



Hydrogeological Investigation Report

D-4 Study

Proposed Residential Development

Lot 28, Concession 3 (49R6217)

Township of Douro-Dummer, Ontario



Executive Summary

This report presents the results of a hydrogeological investigation that was conducted for a proposed single lot residential development on McCracken's Landing Road in the Township of Douro-Dummer, Ontario (the Site). It is our understanding the residential development will be privately serviced by a well and septic.

The Site is located within 500 m of a property which historically has been used as a landfill site. The hydrogeological investigation was completed in general accordance with Ministry of the Environment and Climate Change (MOECC) D-4 Land Use On or Near Landfills and Dumps. Based upon the records reviewed, the area is generally comprised of shallow topsoil / sand underlain by Limestone. The landfill operations are separated by MacCracken Landing Road and do not extend onto the Site. The potential for methane migration and soil settlement is negligible.

In summary, it is GHD's opinion that the proposed development is suitable from a hydrogeological perspective with no risks to health or safety present.



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1. Introduction

This report presents the results of a hydrogeological investigation that was conducted for a proposed single lot residential development along MacCracken Road located at 2100 McCracken's Landing Road. The property has a geographical location of Lot 28, Concession 3, in the Township of Douro-Dummer, Ontario (the Site). The proposed residential development will be privately serviced by well and septic.

The location of the Site relative to the area of potential concern, nearby roads and water courses is illustrated on the Site Plan, Figure 1. More specific ground surface characteristics are illustrated on the Physiography, Figure 2.

2. Scope of Assessment

The Site was identified by the Township of Douro-Dummer to be located within 500 m of a former waste disposal site (WDS) and the hydrogeological investigation was completed in general accordance with Ministry of the Environment, Conservation and Parks (MECP) D-4 Land Use On or Near Landfills and Dumps prior to development of the lands.

The following scope of work was performed to accomplish the foregoing purposes:

1. Reviewed available background information relevant to the Site such as geologic, physiographic, contaminating activity and water resources reports and maps.
2. Carried out an inventory of available well record data on file with the MOECC for the immediate area to evaluate the physical characteristics of the aquifer complexes that underlie the region.
3. A walkover inspection was conducted to review surficial ground characteristics.
4. Prepared a detailed report using engineering analyses of the acquired data outlining our conclusions and recommendations herein.

3. Site Inspection and Information Review

3.1 General

The field program consisted of an inspection of the Site and surrounding general area on February 28, 2019 by GHD. The Site is undeveloped and wooded and is at lower elevation than McCracken Landing Road. The properties on either side have been developed as single residential properties serviced by private well and septic.

The area is generally flat with shallow groundwater flow inferred to be towards Clear Lake. The general soils characteristics of the area consist of shallow soils consisting of sand and silt till overlying limestone at depth. Soil type is illustrated on Figure 3.



3.2 Aggregate Pits / Landfills

No MECP records were reported for the former waste disposal site (WDS). The Township of Douro-Dummer identified its location along the east side of McCracken Landing Road, North of County Road 6, Township of Douro-Dummer, Ontario. It is understood that the landfill has not been in use for over 25 years and the lands are part of a current residential property.

The reported area was inspected and was difficult to discern the exact location. Based on aerial photography the WDS was relatively small. No indications of a fill mound, land subsidence or leachate was observed.

The WDS appears to be up gradient of the Site and groundwater flows would be cross gradient. The local Township office was contacted regarding the WDS, and no major concerns with the WDS and any potential leachate plume were known.

3.3 Mapping and Surrounding Land Use

A series of Ten (10) maps relevant to the Site conditions are attached in the Enclosures that include an aerial image of the area, physiographic conditions, regional topography, MOECC well record locations map, wetland information plan, surficial flow and flow direction / catchment plan and a contaminant activity plan. The Site is located in the township of Douro-Dummer, in the District of Peterborough. The adjacent properties observed at the time of the site inspection are described below.

North: Rural/residential and forested lands;

South: Rural/residential and forested lands;

East: Rural/residential and forested lands and,

West: Rural/residential and forested lands.

3.4 Water Bodies and Areas of Natural Significance

The Property is situated in the physiographic region known as the Dummer Moraines (Chapman and Putnam, 1984) and the localized terrain is dominated by a till moraine. The Dummer Moraines is comprised of rough stony land bordering the Canadian Shield from the Kawartha Lakes eastward. The Ontario Geological Survey information indicates that the Quaternary geology for the area is till. Till is normally comprised of a heterogeneous mixture of soil particles that range from clay through to boulders and is generally of low permeability for limited groundwater movement. Bedrock in the area is comprised of limestone. Clear Lake is north of the Site. Other drainage pathways and wetlands are presented in the attached plans. No other major areas of natural significance are located within 250 m of the property.



3.5 Aerial Photographs

Digital photographs from the National Air Photo Library and Google Earth were available and reviewed for the years 1963, 2009, 2012, 2016.

The photographs show that the Site and immediate surrounding area are generally wooded and have remained largely unchanged. The scale of the imagery is good but the relatively small footprint of the WDS leaves specific site detail to be difficult to define. The WDS is seen to be operational in the aerial photo from 1963. The aerial photo from 2016 presents the Site and surrounding area in general configuration with how they appeared during the site inspection.

3.6 Water Well Records

Information regarding groundwater characteristics of the immediate area was obtained from an inventory of well records. Eleven (11) well records were identified within 500 m of the Site for statistical breakdown. The records consist of eleven (11) drilled bedrock wells ranging in depth from 6.7 to 21.95 meters. The MOECC summary well records are presented in Figure 7.

An inquiry was made in regards to water well information records on file with the MOECC Environmental Monitoring and Reporting Branch which included wells in the immediate area. The database describes locations and characteristics of water wells found within Ontario in accordance with Regulation 903. It includes such information such as coordinates, construction date, well depth, well use etc. Also included in this database is detailed stratigraphy information, depth to bedrock and the depth to the water table.

Lands in the area are privately serviced for water and septic. Physical and hydraulic data are presented on the MOECC well records and the information indicates the presence of one (1) principal aquifer system within the bedrock.

4. Impact Assessment

The use and operation of a former WDS was identified within 500 m of the Site. It is the opinion of GHD that the potential for impact to the Site is negligible. An assessment of the guideline D-4 considerations is presented in the following sections.

4.1 Groundwater and Surface Water Contamination

No surface water was observed in the area. Regional groundwater is inferred to flow towards Clear Lake. The Site is cross-gradient of the former WDS. Drinking water in the area is pulled from drilled wells and is not expected to be impacted by the former WDS historical activities.

Groundwater samples were collected by the property owner from the on-site well to evaluate background water quality. The Certificates of Analysis is presented in Appendix C. The data is summarized and compared with the Ontario Drinking Water Standards (ODWS) in Table 4.1.



Table 4.1.: Water Quality Summary

Parameter	2100 McCracken May 10, 2018	2100 McCracken December 05, 2018	2100 McCracken March 1, 2019	ODWS
Calcium mg/L	116	141	78.4	---
Sodium mg/L	998	37.7	35.3	20 - 200 MAC - AO/OG
Manganese ug/L	20.5	17.6	16.4	50 AO/OG
Magnesium mg/L	12.0	5.26	3.24	---
Potassium mg/L	5.62	2.00	1.62	---
Iron mg/L	208	30	1400	0.30 AO
Sulphate mg/L	1700	92	26	500 AO
Chloride mg/L	310	66	49	250 AO
Nitrite – N mg/L	<0.003	0.014	<0.003	1.0 MAC
Nitrate – N mg/L	<0.006	<0.006	0.156	10 MAC
Fluoride mg/L	3.12	0.17	0.14	1.5 MAC
Alkalinity mg/L	27	271	212	30 to 500 AO
Ammonia+Ammonium mg/L	0.76	0.22	<0.04	---
pH (units)	8.28	8.06	8.06	6.5 to 8.5 AO/OG
Hardness mg/L	339	373	209	80 to 100 AO/OG
Conductivity (µmhos/cm)	3770	848	588	---
Colour (T.C.U.)	6	4	3	5 OG
Total Dissolved Solids mg/L	3168	474	321	500 AO/OG
Aluminum ug/L	140	22.4	76.8	100
Arsenic ug/L	<0.2	<0.2	<0.2	
Barium ug/L	5.02	204	227	
Cadmium ug/L	0.005	0.005	0.014	5
Copper ug/L	0.44	2.43	0.281	1000
Molybdenum ug/L	3.19	4.09	0.45	---
Nickel ug/L	0.7	0.8	0.5	---
Lead ug/L	0.04	0.20	0.24	10 MAC
Selenium ug/L	0.06	0.05	<0.04	10 MAC
Silver ug/L	0.002	<0.002	0.007	--
Strontium ug/L	2490	864	578	--
Thallium ug/L	0.005	0.010	<0.005	---
Titanium ug/L	1.90	0.56	1.59	---
Uranium ug/L	0.601	0.032	0.014	20 MAC
Vandium ug/L	1.04	0.07	0.09	---
Zinc ug/L	3	41	248	5000

ODWS = Ontario Drinking Water Standards, MAC = Maximum Allowable Concentration, OG = Operational Guideline, AO = Aesthetic Objective

The chemical results indicate that the following parameters exceeded the ODWS aesthetic and operational objectives in the May 2018 sample for the following:

- Sodium, Sulphate, Chloride, Fluoride, Alkalinity, Colour, Aluminum, Iron, Hardness, Lead and TDS;



It is interpreted that the well had not been completely developed at the time resulting in particulates resulting in elevated levels. The December and February samples are inferred to be more representative of stabilized conditions. Sodium, hardness, and iron are still elevated in these samples and exceedances of these parameters are common in the area. Sodium exceeds the 20mg/L value those on sodium restricted diets. Hardness was reported outside of the 80-100mg/L aesthetic range. Iron is well elevated above the aesthetic objective of 0.3mg/L and will required treatment to reduce staining and buildup on plumbing fixtures.

Overall it is our professional opinion that the results of the testing do not indicate the presence of leachate impacting the groundwater at these locations and that the elevated parameters are common to the area and fluctuate seasonally.

GHD observed no signs of stressed vegetation on or near the site due to leachate or any other evidence of leachate on the site. Based on the data, the distance from the Site and inferred groundwater flow direction, it is our professional opinion that no impact has occurred due to the WDS.

