively (2009). As the Thompson Creek Wetland Complex is 129.74 ha, the northern and southern wetlands represent 6.5% and 2.7% of the wetland complex, respectively. As NPCA (2017) have identified the watercourse of the northern wetland as slough and MNRF has identified the dominant form as silver maple, it can be classified as a slough forest: "*Slough forests are forested areas with undulating land that contain both seasonally ponded areas, referred to as sloughs or vernal pools; and ridges of higher land*" (NPCA, 2010).

Table 4 – Summary of Nearby Wetlands (MNRF, 2009)

OWES Polygon	Area (ha)	Dominant Form	Other Forms	Wetland Type	Soil
5	8.52	h (Silver Maple)	ts, re	Palustrine	Clay/loam

OWES Polygon	Area (ha)	Dominant Form	Other Forms	Wetland Type	Soil
6	3.55	re (Broadleaf Cattail)	ne, ts	Palustrine	Clay/loam

Notes: h – Deciduous Trees, re – Robust emergents, ts – tall shrubs, ne – Narrow-leaved emergents

Emergents are defined as "*herbaceous plants which rise out of the water*" (MNRF, 2014).

3.6.1 Wetland Hydrologic Characterization

The wetlands are classified as *surface water depression wetlands* (Figure 5) (Mitsch and Gosselink, 2007). A surface water depression wetland is summarized as a:

"*wetland…dominated by surface runoff and precipitation, with little groundwater outflow due to a layer or low-permeability soils*…". Low permeability soils have been noted beneath the wetlands (e.g Sections 3.3 and 3.4, and MNRF, 2009).

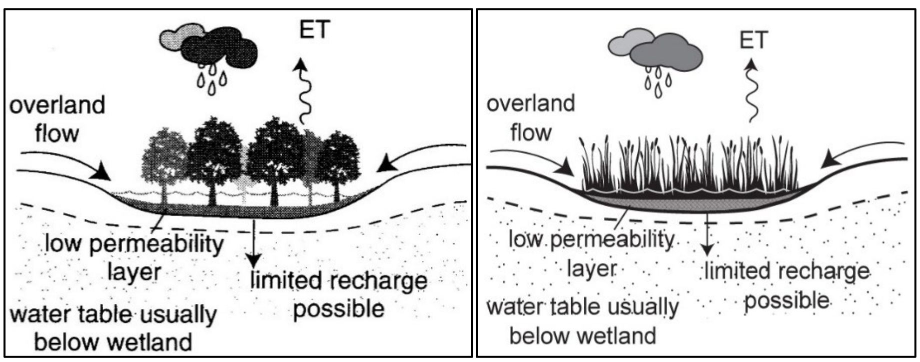

Figure 5 - Surface water depression wetlands (modified after Mitsch and Gosselink, 2007)

3.6.2 Wetland Surface Water Catchments

A digital terrain model from NPCA (2018) was processed in a Geographic Information System (GIS) to determine the surface water catchments at the Site and to the east (Section 3.2).

The northern wetland (Polygon 5) catchment outlets to Garner Road with the western edge of the wetland polygon roughly matching the surface water drainage divide, and the Site is within a separate surface water catchment (Figure 2).

The more southerly wetland (Polygon 6) is upgradient of both watercourses BRE-01 and BRE-02, being located on a drainage divide, consequently surface water flow from the Site does not support the hydroperiod as it would remain within the BRE-02 watercourse (Figure 2).

4.0 Discussion of Wetland Impacts

Development of the Site will not introduce (i) any impervious cover in the wetland catchments, (ii) nor any change in wetland catchment size (TRCA, 2017). This is because the wetlands are surface water wetlands and their water supply by either precipitation or overland flow will not be interrupted by development of the Site.

No impacts to the wetland recharge areas are predicted from development of the Site because the wetlands are surface water dependent wetlands on low permeability soils with no surface water flow changes to the wetlands from development of the Site. In addition, there are no locally significant recharge areas to be impacted as these are defined by TRCA (2017) as "*highly porous sedimentary deposits or otherwise having high hydraulic conductivity*" which the Site does not have (Section 3.4).

Therefore, no negative hydrologic impacts to the downgradient wetlands are predicted.

5.0 Conclusions

The following conclusions are provided:

1. The Site is 22.82 hectares, with no wetlands on-site.

2. The Site is located on the Haldimand Clay Plain, a regional aquitard comprised of silty clay soils.

3. The nearby off-site wetlands are classified as swamp and perched on low permeability silty clay, and are surface water depression wetlands.

4. Residential development of the Site should not negatively impact the hydrology of the nearby wetlands because the nearby wetlands are within separate surface water catchments.

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

Yours truly,

TERRA-DYNAMICS CONSULTING INC.

Jayme D. Campbell

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

cc. Matt Kernahan, MCIP, RPP
Lisa Price, LCA Environmental
Eric Henry, 800460 Ontario Limited

Attachments
Figure 1 – Location of Subject Lands
Figure 2 – Site Details
Appendix A – Concept Plans
Appendix B – MECP Water Well Records
Appendix C – Thompson Creek Stormwater Master Drainage Plan Headwater Drainage Feature Assessment

6.0 References

AquaResource Inc. and Niagara Peninsula Conservation Authority (NPCA), 2009. Water Availability Study for the South Niagara Falls and Lower Welland River Watershed Plan Areas, Niagara Peninsula Source Protection Area.

