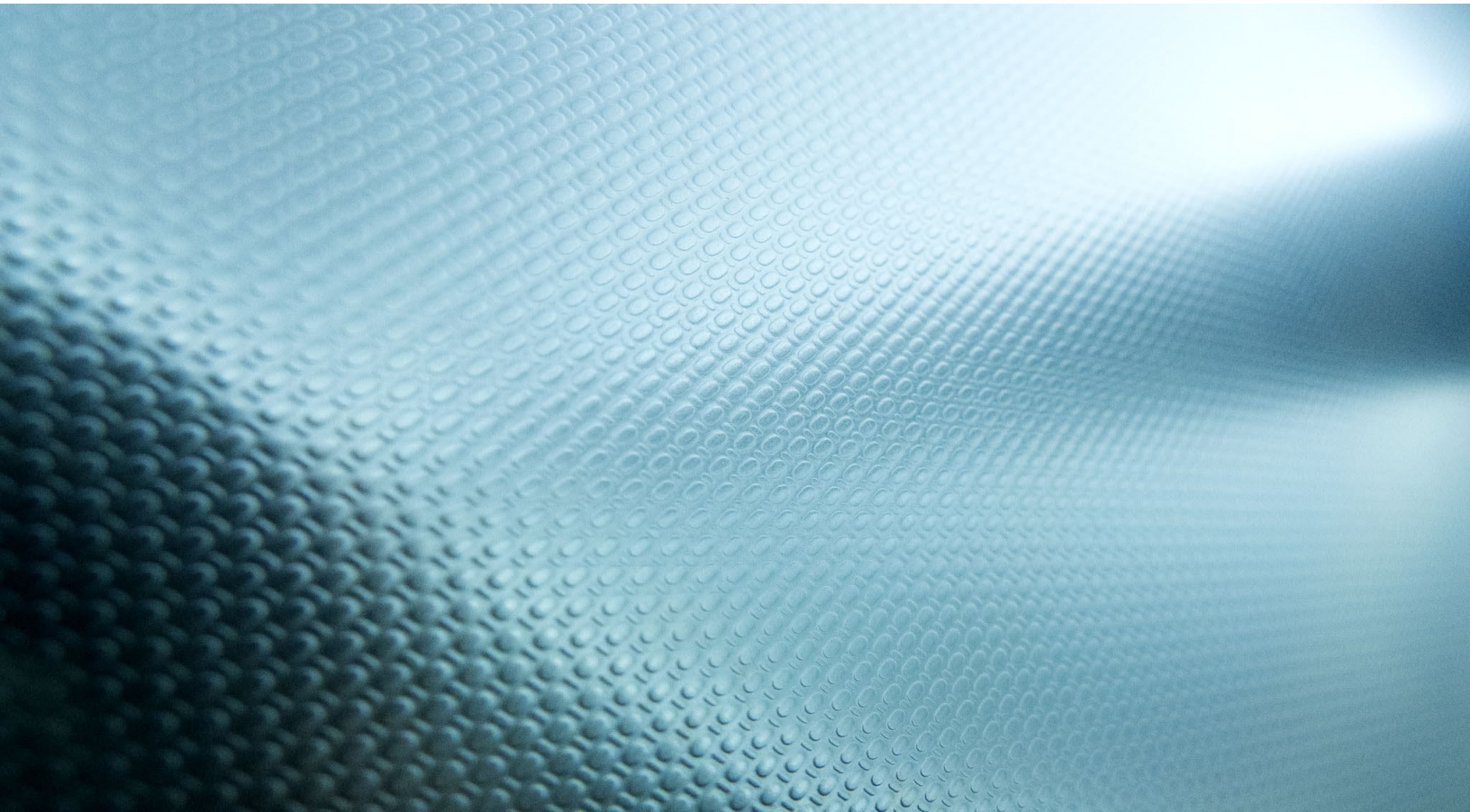
Pumping Test Hydrogeological Assessment Report

Residential Triplex, 14 William Street, Buckhorn, Ontario

Buckhorn Sand & Gravel

08 November 2024

→ The Power of Commitment



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1. Introduction

This report presents the results of a pumping test hydrogeological assessment for the development of a single lot located at 14 William Street in Buckhorn, Ontario (the Site). The location of the Site is depicted on the **Vicinity Plan, Figure 1**. The **Site Plan, Figure 2** provides additional information of the Site and surrounding area. The development consists of a triplex with two 1-bedroom units and one 2-bedroom unit. The Site is located in an area that is privately serviced for well and septic. GHD was retained by Buckhorn Sand and Gravel to conduct this hydrogeological assessment.

2. Scope of Investigation

The purpose of the hydrogeological assessment was to:

– Define prevailing hydrogeologic conditions at the Site including local hydrochemistry, subsurface soil stratigraphy, and groundwater levels;
– Assess the availability of adequate groundwater supplies based on a pumping test;
– Carry out engineering analyses based upon the pumping test and groundwater sampling and provide appropriate recommendations for the Site.

The scope of work for this assessment included the following:

– Conducted a pumping test of a drilled well located on the Site. The test was conducted at a controlled and constant rate for six (6) hours to assess if an adequate source of potable water is available to service the development. Collected measurements of the discharged groundwater from the well. Collected manual water levels from the test well and also utilized a data logger to obtain detailed water level readings from the pumped well and a neighbouring well.
– Water samples were collected during the testing for general chemistry and bacteriological parameters to evaluate the water quality. A sample was collected after one (1) hour and six (6) hours of pumping (i.e. at the end of the testing). The analysis was conducted by SGS Canada Inc., an environmental laboratory accredited for testing of these parameters.
– Reviewed and analyzed the data logger information and prepared this report documenting the pumping test results and work completed.

3. Well Construction

One (1) drilled water well was constructed on the Site for the purpose of aquifer performance testing. The new drilled test well was constructed by Joe Legge & Sons (Ministry of the Environment, Conservation and Parks (MECP) License No. 7052) and completed in August 2024. The MECP well record is presented in **Appendix A**. The well location is shown on the **Plot Plan** within the **Figures** section of this report and is labelled as TW-1.

Test well TW-1 (MECP Well Tag No. A397958) has the following characteristics:

– Drilled to 91.4 m encountering overburden materials consisting of topsoil and then bedrock at 0.3 m;
– Constructed with 6 m of casing and sealed with bentonite slurry, followed by open hole to 91.4 m; and
– Recommended for pumping at 45 litres per minute (L/min) or about 12 US gallons per minute (gpm).

4. Aquifer Performance Testing

A pumping test program was carried out on September 30, 2024 to assess aquifer response and confirm the availability of a suitable groundwater resource. A controlled constant rate pumping test was conducted for six (6) hours with recovery measurements completed after the pumping. A submersible pump was installed in the well to conduct the testing. Water levels were monitored throughout the aquifer performance testing manually and through the use of a data logger. The discharge water was directed away from the pumped well a minimum distance of 30 m downgradient and was allowed to flow overland away from the test well. This practice safeguards against artificial recharge of the well from occurring during the pumping test. Chlorine levels were confirmed in the field prior to conducting bacteriological sampling the groundwater from the test well. The residual chlorine was non-detect prior to obtaining the bacteriological sample.