4.2 Subsurface Run-off

Subsurface run-off from the WDS is expected to flow cross gradient towards Clear Lake. Subsurface run-off is not expected to flow through the Site and based on topography is not expected to have an impact.

4.3 Ground Settlement

The WDS does not encroach upon the Site and no settlement is anticipated at the Site with respect to the activities.

4.4 Visual Impact

The extent of WDS is not visible from the Site. There is a forested area as well as McCracken Road that separates the Site and WDS.

4.5 Soil Contamination and Hazardous Waste

According to information reviewed there is no indication that the site contains hazardous waste. Based on the information reviewed, it is GHD's opinion that there is a low likelihood of soil contamination and hazardous waste impact to the Site with respect to the WDS.

4.6 Landfill Generated Gases

Based on the direction of groundwater flow and the distance from the WDS to the Site it is our professional opinion that the potential for impact from landfill gases is negligible.



5. Conclusions and Recommendations

Based on the results of this assessment, including a review of the MOECC water well database, aerial photographs and GIS maps for the region, and our hydrogeological evaluation, it is our professional opinion that there is negligible potential for the development to be impacted by the former landfill and no further work is required.

Should questions arise regarding any aspect of our report, please contact our office.

Sincerely,

A handwritten signature in black ink, reading "Steven Gagné". The signature is written in a cursive style with a large, stylized 'S' and a long horizontal stroke at the end.

Steven J. Gagné, H.B.Sc.

A handwritten signature in black ink, reading "Nyle McIlveen". The signature is written in a cursive style with a large, stylized 'N' and a long horizontal stroke at the end.

Nyle McIlveen, P.Eng.



6. References

Chapman and Putnam, 1966. The Physiography of Southern Ontario, 2nd Edition. University of Toronto Press.

Chapman and Putnam, 1984. The Physiography of Southern Ontario, 3rd Edition. Ministry of Natural Resources.

Freeze, R. Allan and Cherry, John A. 1979. Groundwater.

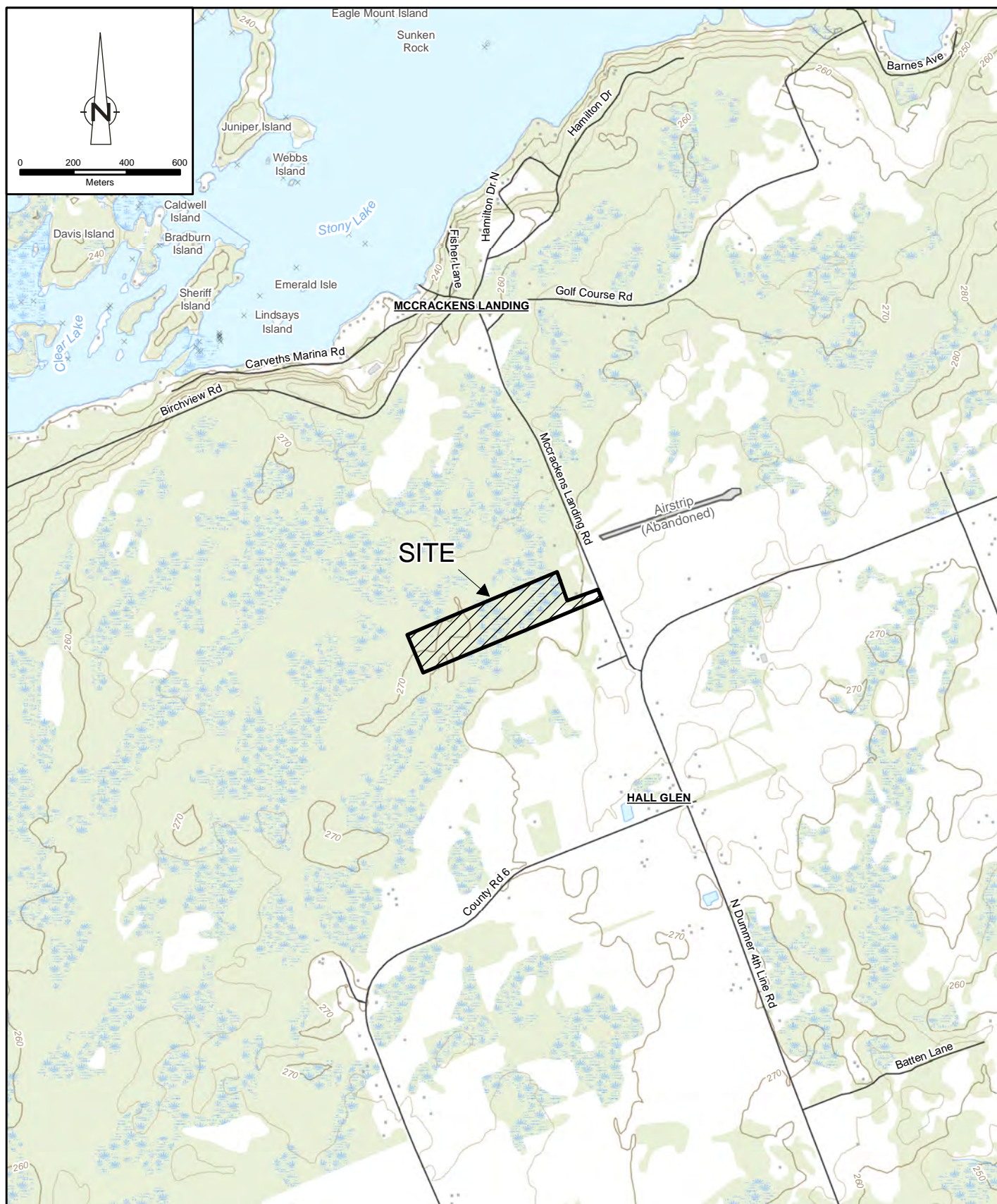


7. Statement of Limitations

This report is intended solely for Mr. and Mrs. Garbutt in assessing the hydrogeological (D-4) aspects of the property located between 2100 McCracken's Landing Road, in Douro-Dummer Township, Ontario and is prohibited for use by others without GHD's prior written consent. This report is considered GHD's professional work product and shall remain the sole property of GHD. Any unauthorized reuse, redistribution of or reliance on the report shall be at the Client and recipient's sole risk, without liability to GHD. Client shall defend, indemnify and hold GHD harmless from any liability arising from or related to Client's unauthorized distribution of the report. No portion of this report may be used as a separate entity; it is to be read in its entirety and shall include all supporting drawings and appendices.

The recommendations made in this report are in accordance with our present understanding of the project, the current site use, ground surface elevations and conditions, and are based on the work scope approved by the Client and described in the report. The services were performed in a manner consistent with that level of care and skill ordinarily exercised by members of hydrogeological and geotechnical engineering professions currently practicing under similar conditions in the same locality. No other representations, and no warranties or representations of any kind, either expressed or implied, are made. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties.

All details of design and construction are rarely known at the time of completion of a hydrogeological study. The recommendations and comments made in the study report are based on our subsurface investigation and resulting understanding of the project, as defined at the time of the study. We should be retained to review our recommendations when the drawings and specifications are complete. Without this review, GHD will not be liable for any misunderstanding of our recommendations or their application and adaptation into the final design.



Source: MNRF NRVIS, 2017. Produced by GHD under licence from Ontario Ministry of Natural Resources and Forestry, © Queen's Printer 2019.
Coordinate System: NAD 1983 UTM Zone 17N

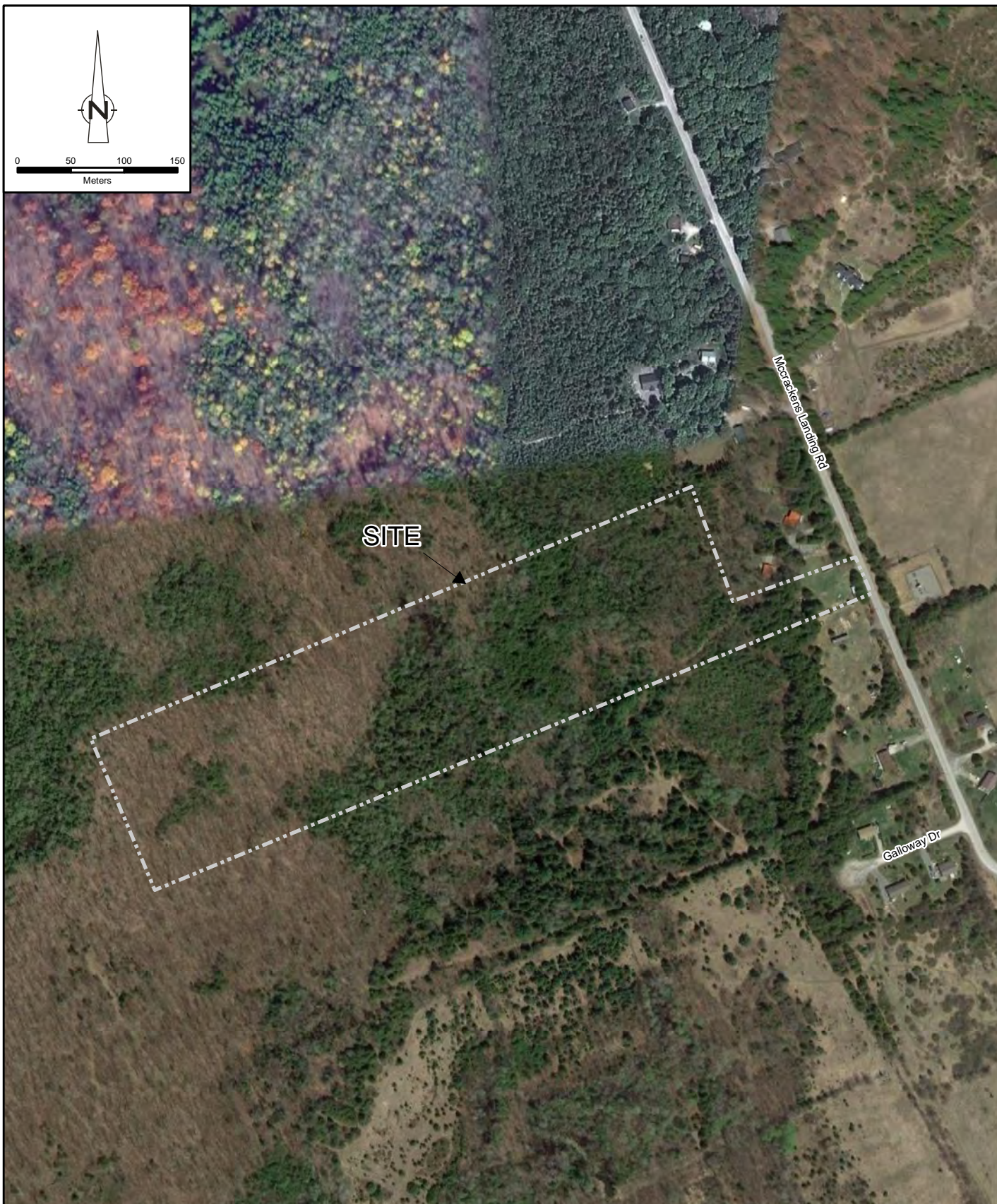


D-4 STUDY
2100 MCCRAKENS LANDING ROAD
DOURO-DUMMER, ON

11191637-01
Mar 6, 2019

SITE LOCATION MAP

FIGURE 1



Source: MNRF NRVIS, 2017. Produced by GHD under licence from Ontario Ministry of Natural Resources and Forestry, © Queen's Printer 2019; Imagery: Image ©2019 Google, Imagery date: 05/06/2018