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

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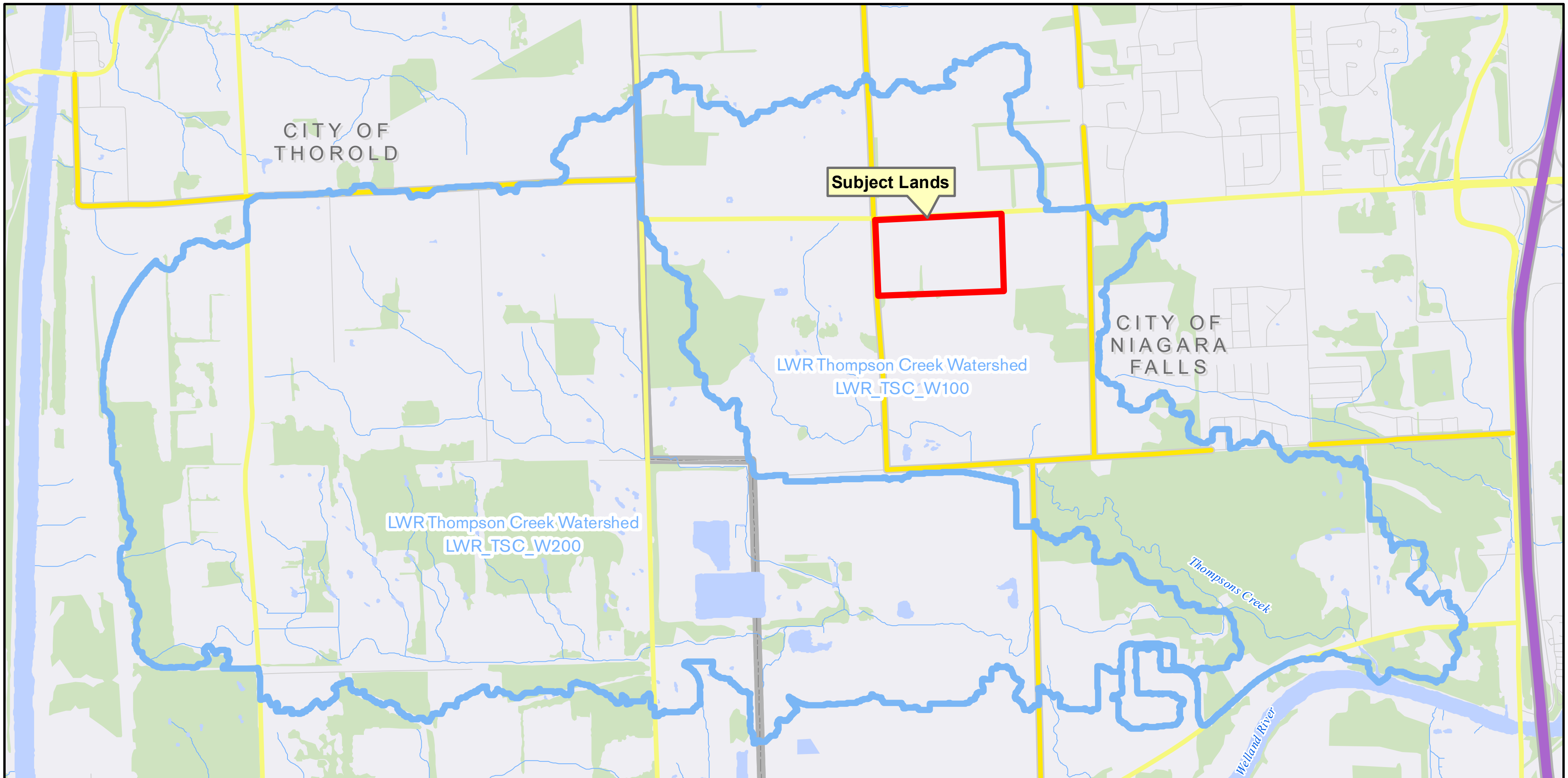

Subject Lands
Subwatershed Boundary (NPCA)

Location of Subject Lands

McLeod Meadows, 9304 McLeod Road
Niagara Falls, ON.