Field measurements of methane, pH, temperature, free chlorine, turbidity, and conductivity were completed with a Hach Pocket Pro+ Multi 2. Calibration of the instruments was completed prior to the pumping test.

The results of the constant rate pumping test is graphically presented in **Appendix B**. The Constant Rate Drawdown, Recovery and Testing Details curves include flow rate, conductivity, pH, turbidity, temperature, free chlorine and methane gas. Pumping test information is summarized below.

4.1 Test Well TW-1

The water level during the pumping test at TW-1 is illustrated on **Figures B-1** and **B-2** showing water level versus time. The plot shows the water level dropping quickly for the first few minutes at a pumping rate of 17 L/min (4.5 gpm). After six (6) hours of pumping at 17 L/min, the water level was about 26 metres below the top of the casing (mbtoc) with nearly 60 m of available drawdown above the bottom of the well remaining. The plotted data indicates this well can safely provide long-term quantities of groundwater at a pumping rate of 17 L/min.

Drawdown data from the constant rate test was plotted on a drawdown versus time semi-log plot in order to evaluate transmissivity and specific capacity coefficients. The coefficients are summarized in **Table 1**. The estimated transmissivity for TW-1 was 0.23 m^2/day (15.4 gpd/ft) based on the drawdown and 0.37 m^2/day (25.0 gpd/ft) based on the recovery period and represents a relatively low to moderate transmissivity.

4.2 Summary of Aquifer Performance

Table 1 presents a summary of the values obtained from the aquifer performance pump testing and the corresponding calculated coefficients. The drawdown within the pumped test well was observed to be 26 m while pumping 17 L/min for six (6) hours.

Table 1 Aquifer Performance Testing Summary

Well No.	Step No.	Yield		Test Type	Time	Maximum Drawdown		Available Drawdown*		Specific Capacity		Estimated Transmissivity	
		gpm	L/min		minutes	feet	metres	feet	metres	gpm/ft	L/min/m	gpd/ft	m^2/day
TW-1 (A397958)	1	0	0	Static	0	0	0	280	85.2	---	---	---	---
	2	4.5	17.0	Const	360	85	26.0	195	59.3	0.05	0.65	15.4	0.23
	3	0	0	Recvy	95% recovery after ~ 91 minutes							25.0	0.37

Notes:

gpm = US gallons per minute; gpd/ft = US gallons per day per foot

"Recvy" refers to Recovery measurements; "Const" refers to the 6 hr Constant Rate test

*Available Drawdown refers to the height of water in the well above the bottom of the well.

The pumping data reflects a relatively low to moderate transmissivity of the aquifer complexes below the Site. The recovery measurements indicate a relatively rapid recharge with 95% recovery after about 1.5 hours. It is concluded that the well can provide groundwater yields on the order of 17 L/min (4.5 gpm) based on an adequate period of recharge. Over the duration of the 6-hour pumping test, the well yielded about 6,120 litres or 1,620 gallons of water.

5. Test Well Water Quality

Water samples were collected during the course of the pumping test for the purpose of water quality analyses. The discharge water was sampled after one (1) hour into the constant rate test and at the end of the test (i.e. 6 hours). Certificates of chemical analyses are presented in **Appendix C**. The water quality data is summarized and compared with the Ontario Drinking Water Standards (ODWS) in **Table 2**.

Table 2 Test Well Water Quality Summary

PARAMETER	Test Well TW-1		ODWS		
	(1 hour)	(6 hours)	MAC	IMAC	AO/OG
Alkalinity (as $CaCO_3$)	208	193	--	--	30 to 500
Ammonia+Ammonium	<0.04	<0.04	--	--	--
Arsenic	<0.0002	0.0002	--	0.025	--
Barium	0.385	0.328	1	--	--
Boron	0.055	0.119	5	--	--
Calcium	101	102	--	--	--
Chloride	**390**	**350**	--	--	250
Chromium	0.00013	0.00017	0.05	--	--
Colour (T.C.U.)	**10**	**8**	--	--	5
Conductivity (mS/cm)	1560	1420	--	--	--
Copper	0.006	0.005	--	--	1.0
Fluoride	0.49	0.62	1.5	--	--
Hardness (as $CaCO_3$)	**282**	**288**	--	--	80 to 100
Iron	0.018	<0.017	--	--	0.3
Lead	<0.0009	<0.0009	0.01	--	--
Magnesium	7.38	8.18	--	--	--
Manganese	**0.271**	**1.19**	--	--	0.05
Nitrogen-Kjeldahl (N)	<0.05	<0.05	--	--	--
Nitrite (N)	<0.03	<0.03	1.0	--	--
Nitrate (N)	2.50	1.55	10	--	--
Organic Nitrogen	<0.05	<0.05	--	--	0.15
pH (units)	7.97	8.11	--	--	6.5 to 8.5
Phosphorus	<0.03	<0.03	--	--	--
Potassium	4.62	4.01	--	--	--
Selenium	0.00011	0.00011	0.01	--	--

PARAMETER	Test Well TW-1		ODWS		
	(1 hour)	(6 hours)	MAC	IMAC	AO/OG
Sodium	192	158	--	--	(20*) 200
Sulphate	24	23	--	--	500
Total Dissolved Solids	**857**	**826**	--	--	500
Total Organic Carbon	3	2	--	--	5
Total Suspended Solids	6	5	--	--	--
Turbidity (N.T.U.)	2	0.45	--	--	5
Uranium	0.0328	0.0321	0.02	--	--
Zinc	0.009	0.007	--	--	5.0
E. coli	---	0	0	--	--
Total Coliform	---	0	<6	--	--
Fecal Coliform	---	0	0	--	--

Notes:

All units in mg/L (i.e. parts per million) unless otherwise noted. Time indicates when the sample was obtained during the pumping test.

MAC = maximum acceptable concentration (health related); IMAC = Interim MAC (insufficient data to establish MAC or not feasible to establish MAC to desired level); AO/OG = aesthetic objective or operational guideline (not health related)

Bacteriological data is presented in Colony Forming Units per 100 mL (CFU/100 mL). **Highlighted** value exceeds ODWS

*The local Medical Officer of Health should be notified when the sodium concentration exceeds 20 mg/L, so that this information may be passed on to local physicians.

The results indicate exceedances of the aesthetic objective for hardness, colour, total dissolved solids, manganese and chloride. No health-related maximum allowable concentrations were exceeded. Sodium was noted to be elevated and does exceed the threshold value of 20 mg/L where those on a sodium restricted diet should be made aware of the presence of sodium in the water; however, the overall sodium concentration was below the aesthetic objective of 200 mg/L where an objectionable taste may be detected.