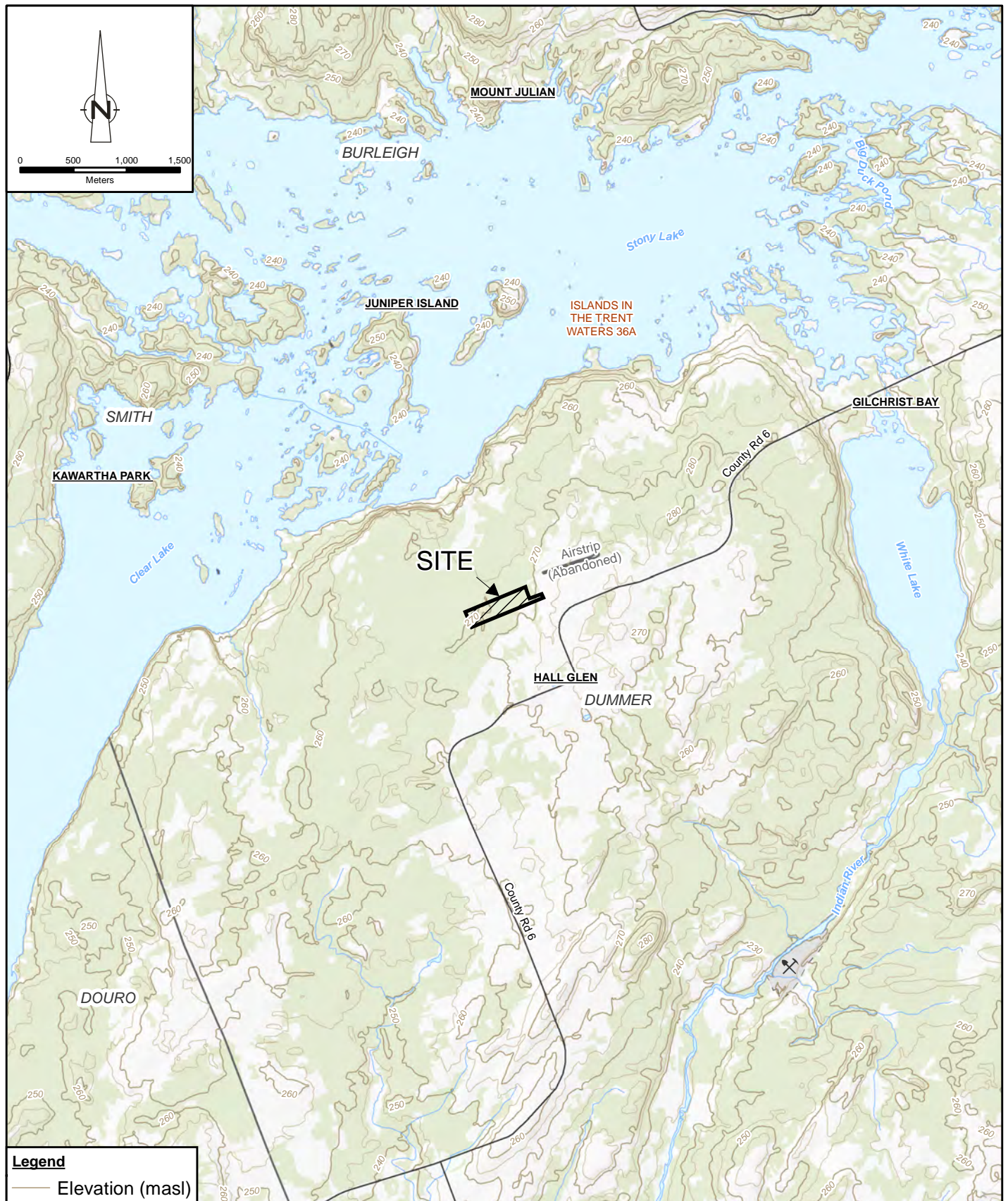


D-4 STUDY
2100 MCCRAKENS LANDING ROAD
DOURO-DUMMER, ON

AERIAL FIGURE

11191637-01
Mar 6, 2019

FIGURE 2

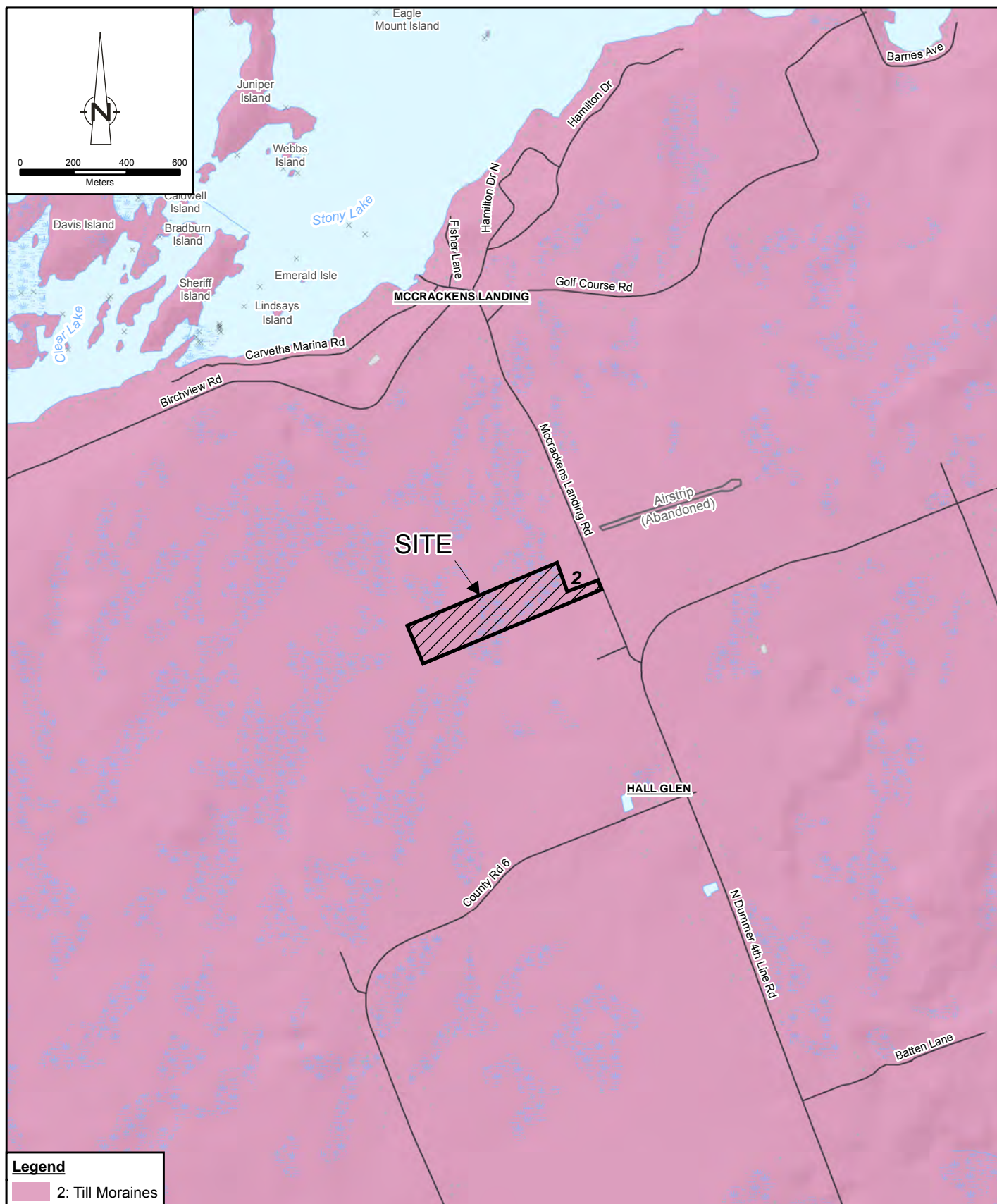


D-4 STUDY
2100 MCCRAKENS LANDING ROAD
DOURO-DUMMER, ON

REGIONAL TOPOGRAPHY

11191637-01
Mar 6, 2019

FIGURE 3

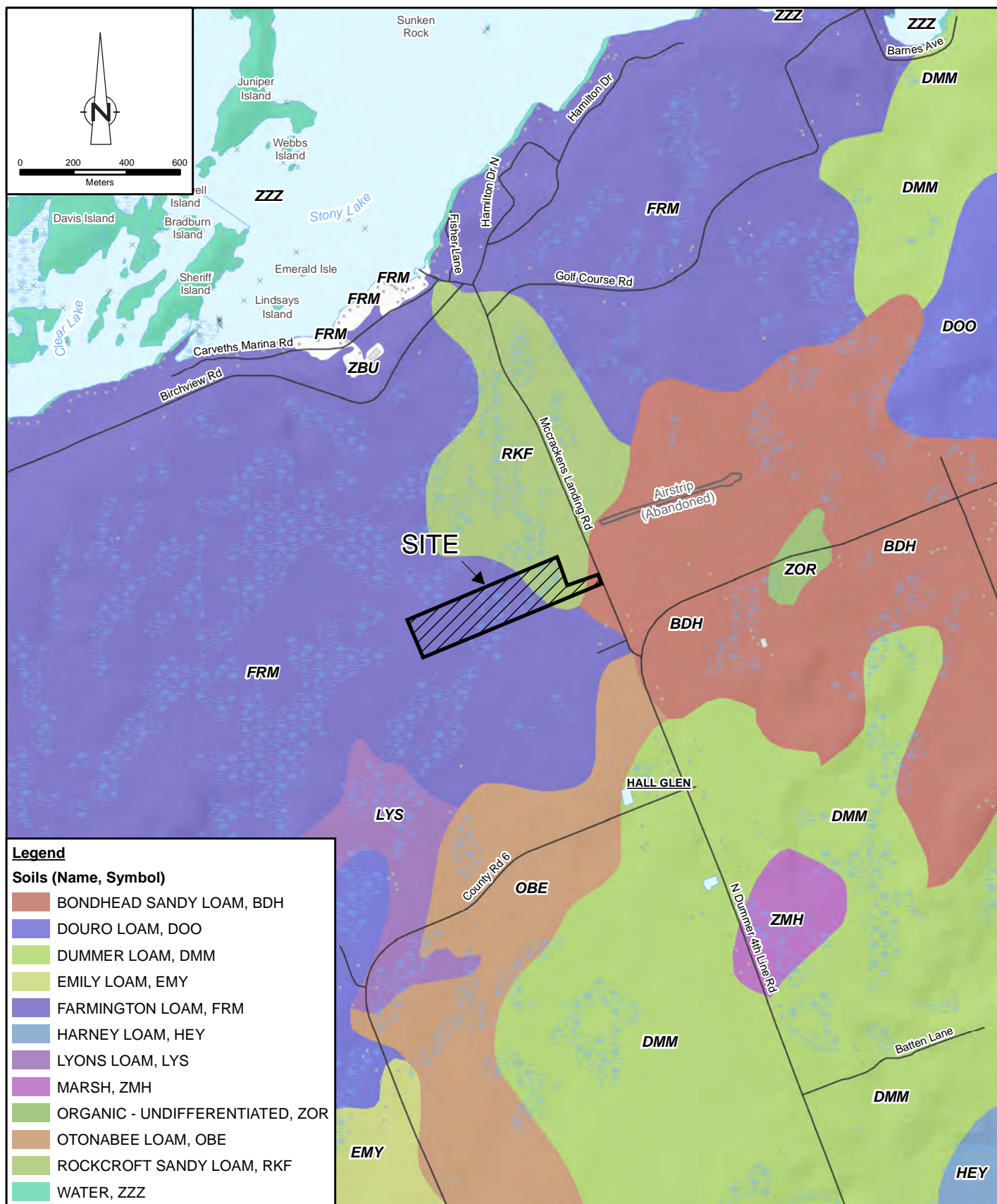


D-4 STUDY
2100 MCCRAKENS LANDING ROAD
DOURO-DUMMER, ON

PHYSIOGRAPHY

11191637-01
Mar 6, 2019

FIGURE 4



Source: MNRF NRVIS, 2017. Produced by GHD under licence from Ontario Ministry of Natural Resources and Forestry, © Queen's Printer 2019.
Coordinate System: NAD 1983 UTM Zone 17N