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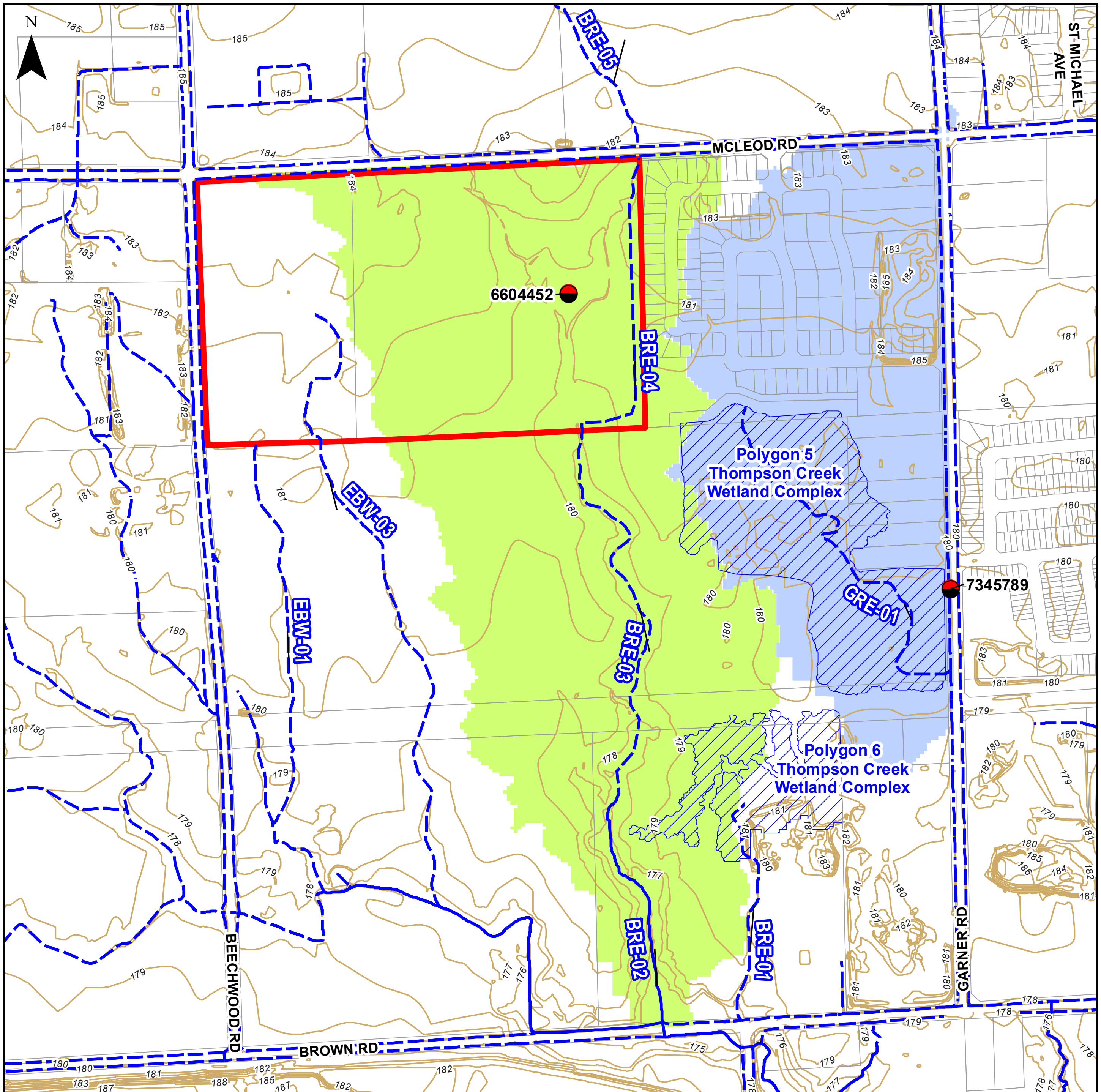
Figure 1

Path: H:\TERRA_DYNAMICS\9589 - TD 9304 McLeod Rd\gis\mxd\Figure 1 Location of Subject Lands.mxd Revised: September 8, 2022



Subject Lands

Select Water Well (WWIS)

Surface Contour 1m (NPCA)

Provincially Significant Wetland (MNRF)

Surface Water Catchment GRE-01

Surface Water Catchment BRE-02/03/04

Watercourse Permanancy (NPCA)

Ephemeral

Intermittent or Ephemeral

BRE-03 Headwater Drainage Feature Identifier

Contains information licensed under the Open Government Licence – Ontario. Base map data from Ontario Ministry of Natural Resources, Ontario GeoHub Land Information Ontario (LIO) Warehouse Open Data Produc ts. https://geohub.lio.gov.on.ca/ Coordinate system: NAD 1983, UTM Zone 17T. Air photo: Ontario Ministry of Natural Resources and Forestry.

Site Details

McLeod Meadows, 9304 McLeod Road
Niagara Falls, ON.

TDC Terra-Dynamics Consulting Inc.