Elevated hardness is a common trait of groundwater supplies in Southern Ontario and can be treated using commercially available equipment such as a water softener. The elevated colour and total dissolved solids can be attributed to the elevated manganese which can also be reduced through water softening. Water softening typically uses a sodium media as part of the process and will likely increase the sodium content above the 200 mg/L aesthetic objective. To reduce sodium levels, an under-the-counter reverse osmosis treatment unit can be installed within each unit of the triplex with a dedicated tap for consumption purposes.

The bacteriological parameters of total coliform, fecal coliform and E.Coli were all reported to be zero (0) colony forming units. GHD recommends that bacteriological treatment (i.e. ultraviolet treatment) be installed as a safeguard against potential bacteriological concerns.

6. Conclusions and Recommendations

Based on the results of our investigation, it is our professional opinion that the Site drilled well is suitable for the proposed residential triplex. Based on the pumping test, the well can produce sufficient amount of water provided there is adequate recharge.

In assessing water demand, Section 8 of the Ontario Building Code, was reviewed, specifically section 8.2.1.3. Sewage System Design Flows. This section provides a relatively conservative value of flow requirements for various uses. Table 8.2.1.3.A. indicates flows for Residential Occupancy for Apartments, Condominiums, Other Multi-family Dwellings to be 275 L/day/person. For a triplex with two 1-bedroom units and one 2-bedroom unit, the number of persons was calculated to be seven (7). This equates to a flow of 1,925 litres for the building. Our constant rate pumping test produced over 6,100 litres of water during the six (6) hours. Based upon the calculations, the triplex requires about one-third of the water pumped during the pumping test with a large amount of available drawdown remaining in the well.

The groundwater users may desire commercial water treatment for hardness, manganese and other related parameters to reduce build-up and staining of fixtures, but treatment should be at the discretion of the individual units. If desired, sodium, chloride and other parameters can be reduced with under-the-counter reverse osmosis treatment units with a dedicated tap for consumption purposes. Ultraviolet treatment is recommended for bacteriological parameters.

We trust that this report meets your immediate requirements. Should you have any questions, please contact our office.

Sincerely,

Steven Gagne, H.B.Sc.
Associate, Project Director

Robert Neck, P.Geo. (Limited)
Senior Geoscientist, Project Director

6.1 Scope and Limitations

This report: has been prepared by GHD for Buckhorn Sand & Gravel and may only be used and relied on by Buckhorn Sand & Gravel for the purpose agreed between GHD and Buckhorn Sand & Gravel as set out in section 1 of this report.

GHD otherwise disclaims responsibility to any person other than Buckhorn Sand & Gravel arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

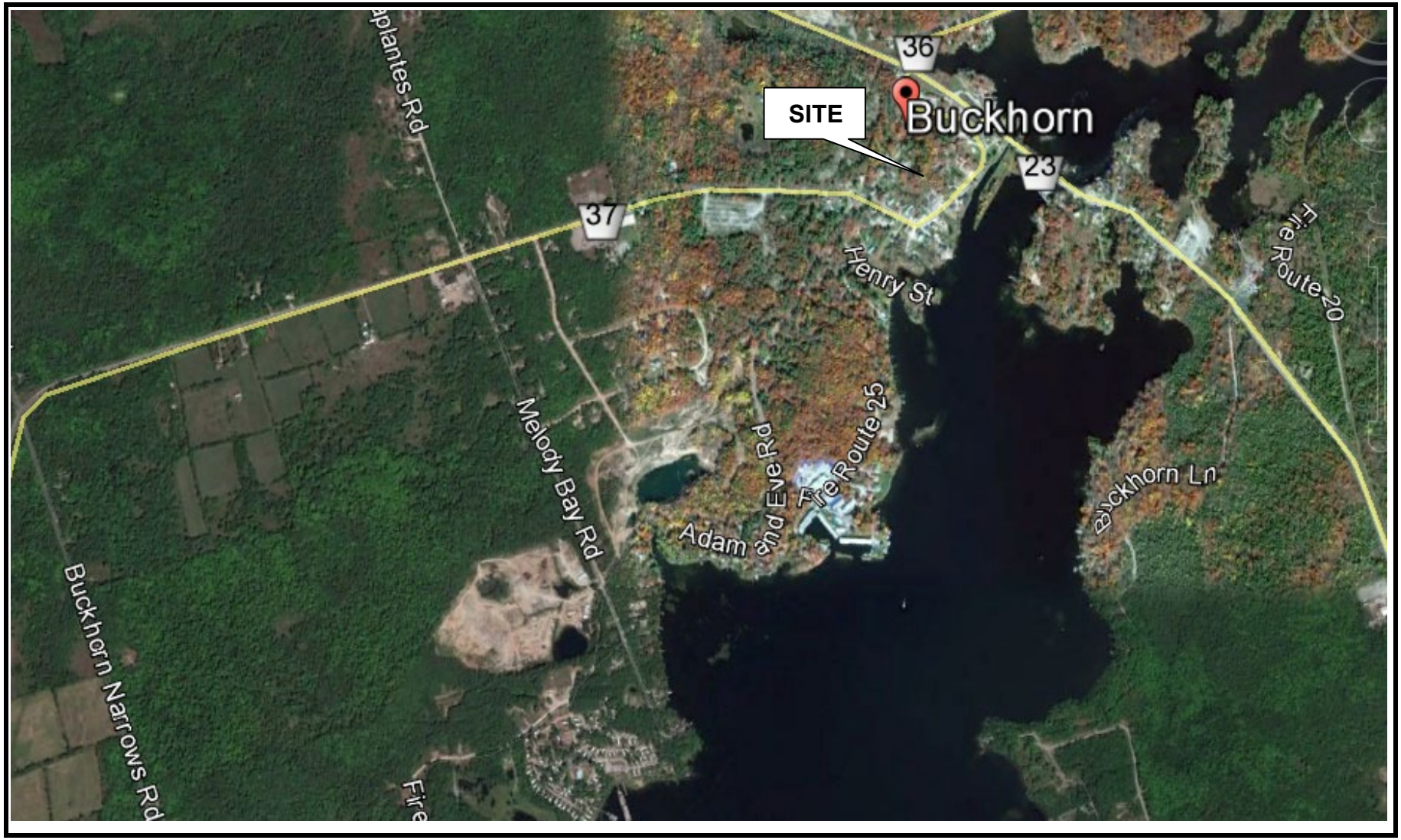
The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

Accessibility of documents

If this report is required to be accessible in any other format, this can be provided by GHD upon request and at an additional cost if necessary.