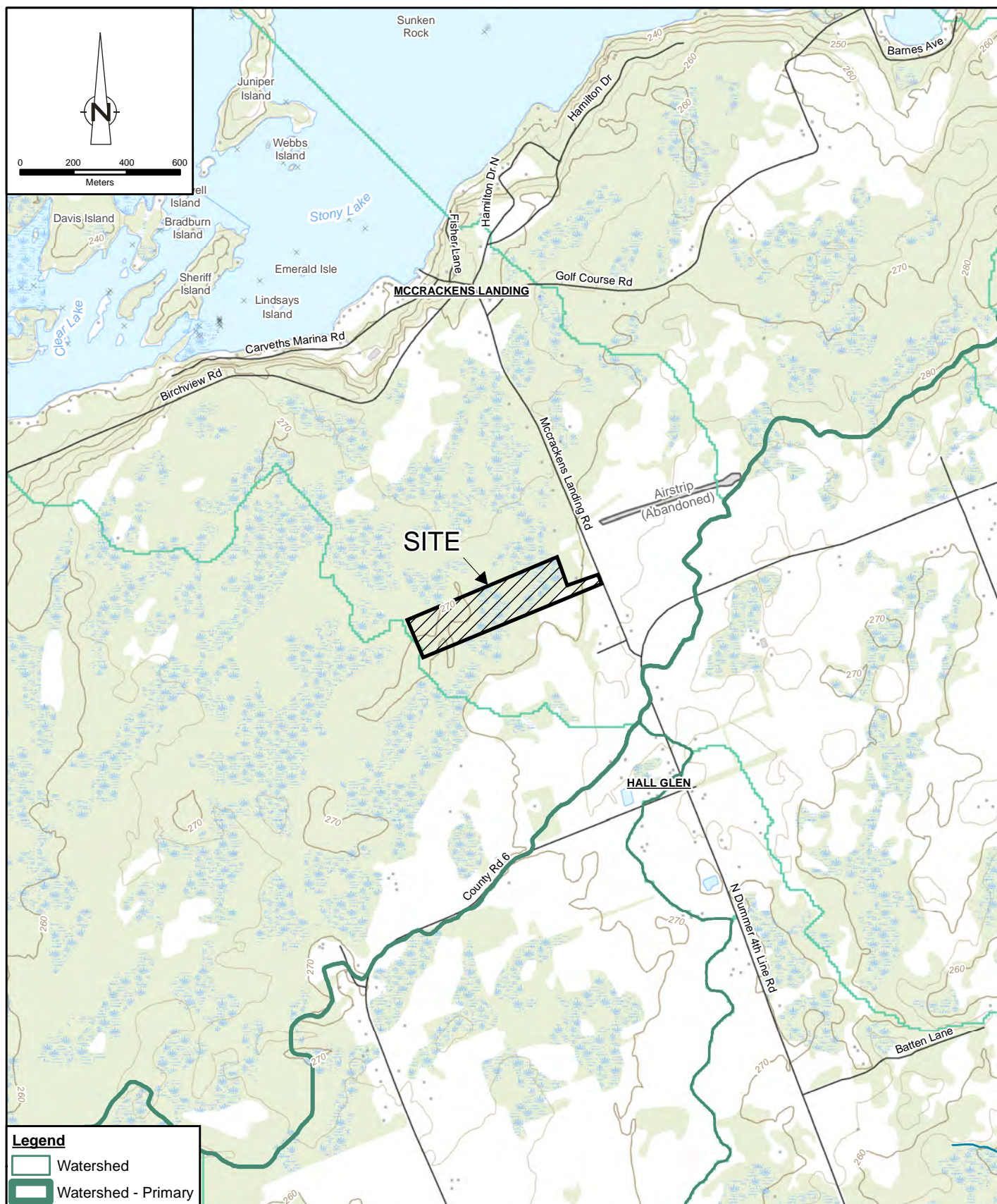


D-4 STUDY
2100 MCCRAKENS LANDING ROAD
DOURO-DUMMER, ON

SOIL - TYPE

11191637-01
Mar 6, 2019

FIGURE 5

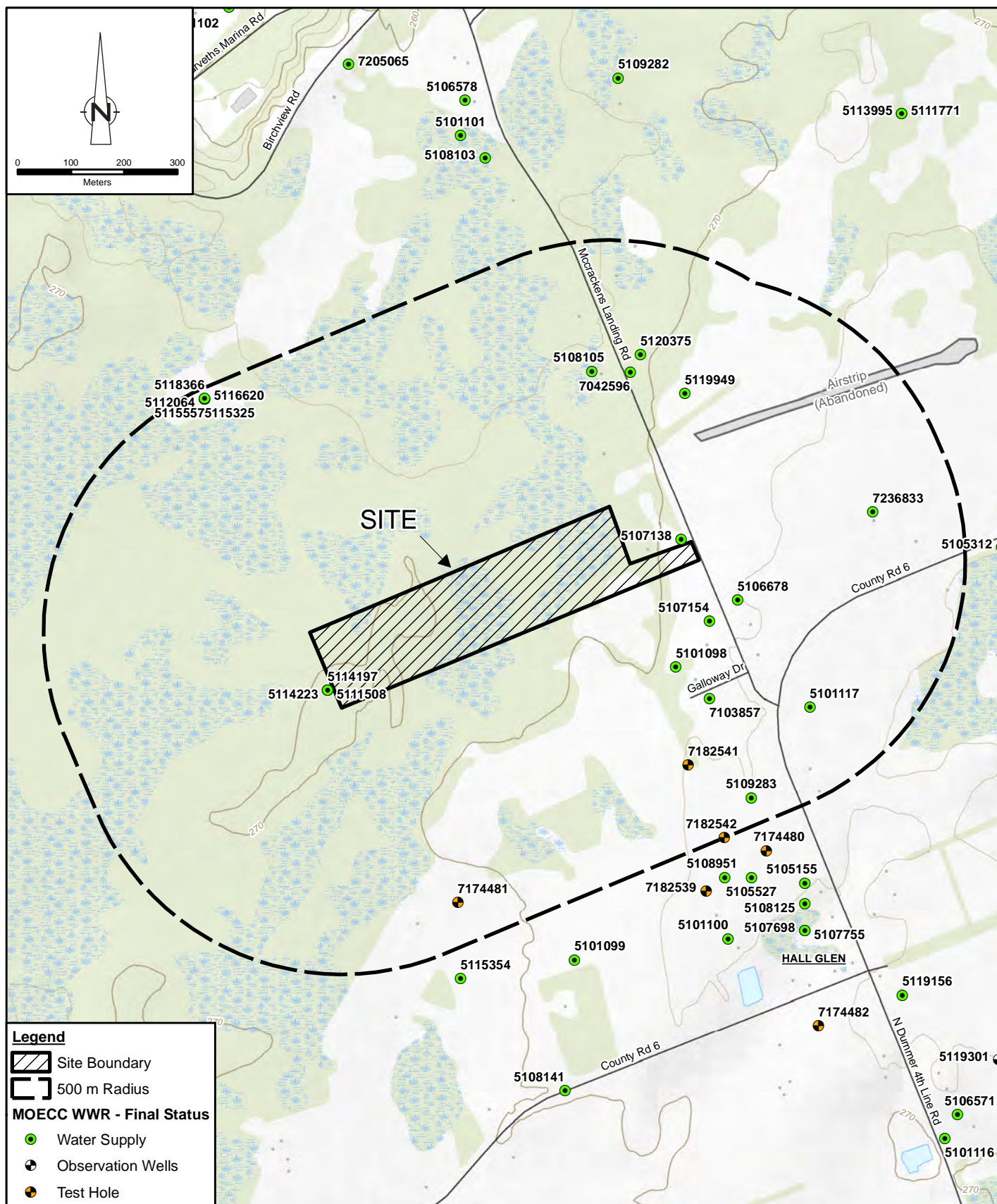


D-4 STUDY
2100 MCCRAKENS LANDING ROAD
DOURO-DUMMER, ON

FLOW DIRECTION

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Mar 6, 2019

FIGURE 6



Source: MNRF NRVIS, 2017. Produced by GHD under licence from Ontario Ministry of Natural Resources and Forestry, © Queen's Printer 2019; WWIS, 2017. Ontario Ministry of the Environment and Climate Change (Accessed January 2017). Coordinate System: NAD 1983 UTM Zone 17N