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Figure 2

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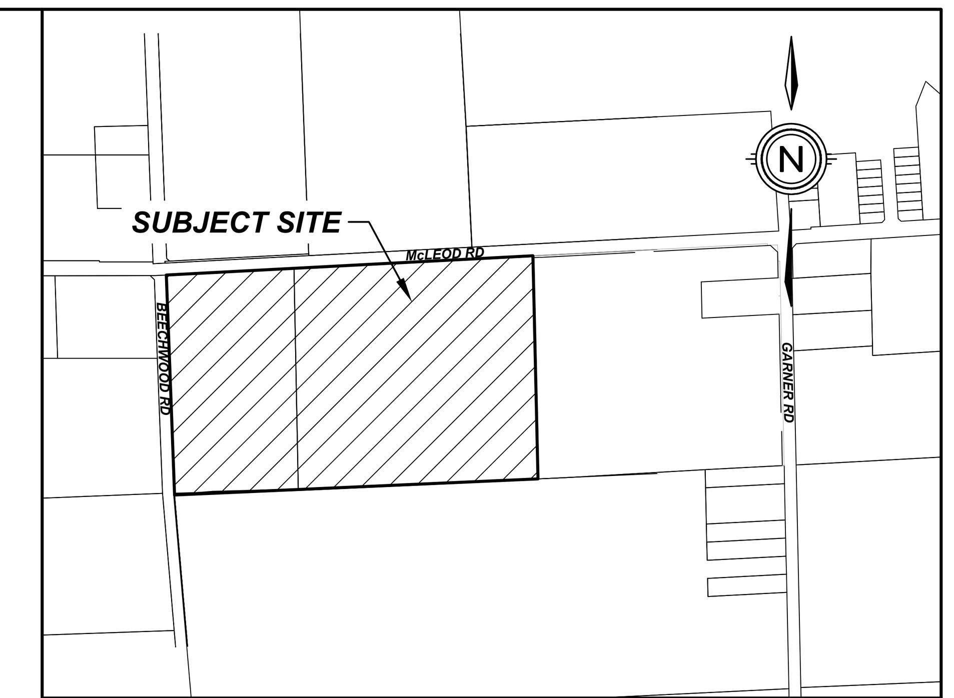
Appendix A

Concept Plans

McLEOD MEADOWS - OPTION 1

CITY OF NIAGARA FALLS



KEY PLAN

N.T.S.

CONCEPT PLAN OF SUBDIVISION

LEGAL DESCRIPTION

LOT #
MUNICIPALITY
REGION

LOTTING BREAKDOWN

FRONTAGE	No. of UNITS	% of TOTAL
10m Single–detached	62	14.55%
12m Single–detached	138	32.39%
15m Single–detached	26	6.10%
Street Towns	128	30.05%
Multi–residential	72	16.90%
TOTAL	426	100%

LAND USE SCHEDULE

LAND USE	LOT/BLOCK	# OF UNITS	AREA(ha)	AREA(%)
SINGLE FAMILY RESIDENTIAL	LOT 1–226	226	#.###	#.##
STREET TOWNS RESIDENTIAL	BLOCK #–#	128	#.###	#.##
MULTIPLE FAMILY RESIDENTIAL	BLOCK #–#	72	#.###	#.##
PARKLAND	BLOCK #–#		1.143	5.00
WATERCOURSE	BLOCK #–#		1.376	6.01
STORMWATER MGMT FACILITY	BLOCK #–#		0.969	4.23
3.0m ROAD WIDENING	BLOCK #–#		#.###	#.##
0.3m RESERVE			#.###	#.##
ROADWAY			5.274	23.05
TOTAL		426	22.882	100.00

DEVELOPABLE AREA: 22.882ha – 1.376ha = 21.506ha
DEVELOPABLE DENSITY = 19.81 units/ha

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UPPER CANADA CONSULTANTS
ENGINEERS / PLANNERS

DENSITY CALCULATIONS:

TARGET DENSITY: MINIMUM 53 PEOPLE AND JOBS PER GROSS HECTARE

UNITS : 2.50 PEOPLE

TOTAL AREA IN Ha: 22.882 Ha – 1.376 Ha. = 21.506
TOTAL NUMBER OF PEOPLE REQUIRED = 1075.30 PEOPLE

PROPOSED:

UNITS: 2.50 PEOPLE X 426 UNITS = 1065 PEOPLE
LIVE/WORK/EMPLOYMENT: 426 UNITS x 5% = 21.3 JOBS

TOTAL = 1086.30 PERSONS AND JOBS
NO. OF PEOPLE/TOTAL AREA (ha): 1086.30/21.506 ha = 50.51 PERSONS & JOBS PER HECTARE

DRAWING TITLE

CONCEPT PLAN OF SUBDIVISION OPTION 1

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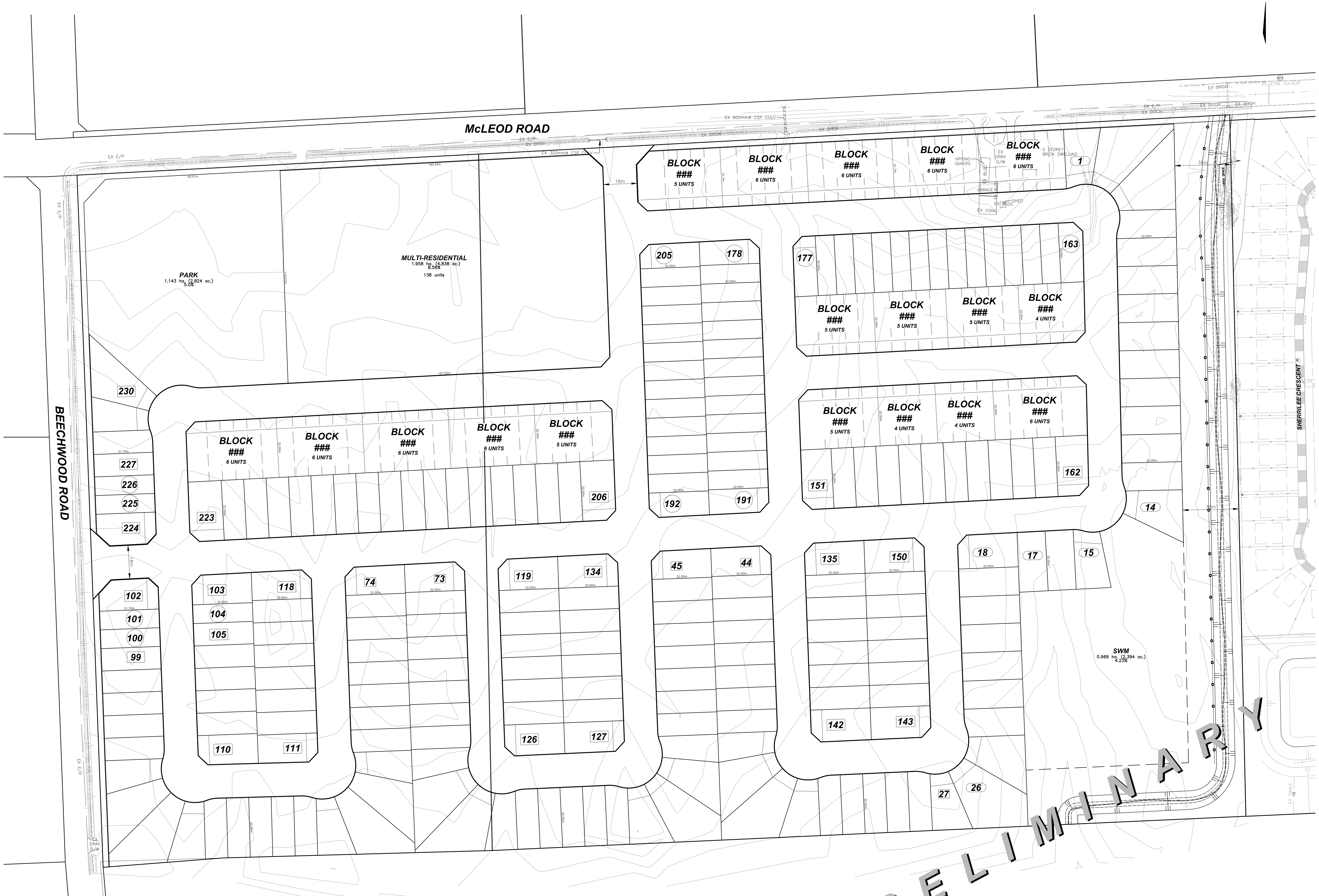
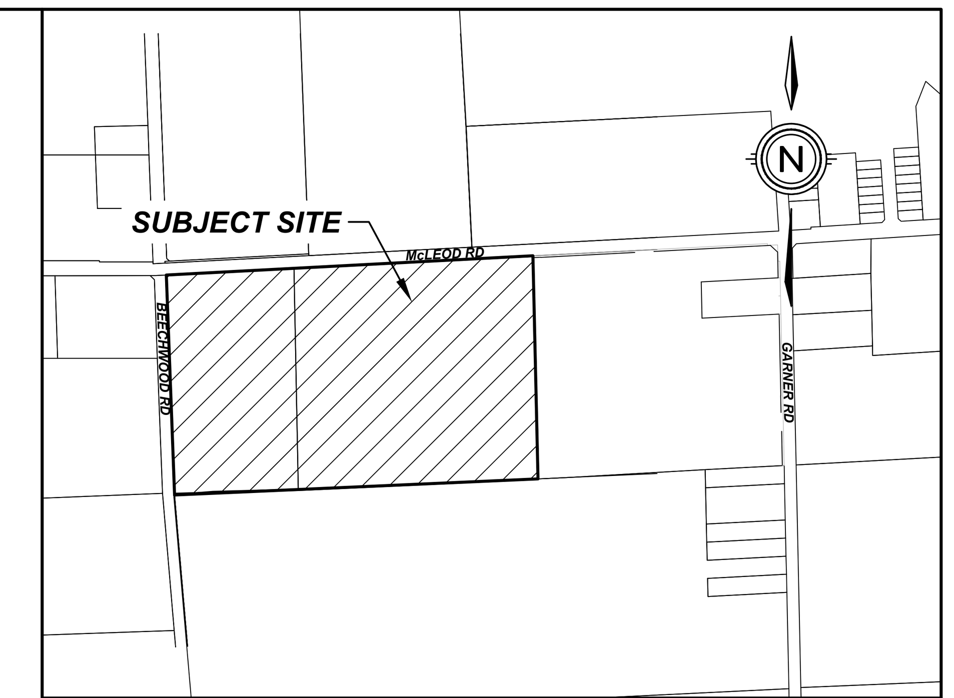
McLEOD MEADOWS - OPTION 4
CITY OF NIAGARA FALLS





KEY PLAN
N.T.S.