Source: Base map compiled from Google Earth

Scale:
NTS

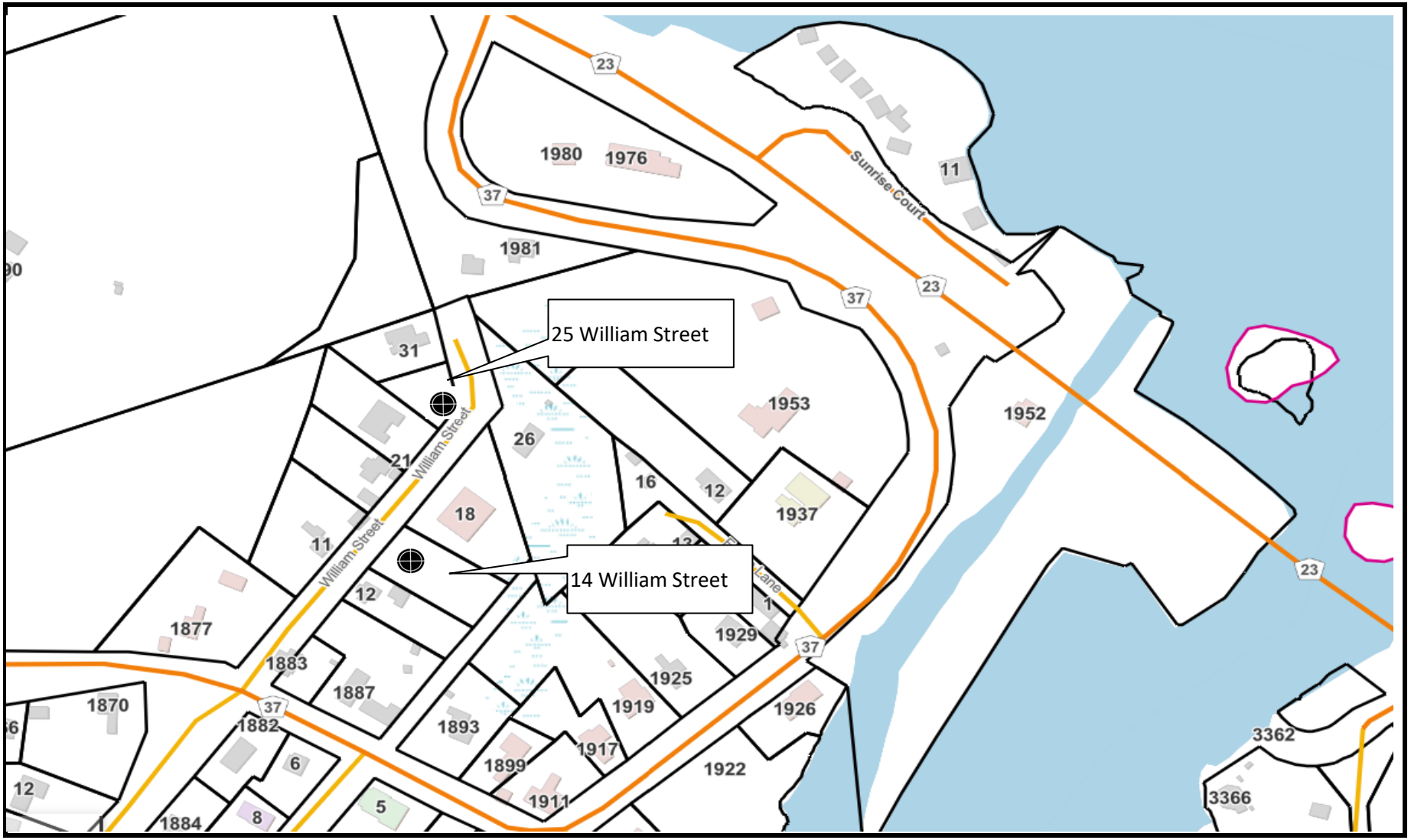
GHD

14 William Street, Buckhorn, Ontario
Buckhorn, Ontario

12614051-02
November 2024

Vicinity Plan

Figure 1



Source: Base map compiled from County of Peterborough, GIS, Let Me Map 2.0

Scale:
NTS

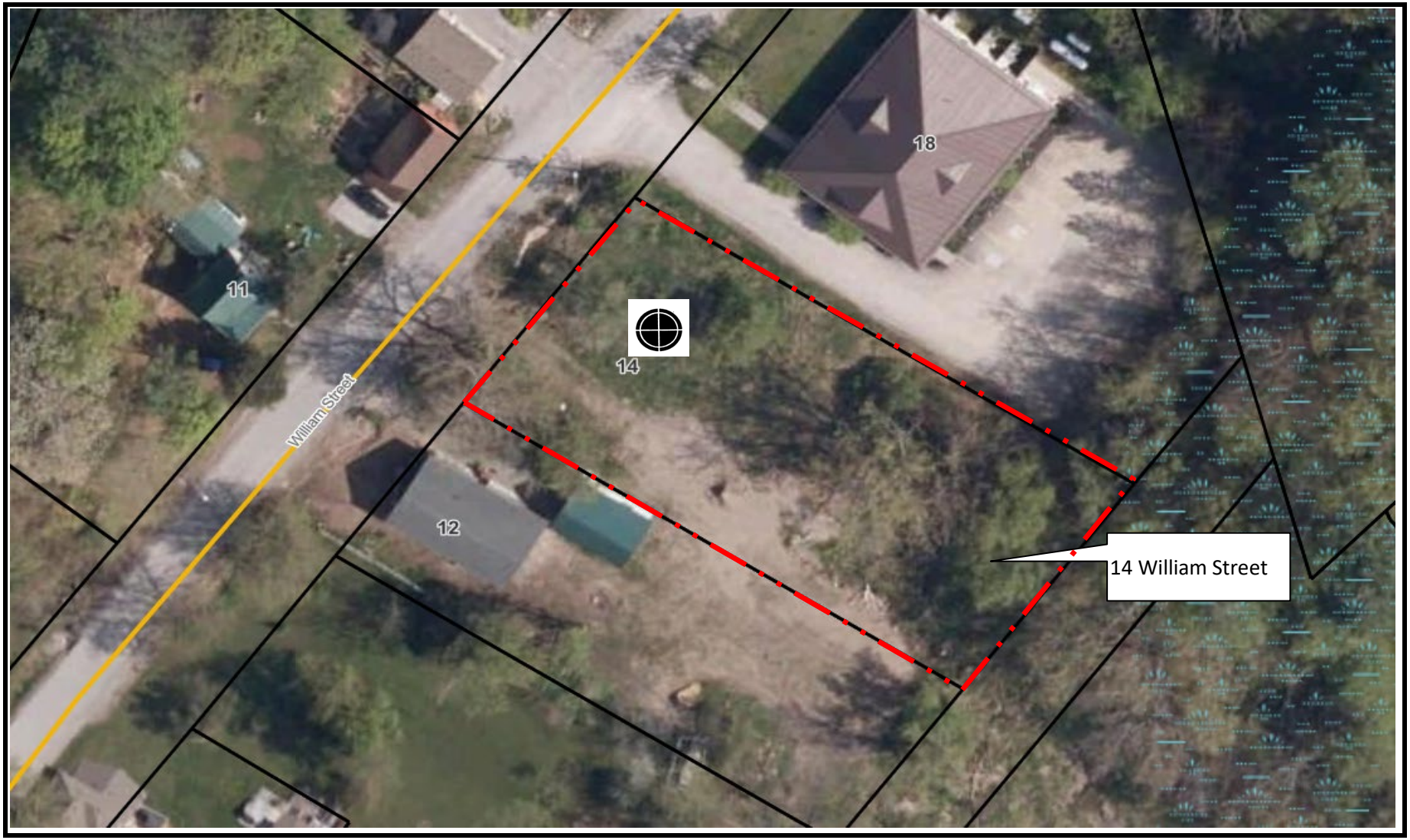
Drilled Well

GHD

14 William Street
Buckhorn, Ontario

Site Plan

12614051
November 2024



Source: Base map compiled from County of Peterborough, GIS, Let Me Map 2.0

Scale:
NTS

Drilled Well

GHD

14 William Street
Buckhorn, Ontario

Plot Plan

12614051
November 2024

Appendices

Appendix A

Ministry of Environment, Conservation and Parks Well Records

Ontario — Ministry of the Environment, Conservation and Parks

Well Record

Regulation 903, Ontario Water Resources Act

Well Tag No. (Place Sticker and/or Print Below): Tag#: A397958

Page ___ of ___

Measurements recorded in: ☐ Metric ● Imperial

Well Owner's Information

First Name: Granite Ridge — Last Name/Organization: Builders — E-mail Address: — ☐ Well Constructed by Well Owner

Mailing Address (Street Number/Name): Box 100 — Municipality: Buckhorn — Province: ONT — Postal Code: K0L1J0 — Telephone No. (inc. area code): 7057943111

Well Location

Address of Well Location (Street Number/Name): 14 William Street — Township: Harvey — Lot: — Concession: —

County/District/Municipality: Peterborough — City/Town/Village: Buckhorn — Province: Ontario — Postal Code: —

UTM Coordinates: Zone: — Easting: — Northing: — Municipal Plan and Subject Number: — Other: —

NAD 8 3 | 1 7 | 0 4 2 | 4 9 3 6 9 1 1

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	To
brown	Topsoil		Packed	0	1
Red	broken granite	Topsoil	Packed	1	5
Red	Granite	grey Granite	Overage	5	300

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	20	Bentonite Slurry	6 ft³

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
6¼"	Steel	.188	+2	20
6"	Open hole		20	300

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

Water Details

Water found at Depth (m/ft)	Kind of Water	Gas	Other, specify
4K (m/ft)	☐ Fresh ☐ Untested	☐	☐
Water found at Depth (m/ft)	Kind of Water: ☐ Fresh ☐ Untested	☐ Gas	☐ Other, specify
Water found at Depth (m/ft)	Kind of Water: ☐ Fresh ☐ Untested	☐ Gas	☐ Other, specify

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	20	9"
20	300	6"

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): 283.0

Pumping rate (l/min / GPM): 20

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 283.0

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

Recommended pump depth (m/ft): 300

Recommended pump rate (l/min/GPM): 10

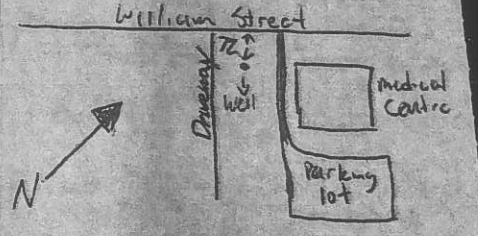
Well production (l/min/GPM): 4

Disinfected? ☑ Yes ☐ No

Time (min)	Draw Down Water Level (m/ft)	Time (min)	Recovery Water Level (m/ft)
Static Level	19.7		283.
1		1	
2		2	
3		3	
4		4	
5	↓	5	261.7
10	107.6	10	