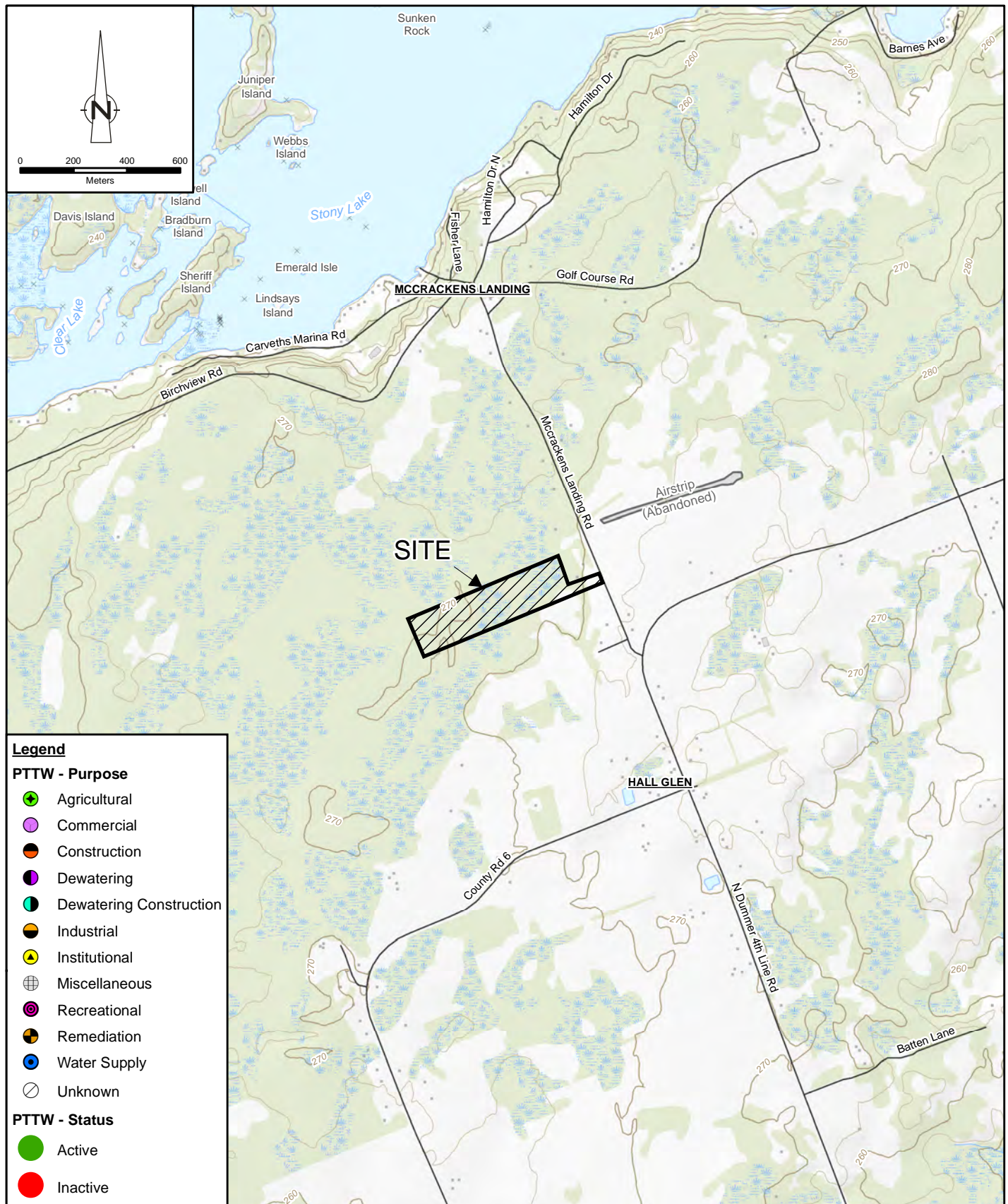


D-4 STUDY
2100 MCCRACKENS LANDING ROAD
DOURO-DUMMER, ON

11191637-01
Mar 6, 2019

MOECC WATER WELLS

FIGURE 7



Source: MNRF NRVIS, 2017. Produced by GHD under licence from Ontario Ministry of Natural Resources and Forestry, © Queen's Printer 2019.
Coordinate System: NAD 1983 UTM Zone 17N