CONCEPT PLAN OF SUBDIVISION

LEGAL DESCRIPTION
LOT #
MUNICIPALITY
REGION

LOTTING BREAKDOWN

FRONTAGE	No. of UNITS	% of TOTAL
10m Single-detached	48	10.34%
12m Single-detached	156	33.62%
15m Single-detached	26	5.60%
Street Towns	96	20.69%
Multi-residential	138	29.74%
TOTAL	464	100%

LAND USE SCHEDULE

LAND USE	LOT/BLOCK	# OF UNITS	AREA(ha)	AREA(%)
SINGLE FAMILY RESIDENTIAL	LOT 1-230	230	#.###	#.##
STREET TOWNS RESIDENTIAL	BLOCK #-#	96	#.###	#.##
MULTIPLE FAMILY RESIDENTIAL	BLOCK #-#	138	1.958	8.56
PARKLAND	BLOCK #-#		1.143	5.00
WATERCOURSE	BLOCK #-#		1.376	6.01
STORMWATER MGMT FACILITY	BLOCK #-#		0.969	4.23
3.0m ROAD WIDENING	BLOCK #-#		#.###	#.##
0.3m RESERVE			#.###	#.##
ROADWAY			4.930	21.55
TOTAL		464	22.882	100.00

DEVELOPABLE AREA: 22.882ha − 1.376ha = 21.506ha
DEVELOPABLE DENSITY = 21.58 units/ha

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UPPER CANADA CONSULTANTS
ENGINEERS / PLANNERS

DENSITY CALCULATIONS:

TARGET DENSITY: MINIMUM 53 PEOPLE AND JOBS PER GROSS HECTARE

UNITS : 2.50 PEOPLE

TOTAL AREA IN Ha: 22.882 Ha − 1.376 Ha. = 21.506
TOTAL NUMBER OF PEOPLE REQUIRED = 1075.30 PEOPLE

PROPOSED:

UNITS: 2.50 PEOPLE X 464 UNITS = 1160 PEOPLE

LIVE/WORK/EMPLOYMENT: 464 UNITS x 5% = 23.20 JOBS

TOTAL= 1183.20 PERSONS AND JOBS
NO. OF PEOPLE/TOTAL AREA (ha): 1183.20/21.506 ha = 55.02 PERSONS & JOBS PER HECTARE

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Appendix B

MECP Water Well Records

Ontario Ministry of the Environment

The Ontario Water Resources Act
WATER WELL RECORD

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

11 6604452 Municipality 66501 Con.

WELLAND

County or District	Township/Borough/City/Town/Village	Con block tract survey, etc.	Lot
[redacted]	NIAGARA FALLS		181
	Address: 9304 McLEOD RD	Date completed: 21 (day) 06 (month) 00 (year)	

21 — Northing RC Elevation RC Basin Code

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	STONE	PACKED	0	2
BROWN	CLAY	STONE	PACKED	2	25
BROWN	CLAY	FINE GRAVEL	PACKED	25	28
GREY	FINE GRAVEL		PACKED	28	30
GREY	LIMESTONE		LAYERED	30	65

31

32

41 WATER RECORD

Water found at - feet	Kind of water
63	1 ☑ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas

51 CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth - feet From	Depth - feet To
6 1/8	1 ☑ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic	1.88	0	30
6	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☑ Open hole 5 ☐ Plastic		30	65
	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic			

SCREEN

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

Material and type — Depth at top of screen: feet

61 PLUGGING & SEALING RECORD

☐ Annular space ☐ Abandonment

Depth set at - feet From	To	Material and type (Cement grout, bentonite, etc.)

71 PUMPING TEST

Pumping test method: 1 ☐ Pump 2 ☑ Bailer — Pumping rate: 21 GPM — Duration of pumping: 2 Hours 30 Mins

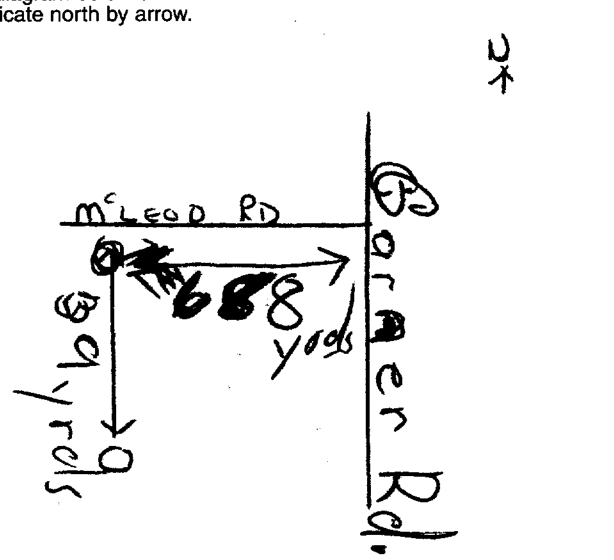
Static level	Water level end of pumping	Water levels during: 1 ☐ Pumping 2 ☐ Recovery — 15 minutes	30 minutes	45 minutes	60 minutes
25 feet	28 feet	25 feet	25 feet	25 feet	25 feet