15		15	
20		20	
25	↓	25	↓
30	219.6	30	190.4
40	↓	40	↓
50	↓	50	↓
60	283	60	86.4

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Hydro Fracked

Well Contractor and Well Technician Information

Business Name of Well Contractor: Joe Legge & Sons — Well Contractor's Licence No.: 7052

Business Address (Street Number/Name): RR#3 — Municipality: Bancroft

Province: ONT — Postal Code: K0L1C0 — Business E-mail Address:

Bus. Telephone No. (inc. area code): 6133492544 — Name of Well Technician (Last Name, First Name): Legge Joe

Well Technician's Licence No.: 1879 — Signature of Technician and/or Contractor: Legge — Date Submitted:

Well owner's information package delivered: ☐ Yes ● No

Date Package Delivered:

Date Work Completed: 2024 08 10

Ministry Use Only

Audit No.: Z424281

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Ministry's Copy

Ontario — Ministry of the Environment and Climate Change

Measurements recorded in: ☐ Metric ☐ Imperial

Well Tag No. *(Place Sticker and/or Print Below)*: A 232 429

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
GRAINITE	RIDGE BUILDERS		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
BOX 100	BUCKHORN	ONT	K0L 1J0	7056579311

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
25 21 WILLIAMS STREET	HARVEY	9	9

County/District/Municipality	City/Town/Village	Province	Postal Code
PETERBOROUGH	BUCKHORN	Ontario	K0L 1J0

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	710417	4936998		

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	SAND	GRAVEL	PACKED	0	4
RED	GRANITE	BLACK GRANITE	BEDROCK	4	340

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	20	QUICK GROUT	6 FT³

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
6¼	STEEL	.188	0	22
6	OPEN HOLE		22	340

Construction Record - Screen

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

Status of Well

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

Water Details

Water found at Depth (m/ft)	Kind of Water	Hole Diameter Depth From (m/ft)	Depth To (m/ft)	Diameter (cm/in)
UK. ☐ Gas ☐ Other, specify	☐ Fresh ☑ Untested	0	20	10"
☐ Gas ☐ Other, specify	☐ Fresh ☐ Untested	20	340	6"
☐ Gas ☐ Other, specify	☐ Fresh ☐ Untested			

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
JOE LEGGE & SONS	7052

Business Address (Street Number/Name)	Municipality	Province	Postal Code	Business E-mail Address
RR#3	BANCROFT	ONT	K0L 1C0	

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)	Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
6133392025		1879	J Legge	

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): 166

Pumping rate (l/min / GPM): 15

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 166

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

Recommended pump depth (m/ft): 240

Recommended pump rate (l/min / GPM): 10

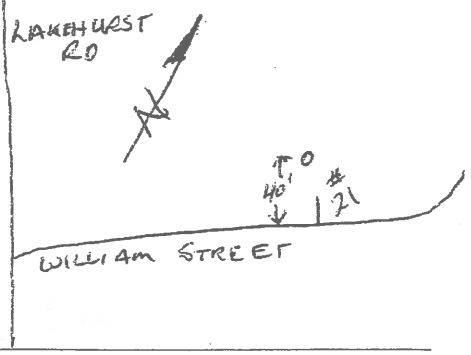
Well production (l/min / GPM): 6.