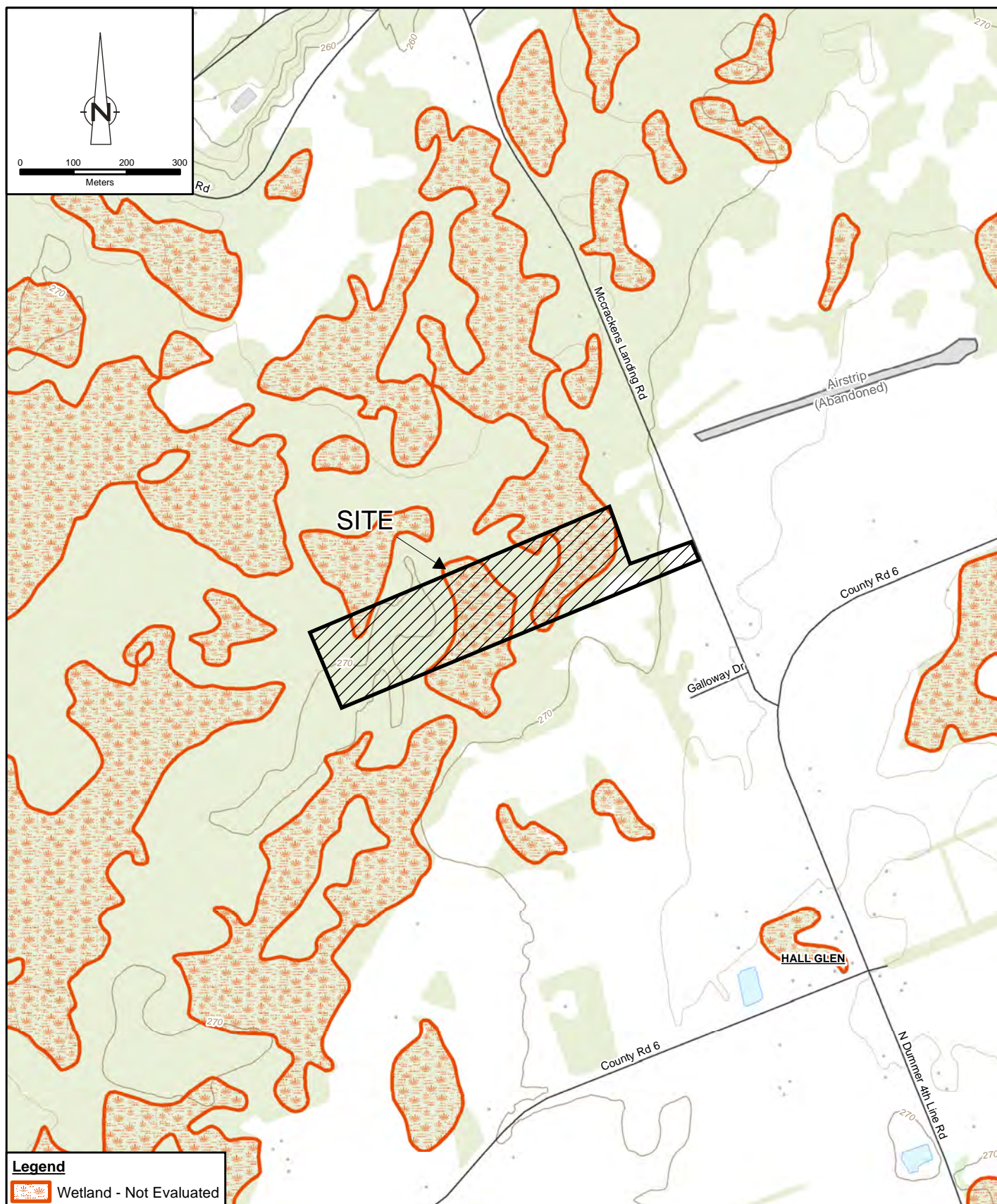


D-4 STUDY
2100 MCCRACKENS LANDING ROAD
DOURO-DUMMER, ON

11191637-01
Mar 6, 2019

PERMITS TO TAKE WATER

FIGURE 8

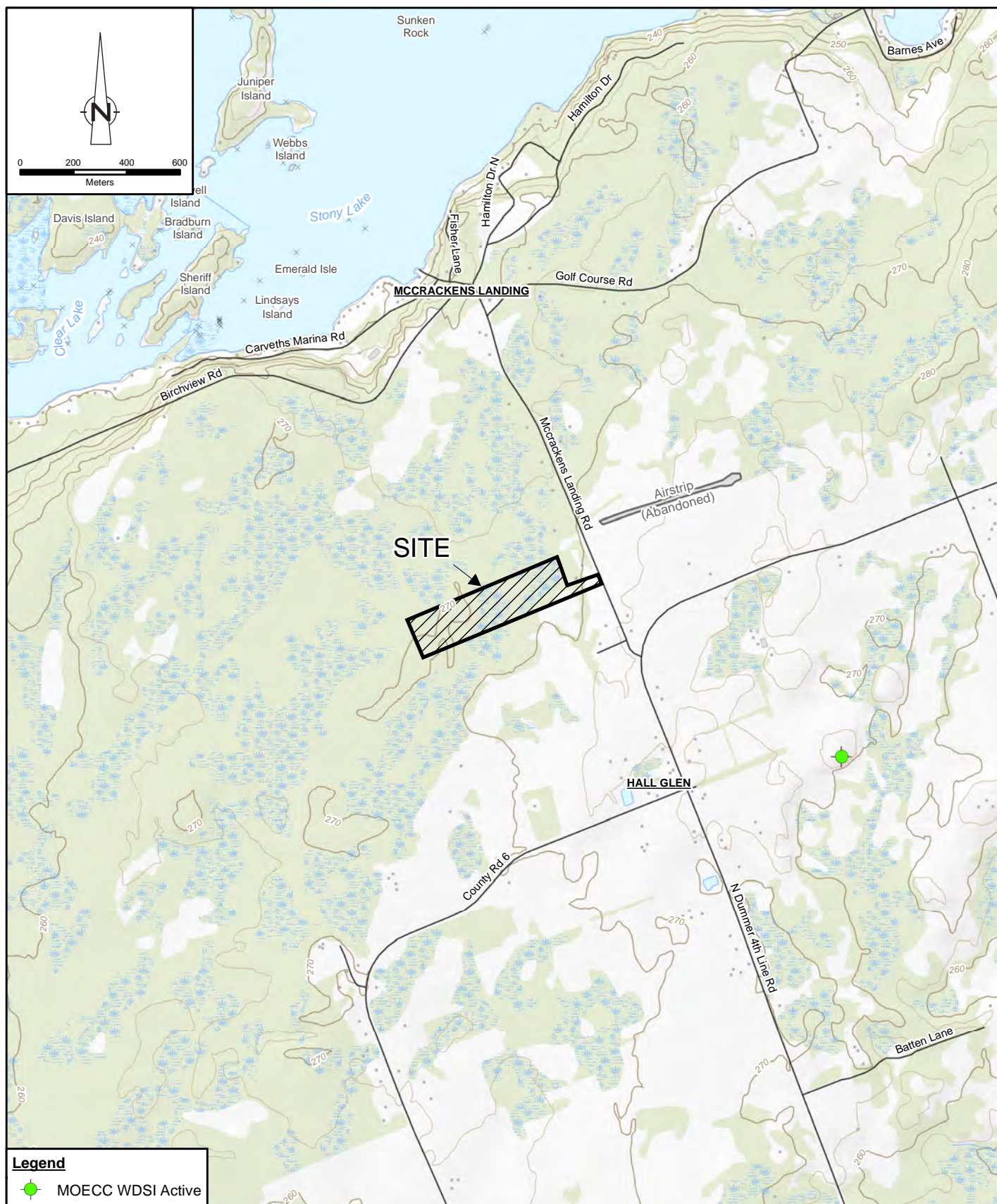


D-4 STUDY
2100 MCCRACKENS LANDING ROAD
DOURO-DUMMER, ON

WETLANDS

11191637-01
Mar 6, 2019

FIGURE 9



Source: MNRF NRVS, 2017. Produced by GHD under licence from Ontario Ministry of Natural Resources and Forestry, © Queen's Printer 2019; MOECC WDSI 1991; NPRI 2010; NPRI January 2012; OGSF 2008; AMIS 2010. Coordinate System: NAD 1983 UTM Zone 17N



D-4 STUDY
2100 MCCRACKENS LANDING ROAD
DOURO-DUMMER, ON

11191637-01
Mar 6, 2019

CONTAMINATING ACTIVITY

FIGURE 10

Measurements recorded in: ☐ Metric ☒ Imperial

A231016

Well Owner's Information

First Name: JERRY Last Name / Organization: GARBUTT E-mail Address:
Mailing Address (Street Number/Name): 602 GOLF COURSE RD Municipality: PETERBOROUGH Province: ON Postal Code: K0K 2H0 Telephone No. (inc. area code):
☒ Well Constructed by Well Owner

Well Location

Address of Well Location (Street Number/Name): 2100 MCCRACKENS LANDING RD Township: DUNDAS/DUMFRIES Lot: 27 Concession: 3
County/District/Municipality: PETERBOROUGH City/Town/Village: HALLS GREEN Province: Ontario Postal Code: K0K 2H0
UTM Coordinates Zone: 18 Easting: 7727537 Northing: 4933997 Municipal Plan and Sublot Number:
NAD: 83

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)
GREY	LIMESTONE		HARD	0 140
RED	GRANITE		HARD	140 160
WHITE	GRANITE		HARD	160 180

Annular Space

Depth Set at (m/ft)	Type of Sealant Used (Material and Type)	Volume Placed (m ³ /ft ³)
0 20	BENTONITE	7.13

Results of Well Yield Testing

After test of well yield, water was:		Draw Down		Recovery	
<input checked="" type="checkbox"/> Clear and sand free	<input type="checkbox"/> Other, specify	Time (min)	Water Level (m/ft)	Time (min)	Water Level (m/ft)
If pumping discontinued, give reason:		Static Level	75		
Pump intake set at (m/ft)		1	75.1	1	81.8
Pumping rate (l/min / GPM)		2	75.3	2	81.3
Duration of pumping		3	75.6	3	81
1 hrs + min		4	75.9	4	80.5
Final water level end of pumping (m/ft)		5	76	5	80
If flowing give rate (l/min / GPM)		10	77.3	10	76.9
Recommended pump depth (m/ft)		15	78	15	75
Recommended pump rate (l/min / GPM)		20	78.6	20	75
Well production (l/min / GPM)		25	79.2	25	75
Disinfected?		30	79.7	30	75
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		40	80.5	40	75
		50	81.3	50	75
		60	82	60	75

Method of Construction

Method of Construction	Well Use
<input type="checkbox"/> Cable Tool	<input type="checkbox"/> Public
<input type="checkbox"/> Rotary (Conventional)	<input type="checkbox"/> Commercial
<input type="checkbox"/> Rotary (Reverse)	<input type="checkbox"/> Domestic
<input type="checkbox"/> Boring	<input type="checkbox"/> Municipal
<input type="checkbox"/> Air percussion	<input type="checkbox"/> Livestock
<input type="checkbox"/> Other, specify	<input type="checkbox"/> Test Hole
	<input type="checkbox"/> Cooling & Air Conditioning
	<input type="checkbox"/> Industrial
	<input type="checkbox"/> Other, specify

Construction Record - Casing

Status of Well

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft)	Status of Well
6 1/8	STEEL	188	0 20	<input type="checkbox"/> Water Supply
6 1/8	OPEN HOLE		20 180	<input type="checkbox"/> Replacement Well
				<input type="checkbox"/> Test Hole
				<input type="checkbox"/> Recharge Well
				<input type="checkbox"/> Dewatering Well
				<input type="checkbox"/> Observation and/or Monitoring Hole
				<input type="checkbox"/> Alteration (Construction)
				<input type="checkbox"/> Abandoned, Insufficient Supply
				<input type="checkbox"/> Abandoned, Poor Water Quality
				<input type="checkbox"/> Abandoned, other, specify
				<input type="checkbox"/> Other, specify

Construction Record - Screen

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

Water Details

Hole Diameter

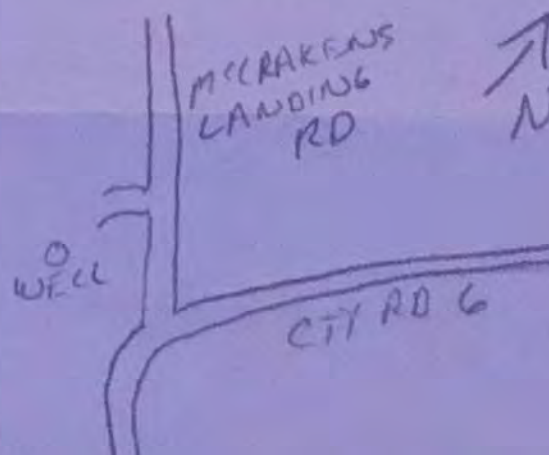
Water found at Depth (m/ft)	Kind of Water: <input type="checkbox"/> Fresh <input checked="" type="checkbox"/> Untested	Depth (m/ft)	Diameter (cm/in)
170	<input type="checkbox"/> Gas <input type="checkbox"/> Other, specify	0 20	8 3/4
		20 180	6 1/8

Well Contractor and Well Technician Information

Business Name of Well Contractor: Well Contractor's Licence No.:

Map of Well Location

Please provide a map below following instructions on the back.