If flowing give rate: GPM — Pump intake set at: feet — Water at end of test: ☑ Clear ☐ Cloudy

Recommended pump type: ☐ Shallow ☑ Deep — Recommended pump setting: 55 feet — Recommended pump rate: GPM

LOCATION OF WELL

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



219361

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 ☐ Abandoned (Other) 8 ☐ Dewatering 9 ☐ Unfinished 10 ☐ Replacement well

WATER USE

1 ☑ Domestic 2 ☐ Stock 3 ☐ Irrigation 4 ☐ Industrial 5 ☐ Commercial 6 ☐ Municipal 7 ☐ Public supply 8 ☐ Cooling & air conditioning 9 ☐ Not use 10 ☐ Other

METHOD OF CONSTRUCTION

1 ☑ Cable tool 2 ☐ Rotary (conventional) 3 ☐ Rotary (reverse) 4 ☐ Rotary (air) 5 ☐ Air percussion 6 ☐ Boring 7 ☐ Diamond 8 ☐ Jetting 9 ☐ Driving 10 ☐ Digging 11 ☐ Other

Name of Well Contractor: KEN SCHOOLEY — Well Contractor's Licence No.: 4795

Address: RR#1 STEVENSVILLE

Name of Well Technician: KEN SCHOOLEY — Well Technician's Licence No.: T-0351

Signature of Technician/Contractor — Submission date: 21 day 07 mo 00 yr

MINISTRY USE ONLY: Data source — Contractor 4795 — Date received AUG 17 2000 — Date of inspection — Inspector — Remarks: CSS.ES0

2 - MINISTRY OF THE ENVIRONMENT COPY

0506 (11/98) Front Form 9

EXP

Ontario | Ministry of the Environment and Climate Change

Measurements recorded in: ☐ Metric ☒ Imperial

Well Tag No. *(Place Sticker and/or Print Below)* Tag#:A254965

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
CITY of	NIAGARA FALLS	ngolia@niagarafalls.ca	

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. *(inc. area code)*
4310 QUEEN ST.	NIAGARA FALLS	ON	L2E6X5	9053562521

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
GARNER RD, north of Brown Road			

County/District/Municipality	City/Town/Village	Province	Postal Code
R.M. of NIAGARA	NIAGARA FALLS	Ontario	

UTM Coordinates Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83 17	650777	4769571		

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
BROWN	SILTY	CLAY		0	20'
GRAY	CLAY	Sand Silt		20	40'

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used *(Material and Type)*	Volume Placed *(m³/ft³)*
0	34	BENTONITE CHIPS	450 LB
34	40'	#3 GRAVEL	100 LB

Results of Well Yield Testing

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

If pumping discontinued, give reason:

Pump intake set at *(m/ft)*

Pumping rate *(l/min / GPM)*

Duration of pumping ___ hrs + ___ min

Final water level end of pumping *(m/ft)*

If flowing give rate *(l/min / GPM)*

Recommended pump depth *(m/ft)*

Recommended pump rate *(l/min / GPM)*

Well production *(l/min / GPM)*

Disinfected? ☐ Yes ☒ No

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

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
2"	PVC	1/4"	0	35'

Status of Well

☐ Water Supply ☐ Replacement Well ☐ Test Hole ☐ Recharge Well ☐ Dewatering Well ☒ Observation and/or Monitoring Hole ☐ Alteration (Construction) ☐ Abandoned, Insufficient Supply ☐ Abandoned, Poor Water Quality ☐ Abandoned, other, specify ☐ Other, specify

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	To
2"	PVC	.010	35	40'

Water Details

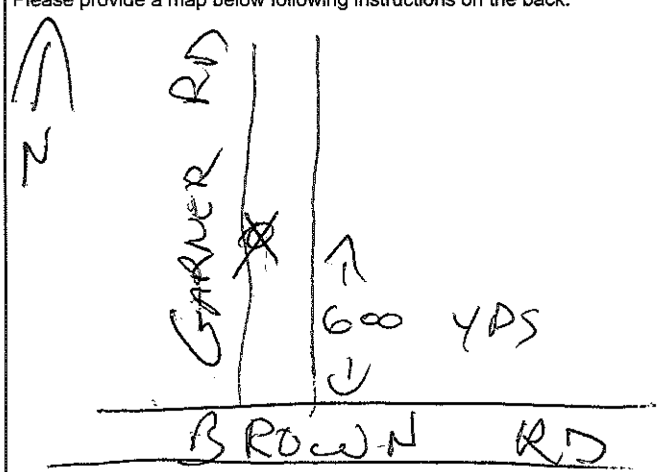
Water found at Depth	Kind of Water
40 (m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify
(m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify
(m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	40	6

Map of Well Location

Please provide a map below following instructions on the back.