Disinfected? ☑ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	12.4		166
1	26.9	1	160.7
2	36.3	2	155.6
3	45.7	3	150.6
4	54.3	4	145.6
5	62.6	5	140.5
10	97.3	10	125.4
15	123.6	15	107.7
20	140.1	20	90.9
25	161.1	25	76.3
30	166.0	30	63.3
40	11	40	48.1
50	11	50	33.6
60	166	60	25.7

Map of Well Location

Please provide a map below following instructions on the back.



Comments: HYDRO FRAC REQUIRED

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☐ Yes ☑ No		2017/09/18

Ministry Use Only

Audit No. Z266583

Received NOV 02 2017

Ministry's Copy

Ontario — Ministry of the Environment and Climate Change

Measurements recorded in: ☐ Metric ☒ Imperial

Well Tag No. *(Place Sticker and/or Print Below)*: Tag#: A 232460

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
GRANITE RIDGE	BUILDERS		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
BOX 100	BUCKHORN	ONT	K0L1C0	7056579311

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
21 WILLIAMS STREET	HARVEY		

County/District/Municipality	City/Town/Village	Province	Postal Code
PETERBOROUGH	BUCK HORN	Ontario	K0L1J0

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	710480	4937039		

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
BLACK	MUCK, STONES	WOOD	FILL (WET	0	4
BROWN	SAND	GRAVEL	LOOSE, WET	4	18
RED	GRANITE	BLACK GRANITE	BEDROCK	18	200

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	20	BENTONITE SLURRY	6 FT³

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
6 1/4	STEEL	.188	+2	25
6	OPEN HOLE		25	200

Construction Record - Screen

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

Status of Well

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

Water Details

Water found at Depth	Kind of Water	Hole Diameter Depth From	To	Diameter (cm/in)
186 (m/ft) ☐ Gas	☐ Fresh ☒ Untested ☐ Other, specify	0	23	9"
(m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify	23	200	6"
(m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify			

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): 191

Pumping rate (l/min / GPM): 15

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 191

If flowing give rate (l/min / GPM): ____

Recommended pump depth (m/ft): 190

Recommended pump rate (l/min / GPM): 10

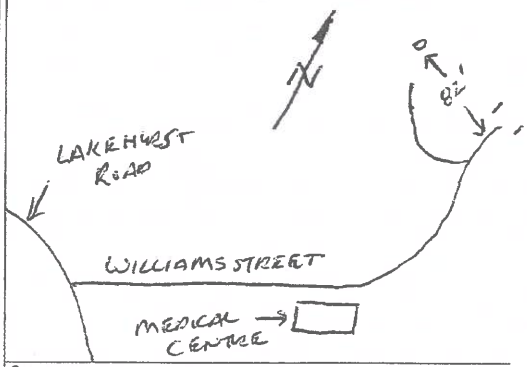
Well production (l/min / GPM): 2

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
Static Level	0		191
1	10.1	1	187.2
2	20.2	2	180.1
3	30.5	3	177.5
4	41.6	4	175.6
5	49.9	5	173.9
10	87.6	10	165.1
15	121.2	15	157.2
20	152.2	20	149.5
25	180.7	25	141.9
30	191	30	136.1
40	"	40	120.9
50	"	50	105.7
60	191	60	90.5

Map of Well Location

Please provide a map below following instructions on the back.



Comments: ____

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
JOE LEGGE & SONS	7052

Business Address (Street Number/Name)	Municipality
RR#3	BANCROFT

Province	Postal Code	Business E-mail Address
ONT	K0L1C0	

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
6133392025	LEGGE JOE

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
1979	J Legge	

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☐ Yes ☒ No		2017/11/20

Ministry Use Only

Audit No. Z266606

Received: DEC 29 2017

0506E (2014/11) Ministry's Copy

Ontario — Ministry of the Environment and Climate Change

Measurements recorded in: ☐ Metric ☒ Imperial

Well Tag No. *(Place Sticker and/or Print Below)* Tag#: A172724

Well Record

Regulation 903 Ontario Water Resources Act

Page _____ of _____

31

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
GRANITE RIDGE	BUILDERS		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. *(inc. area code)*
BOX 100 BUCKHORN	BUCKHORN	ONT	K0L1J0	7956579311

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
21 WILLIAM STREET	HARVEY	9	9

County/District/Municipality	City/Town/Village	Province	Postal Code
PETERBOROUGH	BUCKHORN	Ontario	K0L1J0

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	710436	4993993		

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	SAND	GRAVEL	PACKED	0	4
RED	GRANITE	BLACK GRANITE	BEDROCK	4	340

Annular Space

Depth Set at (m/ft) From	Depth Set at (m/ft) To	Type of Sealant Used (Material and Type)	Volume Placed (m^3/ft^3)
0	20	QUICK GROUT	6 ft^3

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
6 1/4"	STEEL	.188	0	22
6"	OPEN HOLE		22	340

Construction Record - Screen

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

Status of Well

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

Water Details

Water found at Depth (m/ft)	Kind of Water	Hole Diameter Depth From (m/ft)	Hole Diameter Depth To (m/ft)	Hole Diameter (cm/in)
4ft (m/ft) ☐ Gas ☐ Other, *specify* _____	☐ Fresh ☒ Untested	0	20	9"
(m/ft) ☐ Gas ☐ Other, *specify* _____	☐ Fresh ☐ Untested	20	340	6"
(m/ft) ☐ Gas ☐ Other, *specify* _____	☐ Fresh ☐ Untested			

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): 40

Pumping rate (l/min / GPM):

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 40

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

Recommended pump depth (m/ft): 140

Recommended pump rate (l/min / GPM): 16

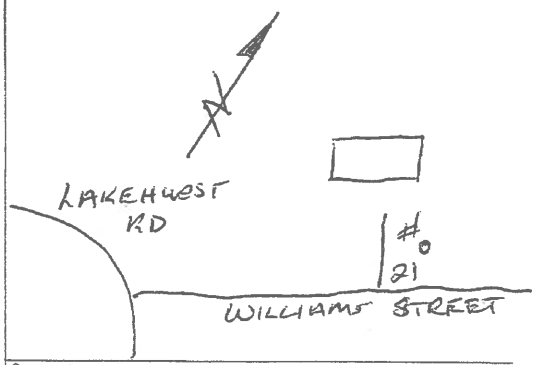
Well production (l/min / GPM): 6

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	12.5		40.0
1	16.7	1	35.1
2	20.2	2	31.4
3	23.6	3	28.4
4	26.1	4	26.6
5	28.7	5	24.9
10	33.4	10	20.2
15	37.2	15	18.5
20	40.0	20	16.9
25	"	25	15.7
30	"	30	14.9
40	"	40	13.8
50	"	50	13.2
60	40.0	60	12.9

Map of Well Location

Please provide a map below following instructions on the back.