NAD 83		Easting		Northing		Municipal Plan and Sublot Number		Ontario	
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)	
GREY		LIMESTONE				HARD		0 140	
RED		GRANITE				HARD		140 160	
WHITE		GRANITE				HARD		160 180	
Annular Space									
Depth Set at (m/ft)		Type of Sealant Used (Material and Type)		Volume Placed (m³/ft³)		Results of Well Yield Testing			
0 20		BENTONITE		7.173		After test of well yield, water was: <input checked="" type="checkbox"/> Clear and sand free <input type="checkbox"/> Other, specify			
						If pumping discontinued, give reason:			
						Static Level			
						1 75.1 1 81.8			
						2 75.3 2 81.3			
						3 75.6 3 81			
						4 75.9 4 80.5			
						5 76 5 80			
						10 77.3 10 76.9			
						15 78 15 75			
						20 78.6 20 75			
						25 79.2 25 75			
						30 79.7 30 75			
						40 80.5 40 75			
						50 81.3 50 75			
						60 82 60 75			
						Recommended pump depth (m/ft)			
						170			
						Recommended pump rate (l/min / GPM)			
						7			
						Well production (l/min / GPM)			
						7			
						Disinfected?			
						<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			
Method of Construction									
<input type="checkbox"/> Cable Tool <input type="checkbox"/> Diamond					<input type="checkbox"/> Public				
<input type="checkbox"/> Rotary (Conventional) <input type="checkbox"/> Jetting					<input type="checkbox"/> Commercial <input type="checkbox"/> Not used				
<input type="checkbox"/> Rotary (Reverse) <input type="checkbox"/> Driving					<input type="checkbox"/> Municipal <input type="checkbox"/> Dewatering				
<input type="checkbox"/> Boring <input type="checkbox"/> Digging					<input type="checkbox"/> Livestock <input type="checkbox"/> Test Hole <input type="checkbox"/> Monitoring				
<input type="checkbox"/> Air percussion					<input type="checkbox"/> Irrigation <input type="checkbox"/> Cooling & Air Conditioning				
<input type="checkbox"/> Other, specify					<input type="checkbox"/> Industrial <input type="checkbox"/> Other, specify				
Well Use									
<input type="checkbox"/> Well Supply									
<input type="checkbox"/> Replacement Well									
<input type="checkbox"/> Test Hole									
<input type="checkbox"/> Recharge Well									
<input type="checkbox"/> Dewatering Well									
<input type="checkbox"/> Observation and/or Monitoring Hole									
<input type="checkbox"/> Alteration (Construction)									
<input type="checkbox"/> Abandoned, Insufficient Supply									
<input type="checkbox"/> Abandoned, Poor Water Quality									
<input type="checkbox"/> Abandoned, other, specify									
<input type="checkbox"/> 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)		Status of Well	
6 1/8		STEEL		188		0 20		<input type="checkbox"/> Water Supply	
6 1/8		OPEN HOLE				20 180		<input type="checkbox"/> Replacement Well	
								<input type="checkbox"/> Test Hole	
								<input type="checkbox"/> Recharge Well	
								<input type="checkbox"/> Dewatering Well	
								<input type="checkbox"/> Observation and/or Monitoring Hole	
								<input type="checkbox"/> Alteration (Construction)	
								<input type="checkbox"/> Abandoned, Insufficient Supply	
								<input type="checkbox"/> Abandoned, Poor Water Quality	
								<input type="checkbox"/> Abandoned, other, specify	
								<input type="checkbox"/> Other, specify	
Construction Record - Screen									
Outside Diameter (cm/in)		Material (Plastic, Galvanized, Steel)		Slot No.		Depth (m/ft)			
						From To			
Water Details									
Water found at Depth		Kind of Water: <input type="checkbox"/> Fresh <input checked="" type="checkbox"/> Untested		Depth (m/ft)		Diameter (cm/in)			
170 (m/ft) <input type="checkbox"/> Gas		<input type="checkbox"/> Other, specify		From To					
				0 20		8 3/4			
				20 180		6 1/8			
Hole Diameter									
Water found at Depth		Kind of Water: <input type="checkbox"/> Fresh <input type="checkbox"/> Untested		Depth (m/ft)		Diameter (cm/in)			
(m/ft) <input type="checkbox"/> Gas		<input type="checkbox"/> Other, specify		From To					
				0 20		8 3/4			
				20 180		6 1/8			
Well Contractor and Well Technician Information									
Business Name of Well Contractor				Well Contractor's Licence No.					
WEXLEY WATER WELL LTD				6 5 7 18					
Business Address (Street Number/Name)				Municipality					
RR 2 LAKEFIELD				PETERBORO					
Province		Postal Code		Business E-mail Address					
ON		K0K 1M0							
Business Telephone No. (inc. area code)				Name of Well Technician (Last Name, First Name)					
505 652 11629				ERIK WEXLEY					
Well Technician's Licence No.				Signature of Technician and/or Contractor		Date Submitted			
316 13 12						2018 06 07			
Well Owner's Copy									

Map of Well Location

Please provide a map below following instructions on the back.

Comments:

HAUSCLEN

Well owner's information package delivered ☒ Yes ☐ No

Date Package Delivered 2018 05 05

Date Work Completed 2018 05 10

Ministry Use Only

Audit No. Z265252

Received

**SGS Canada Inc.**

P.O. Box 4300 - 185 Concession St.
 Lakefield - Ontario - K0L 2H0
 Phone: 705-652-2000 FAX: 705-652-6365

13-December-2018**Jerry and Liz Garbutt**

**602 Golf Course Rd.
 Douro-Dummer, ON
 K0L 2H0**

Date Rec. : 06 December 2018
LR Report: CA14108-DEC18

Copy: #1

**Phone: 705-652-6187
 Email: Jergar@nexicom.net**

CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MAC	6: AO/OG	7: NR Well
Sample Date & Time							05-Dec-18 14:30
Temperature Upon Receipt [°C]	---	---	---	---	---	---	14.0
Biochemical Oxygen Demand (BOD5) [mg/L]	06-Dec-18	17:36	11-Dec-18	16:39	---	---	12
UV Transmittance [%T]	10-Dec-18	09:44	12-Dec-18	22:22	---	---	88.5
Colour [TCU]	07-Dec-18	11:59	10-Dec-18	12:03	---	5	4
Alkalinity [mg/L as CaCO ₃]	06-Dec-18	15:12	12-Dec-18	11:07	---	30-500	271
Conductivity [uS/cm]	06-Dec-18	15:12	12-Dec-18	11:07	---	---	848
Temperature @ pH [°C]	06-Dec-18	15:12	---	---	---	---	22.7
pH [no unit]	06-Dec-18	15:12	12-Dec-18	11:07	---	6.5-8.5	8.06
OH [mg/L as CaCO ₃]	06-Dec-18	15:12	12-Dec-18	11:07	---	---	< 2
Bicarbonate [mg/L as CaCO ₃]	06-Dec-18	15:12	12-Dec-18	11:07	---	---	271
Carbonate [mg/L as CaCO ₃]	06-Dec-18	15:12	12-Dec-18	11:07	---	---	< 2
Total Suspended Solids [mg/L]	08-Dec-18	14:51	11-Dec-18	22:15	---	---	12
Total Dissolved Solids [mg/L]	06-Dec-18	14:06	07-Dec-18	16:02	---	500	474
Turbidity [NTU]	06-Dec-18	14:16	12-Dec-18	10:51	1	5	1.47
Hydrogen Sulphide [mg/L]	07-Dec-18	08:00	10-Dec-18	14:30	---	0.05	< 0.006
Sulphide [ug/L]	07-Dec-18	08:00	10-Dec-18	14:30	---	50	< 6
Organic Nitrogen [mg/L]	07-Dec-18	08:00	11-Dec-18	14:29	---	0.15	< 0.05
Total Kjeldahl Nitrogen (N) [mg/L]	07-Dec-18	19:30	11-Dec-18	14:29	---	---	0.25
Ammonia+Ammonium (N) [mg/L]	07-Dec-18	08:00	10-Dec-18	15:33	---	---	0.22
Total Organic Carbon [mg/L]	10-Dec-18	21:45	11-Dec-18	15:20	---	---	2
Dissolved Organic Carbon [mg/L]	10-Dec-18	21:45	11-Dec-18	15:20	---	5	2
Fluoride [mg/L]	07-Dec-18	09:16	07-Dec-18	13:20	1.5	---	0.17
Nitrite (as N) [mg/L]	08-Dec-18	17:36	12-Dec-18	08:16	1	---	0.014
Nitrate (as N) [mg/L]	08-Dec-18	17:36	12-Dec-18	08:16	10	---	< 0.006
Bromide [mg/L]	08-Dec-18	17:36	12-Dec-18	08:16	---	---	< 0.05
Chloride [mg/L]	11-Dec-18	22:45	13-Dec-18	10:19	---	250	66
Sulphate [mg/L]	11-Dec-18	22:45	13-Dec-18	10:19	---	500	92
Phosphorus (total reactive) [mg/L]	06-Dec-18	17:43	11-Dec-18	12:38	---	---	< 0.03
Reactive Silica [mg/L]	06-Dec-18	14:27	07-Dec-18	10:34	---	---	5.73

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LR Report : CA14108-DEC18

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MAC	6: AO/OG	7: NR Well
Hardness [mg/L as CaCO ₃]	10-Dec-18	14:48	11-Dec-18	11:58	---	80-100	373
Aluminum [ug/L]	10-Dec-18	14:48	11-Dec-18	11:58	---	100	22.4
Antimony [ug/L]	10-Dec-18	14:48	11-Dec-18	11:58	6	---	0.05
Arsenic [ug/L]	10-Dec-18	14:48	11-Dec-18	11:58	10	---	< 0.2
Barium [ug/L]	10-Dec-18	14:48	11-Dec-18	11:58	1000	---	204
Boron [ug/L]	10-Dec-18	14:48	11-Dec-18	11:58	5000	---	34
Calcium [mg/L]	10-Dec-18	14:48	11-Dec-18	11:58	---	---	141
Cadmium [ug/L]	10-Dec-18	14:48	11-Dec-18	11:58	5	---	0.005
Chromium [ug/L]	10-Dec-18	14:48	11-Dec-18	11:58	50	---	0.53
Cobalt [ug/L]	10-Dec-18	14:48	11-Dec-18	11:58	---	---	0.228
Copper [ug/L]	10-Dec-18	14:48	11-Dec-18	11:58	---	1000	2.43
Iron [ug/L]	10-Dec-18	14:48	11-Dec-18	11:58	---	300	30
Lead [ug/L]	10-Dec-18	14:48	11-Dec-18	11:58	10	---	0.20
Magnesium [mg/L]	10-Dec-18	14:48	11-Dec-18	11:58	---	---	5.26
Manganese [ug/L]	10-Dec-18	14:48	11-Dec-18	11:58	---	50	17.6
Molybdenum [ug/L]	10-Dec-18	14:48	11-Dec-18	11:58	---	---	4.09
Nickel [ug/L]	10-Dec-18	14:48	11-Dec-18	11:58	---	---	0.8
Potassium [mg/L]	10-Dec-18	14:48	11-Dec-18	11:58	---	---	2.00
Phosphorus [mg/L]	10-Dec-18	14:48	11-Dec-18	11:58	---	---	< 0.003
Selenium [ug/L]	10-Dec-18	14:48	11-Dec-18	11:58	50	---	0.05
Silver [ug/L]	10-Dec-18	14:48	11-Dec-18	11:58	---	---	< 0.002
Sodium [mg/L]	10-Dec-18	14:48	11-Dec-18	11:58	20	200	37.7
Strontium [ug/L]	10-Dec-18	14:48	11-Dec-18	11:58	---	---	864
Uranium [ug/L]	10-Dec-18	14:48	11-Dec-18	11:58	20	---	0.032
Thallium [ug/L]	10-Dec-18	14:48	11-Dec-18	11:58	---	---	0.010
Titanium [ug/L]	10-Dec-18	14:48	11-Dec-18	11:58	---	---	0.56
Vanadium [ug/L]	10-Dec-18	14:48	11-Dec-18	11:58	---	---	0.07
Zinc [ug/L]	10-Dec-18	14:48	11-Dec-18	11:58	---	5000	41
Total Coliform [cfu/100mL]	06-Dec-18	13:40	07-Dec-18	15:47	0	---	13
E. Coli [cfu/100mL]	06-Dec-18	13:40	07-Dec-18	15:47	0	---	0
Total Dissolved Solids (calculated) [mg/L]	---	---	---	---	---	---	507
Cation sum [meq/L]	---	---	---	---	---	---	9.18
Anion Sum [meq/L]	---	---	---	---	---	---	9.20
Anion-Cation Balance [% difference]	---	---	---	---	---	---	-0.09
Ion Ratio	---	---	---	---	---	---	1.00
Langelier's Index [@ 4° C]	---	---	---	---	---	---	0.67
Langelier's Index [@ 20° C]	---	---	---	---	---	---	0.99
Saturation pH [pHs @ 4°C]	---	---	---	---	---	---	7.39
Saturation pH [pHs @ 20°C]	---	---	---	---	---	---	7.07