Comments: WELL ON RD

Well Contractor and Well Technician Information

ELITE DRILLING SERVICES
PO BOX 20062
St. Catharines, ON L2M 7W7
905 687-8691

Well Contractor's Licence No. 7484

Municipality

Address

Bus. Telephone No. *(inc. area code)* | Name of Well Technician (Last Name, First Name) GOW, JOHN

Well Technician's Licence No. 2617 | Signature of Technician and/or Contractor | Date Submitted 20190919

Well owner's information package delivered ☐ Yes ☐ No

Date Package Delivered Y Y Y Y M M D D

Date Work Completed 20190802

Ministry Use Only

Audit No. Z295791

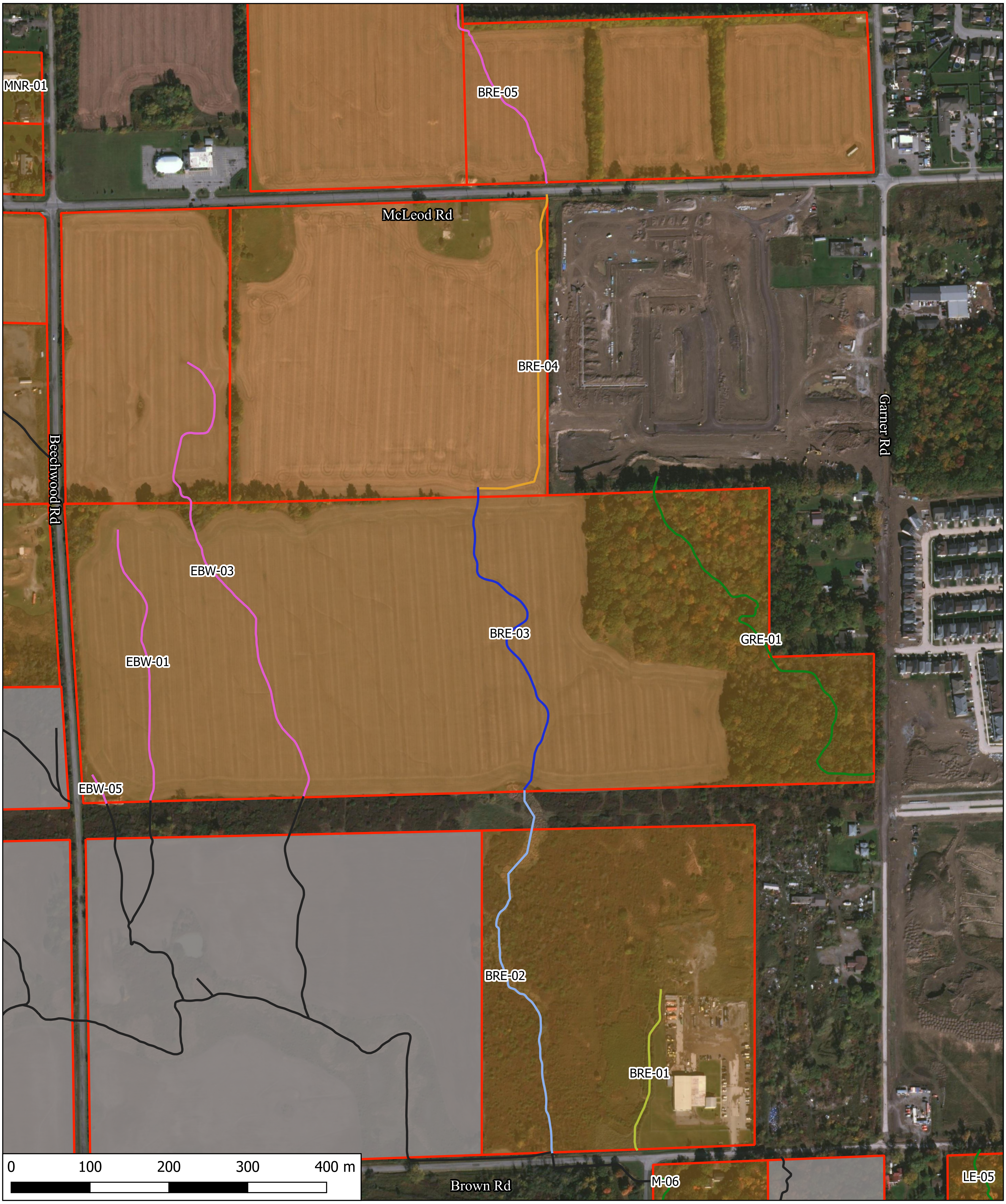
OCT 30 2019

Received

Appendix C

Thompson Creek Stormwater Master Drainage Plan

Headwater Drainage Feature Assessment



Legend

Thorold-Niagara Falls Municipal Boundary

Properties Thompson Creek Crosses:

Access Granted

No Access Granted

Level of Conservation:

Protection

Conservation

Mitigation

Maintain/Replicate Terrestrial Linkage

No Mitigation Required

Previously Realigned

Reach Not Studied

Map 2 of 3

Imagery: ESRI 2020 Satellite Imagery

Data: Niagara Navigator and Niagara OpenData

Thompson Creek Stormwater Drainage Master Plan

CONSERVATION LEVEL - EAST

LCA Environmental Consultants

N

Scale: 1:6,000

UTM NAD 83 17N

Date: January 11, 2022