Comments: HYDROFRAC REQUIRED

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
JOE LEGGE & SONS	7052

Business Address (Street Number/Name)	Municipality
RR#3	BANCROFT

Province	Postal Code	Business E-mail Address
ONT	K0L1C0	

Bus. Telephone No. *(inc. area code)*	Name of Well Technician (Last Name, First Name)
6133392025	LEGGE JOE

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
1879	J Legge	

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☒ Yes ☐ No	2017/04/22	2017/04/22

Ministry Use Only

Audit No. Z225166

JUN 01 2017

Received

0506E (2014/11)

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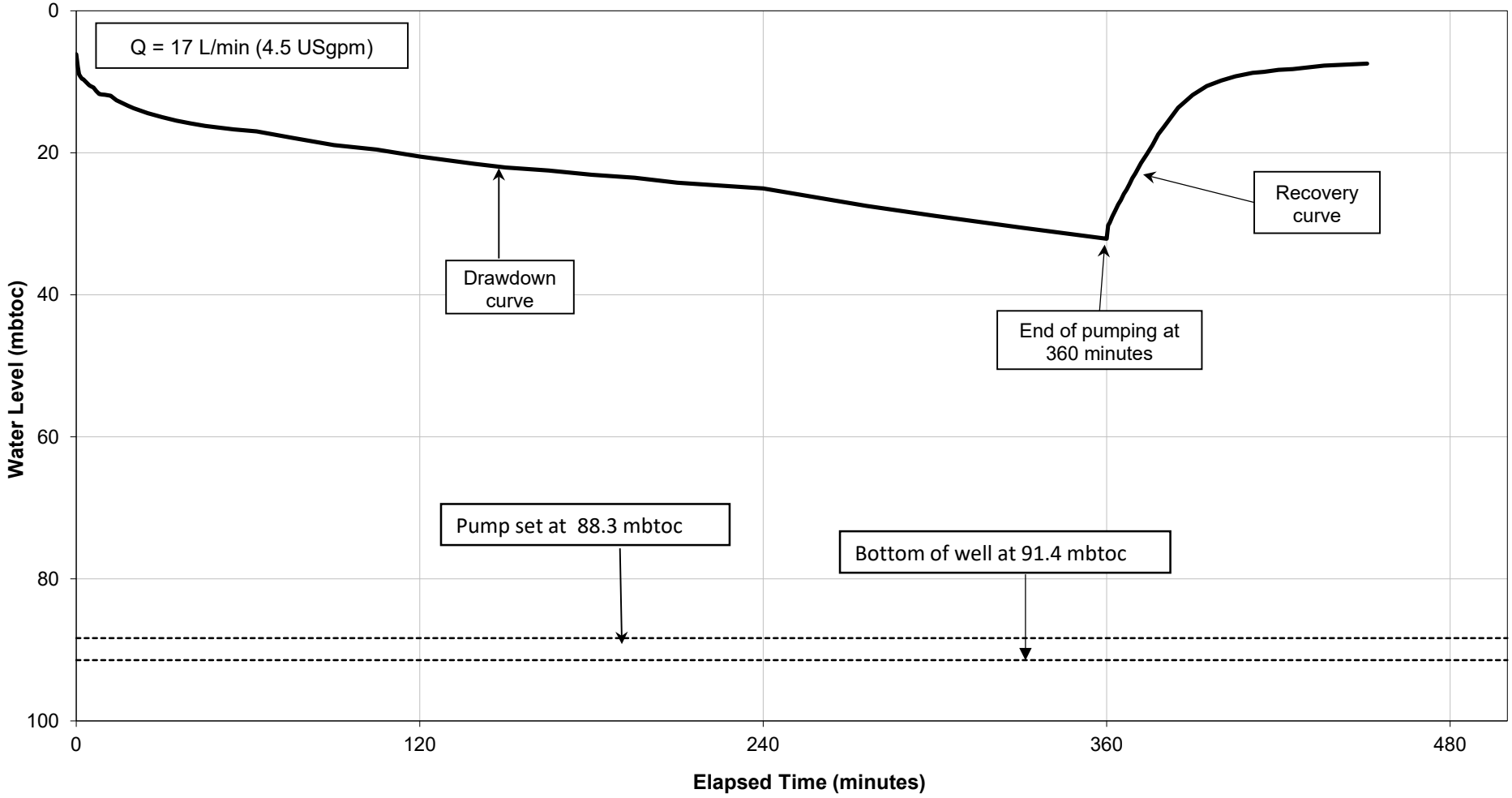
Appendix B

Aquifer Performance Testing Curves

PUMP HISTORY CURVE
A397958: September 30, 2024



PUMP HISTORY CURVE

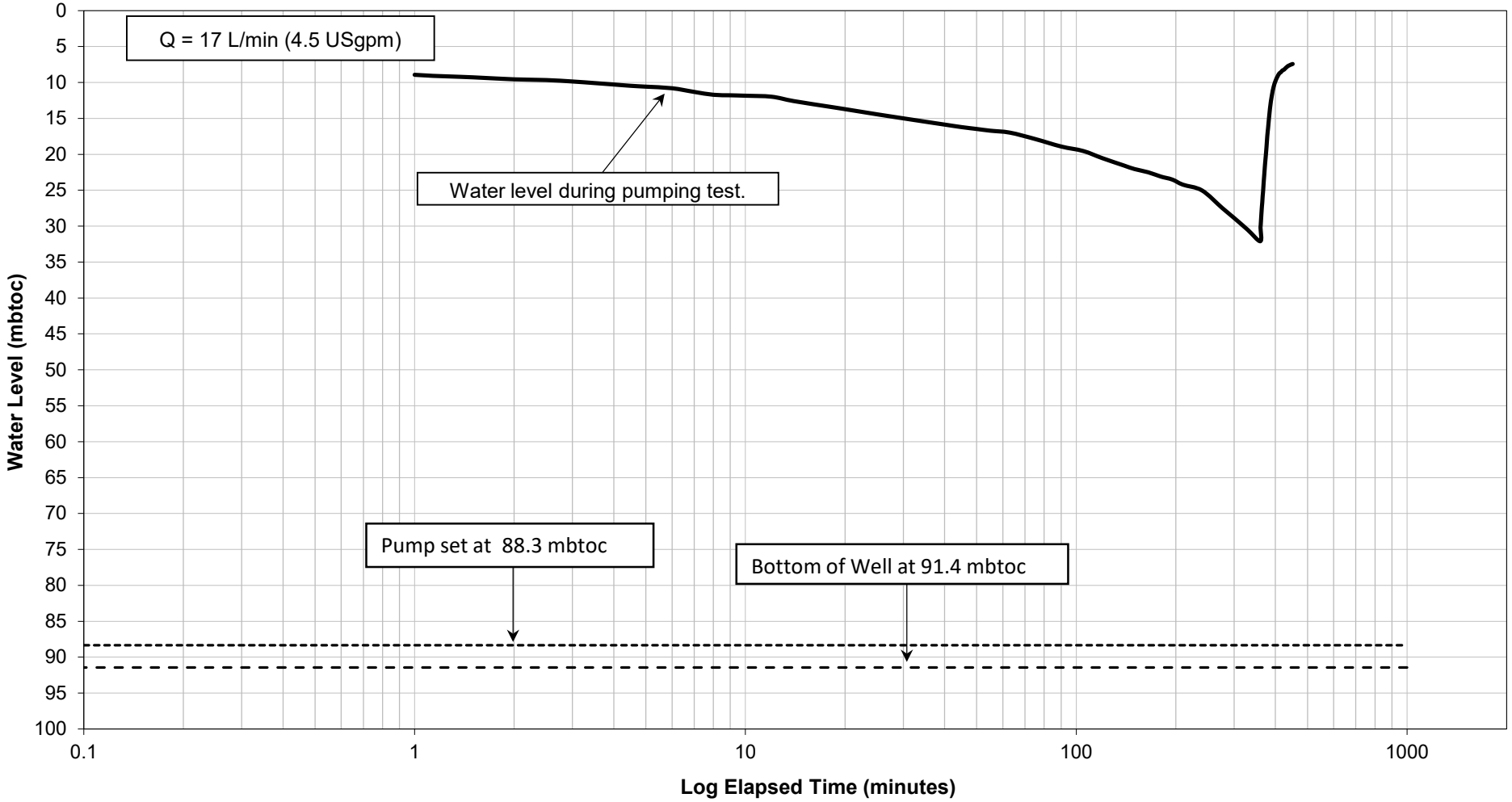
Drilled Well
MECP Well ID: A397958
Static Level = 6.13 mbtoc (5.63 mbgs)