MAC - Maximum Acceptable Concentration

AO/OG - Aesthetic Objective / Operational Guideline

NR - Not regulated / reportable under applicable Provincial drinking water regulations as per client.

Note: Hydrogen Sulphide (H₂S) calculated using lab results for pH, temperature and conductivity.



SGS Canada Inc.

P.O. Box 4300 - 185 Concession St.

Lakefield - Ontario - KOL 2H0

Phone: 705-652-2000 FAX: 705-652-6365

LR Report : CA14108-DEC18

Kimberley Didsbury
Project Specialist
Environmental Services, Analytical

**SGS Canada Inc.**

P.O. Box 4300 - 185 Concession St.
 Lakefield - Ontario - KOL 2H0
 Phone: 705-652-2000 FAX: 705-652-6365

Project : 1119 1118 Hall's Glen

11-March-2019

GHD**Attn :** Gus Bolin

347 Pido Rd., Unit #29
 Peterborough, ON
 K9J 6Z8, Canada

Phone: 705-749-3317

Fax:

Date Rec. : 01 March 2019**LR Report:** CA14023-MAR19**Reference:** 1119 1118 Gus Bolin**Copy:** #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MAC	6: AO/OG	7: 602 Golf Course Road
Sample Date & Time							28-Feb-19
Temp Upon Receipt [°C]	***	***	***	***	***	***	***
BOD5 [mg/L]	04-Mar-19	17:07	11-Mar-19	08:19	---	---	5
UV Transmittance [%T]	04-Mar-19	16:58	07-Mar-19	11:11	---	---	82.3
Colour [TCU]	1894686784	17:23	07-Mar-19	11:12	---	5	3
Alkalinity [mg/L as CaCO ₃]	05-Mar-19	13:33	06-Mar-19	12:16	---	30-500	212
Conductivity [uS/cm]	05-Mar-19	13:33	06-Mar-19	12:16	---	---	588
Temperature @ pH [°C]	05-Mar-19	13:33	06-Mar-19	12:16	---	---	17.8
pH [no unit]	05-Mar-19	13:33	06-Mar-19	12:16	---	6.5-8.5	8.06
HCO ₃ [mg/L as CaCO ₃]	05-Mar-19	13:33	06-Mar-19	12:16	---	---	212
CO ₃ [mg/L as CaCO ₃]	05-Mar-19	13:33	06-Mar-19	12:16	---	---	< 2
OH [mg/L as CaCO ₃]	05-Mar-19	13:33	06-Mar-19	12:16	---	---	< 2
TSS [mg/L]	05-Mar-19	07:57	06-Mar-19	14:22	---	---	7
Turbidity [NTU]	04-Mar-19	20:32	05-Mar-19	10:26	1	5	5.21
Organic N [mg/L]	05-Mar-19	09:00	07-Mar-19	13:02	---	0.15	0.20
TKN [as N mg/L]	05-Mar-19	09:00	07-Mar-19	13:02	---	---	0.22
NH ₃ +NH ₄ [as N mg/L]	04-Mar-19	21:35	06-Mar-19	09:20	---	---	< 0.04
TOC [mg/L]	05-Mar-19	21:10	06-Mar-19	09:39	---	---	2
DOC [mg/L]	05-Mar-19	21:10	06-Mar-19	09:39	---	5	2
F [mg/L]	04-Mar-19	09:06	05-Mar-19	13:38	1.5	---	0.14
Br [mg/L]	05-Mar-19	00:22	05-Mar-19	13:51	---	---	0.05 <MDL
NO ₂ [as N mg/L]	05-Mar-19	00:22	05-Mar-19	13:51	1	---	0.003 <MDL
NO ₃ [as N mg/L]	05-Mar-19	00:22	05-Mar-19	13:51	10	---	0.156
Cl [mg/L]	06-Mar-19	06:07	08-Mar-19	11:40	---	250	49
SO ₄ [mg/L]	06-Mar-19	06:07	08-Mar-19	11:40	---	500	26
Tot.Reactive P [mg/L]	04-Mar-19	19:58	07-Mar-19	09:21	---	---	< 0.03
Reactive SiO ₂ [mg/L]	04-Mar-19	13:34	07-Mar-19	11:02	---	---	5.92
Hardness [mg/L as CaCO ₃]	06-Mar-19	12:53	07-Mar-19	11:12	---	80-100	209
Al [µg/L]	06-Mar-19	12:53	07-Mar-19	11:12	---	100	76.8
Sb [µg/L]	06-Mar-19	12:53	07-Mar-19	11:12	6	---	0.71

**SGS Canada Inc.**

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 Lakefield - Ontario - K0L 2H0
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Project : 1119 1118 Hall's Glen**LR Report : CA14023-MAR19**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MAC	6: AO/OG	7: 602 Golf Course Road
As [µg/L]	06-Mar-19	12:53	07-Mar-19	11:12	10	---	< 0.2
Ba [µg/L]	06-Mar-19	12:53	07-Mar-19	11:12	1000	---	227
B [µg/L]	06-Mar-19	12:53	07-Mar-19	11:12	5000	---	47*
Ca [mg/L]	06-Mar-19	12:53	07-Mar-19	11:12	---	---	78.4
Cd [µg/L]	06-Mar-19	12:53	07-Mar-19	11:12	5	---	0.014
Cr [µg/L]	06-Mar-19	12:53	07-Mar-19	11:12	50	---	0.44
Co [µg/L]	06-Mar-19	12:53	07-Mar-19	11:12	---	---	0.281
Cu [µg/L]	06-Mar-19	12:53	07-Mar-19	11:12	---	1000	0.98
Fe [ug/L]	06-Mar-19	12:53	07-Mar-19	11:12	---	300	1400
Pb [µg/L]	06-Mar-19	12:53	07-Mar-19	11:12	10	---	0.24
Mg [mg/L]	06-Mar-19	12:53	07-Mar-19	11:12	---	---	3.24
Mn [µg/L]	06-Mar-19	12:53	07-Mar-19	11:12	---	50	16.4
Mo [µg/L]	06-Mar-19	12:53	07-Mar-19	11:12	---	---	0.45
Ni [µg/L]	06-Mar-19	12:53	07-Mar-19	11:12	---	---	0.5
K [mg/L]	06-Mar-19	12:53	07-Mar-19	11:12	---	---	1.62
P [mg/L]	06-Mar-19	12:53	07-Mar-19	11:12	---	---	0.003
Se [µg/L]	06-Mar-19	12:53	07-Mar-19	11:12	50	---	< 0.04
Sr [µg/L]	06-Mar-19	12:53	07-Mar-19	11:12	---	---	578
Tl [µg/L]	06-Mar-19	12:53	07-Mar-19	11:12	---	---	< 0.005
Ti [ug/L]	06-Mar-19	12:53	07-Mar-19	11:12	---	---	1.59
Ag [µg/L]	06-Mar-19	12:53	07-Mar-19	11:12	---	---	0.007
Na [mg/L]	06-Mar-19	12:53	07-Mar-19	11:12	20	200	35.3
U [µg/L]	06-Mar-19	12:53	07-Mar-19	11:12	20	---	0.014
V [µg/L]	06-Mar-19	12:53	07-Mar-19	11:12	---	---	0.09
Zn [µg/L]	06-Mar-19	12:53	07-Mar-19	11:12	---	5000	248
TDS (calculated) [mg/L]	---	---	---	---	---	500	321
Cation Sum [meq/L]	---	---	---	---	---	---	5.86
Anion Sum [meq/L]	---	---	---	---	---	---	6.17
Anion-Cation Balance [% difference]	---	---	---	---	---	---	-2.5
Ion Ratio	---	---	---	---	---	---	0.95
Langelier's Index [@ 4° C]	---	---	---	---	---	---	0.32
Langelier's Index [@ 20° C]	---	---	---	---	---	---	0.64
Saturation pH [pHs @ 4°C]	---	---	---	---	---	---	7.74
Saturation pH [pHs @20°C]	---	---	---	---	---	---	7.42
Total Coliform [cfu/100mL]	02-Mar-19	12:00	01-Mar-19	16:58	0	---	1
E.Coli [cfu/100mL]	02-Mar-19	12:00	01-Mar-19	16:58	0	---	0

MAC - Maximum Acceptable Concentration

AO/OG - Aesthetic Objective / Operational Guideline

NR - Not regulated / reportable under applicable Provincial drinking water regulations as per client.

Note: Hydrogen Sulphide (H₂S) calculated using lab results for pH, temperature and conductivity.

Turbidity and Phos_TR processed outside of method specified hold time



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Project : 1119 1118 Hall's Glen

LR Report : CA14023-MAR19

*Brad Moore Hon. B.Sc
Project Specialist,
Environment, Health & Safety*