Note: m = metres; mbtoc = metres below top of casing; mbgs = metres below ground surface; Stick up = 0.50 m

DATE: SEPTEMBER 2024
LOCATION: 14 William St. Buckhorn, Ontario
JOB NUMBER: 12614051
DRAWING NUMBER: B-1

GHD
347 PIDO ROAD, UNIT 29
PETERBOROUGH, ON K9J 6X7
www.ghd.com

CONSTANT RATE TEST: WATER LEVEL vs. LOG ELAPSED TIME
A397958: September 30, 2024



CONSTANT RATE

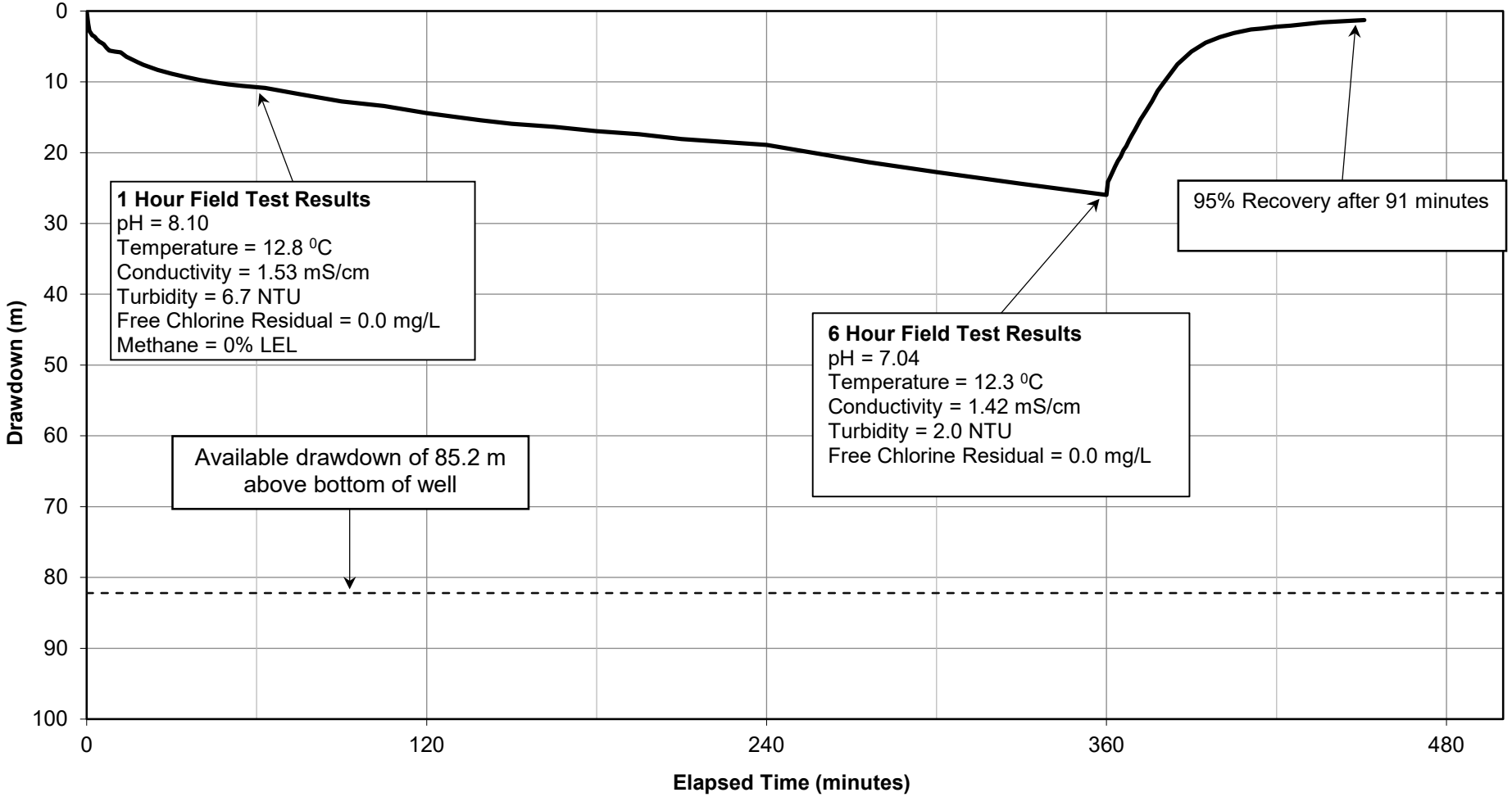
Drilled Well
MECP Well ID: A397958
Static Level = 6.13 mbtoc (5.63 mbgs)

Note: m = metres; mbtoc = metres below top of casing; mbgs = metres below ground surface; Stick up = 0.50 m

DATE: SEPTEMBER 2024
LOCATION: 14 William St. Buckhorn, Ontario
JOB NUMBER: 12614051
DRAWING NUMBER: B-2

GHD
347 PIDO ROAD, UNIT 29
PETERBOROUGH, ON K9J 6X7
www.ghd.com

CONSTANT RATE DRAWDOWN, RECOVERY AND TESTING DETAILS
A397958: September 30, 2024



CONSTANT RATE DRAWDOWN

Drilled Well
MECP Well ID: A397958
Static Level = 6.13 mbtoc (5.63 mbgs)

Note: m = metres; mbtoc = metres below top of casing; mbgs = metres below ground surface; Stick up = 0.50 m

DATE: SEPTEMBER 2024

LOCATION: 14 William St. Buckhorn, Ontario

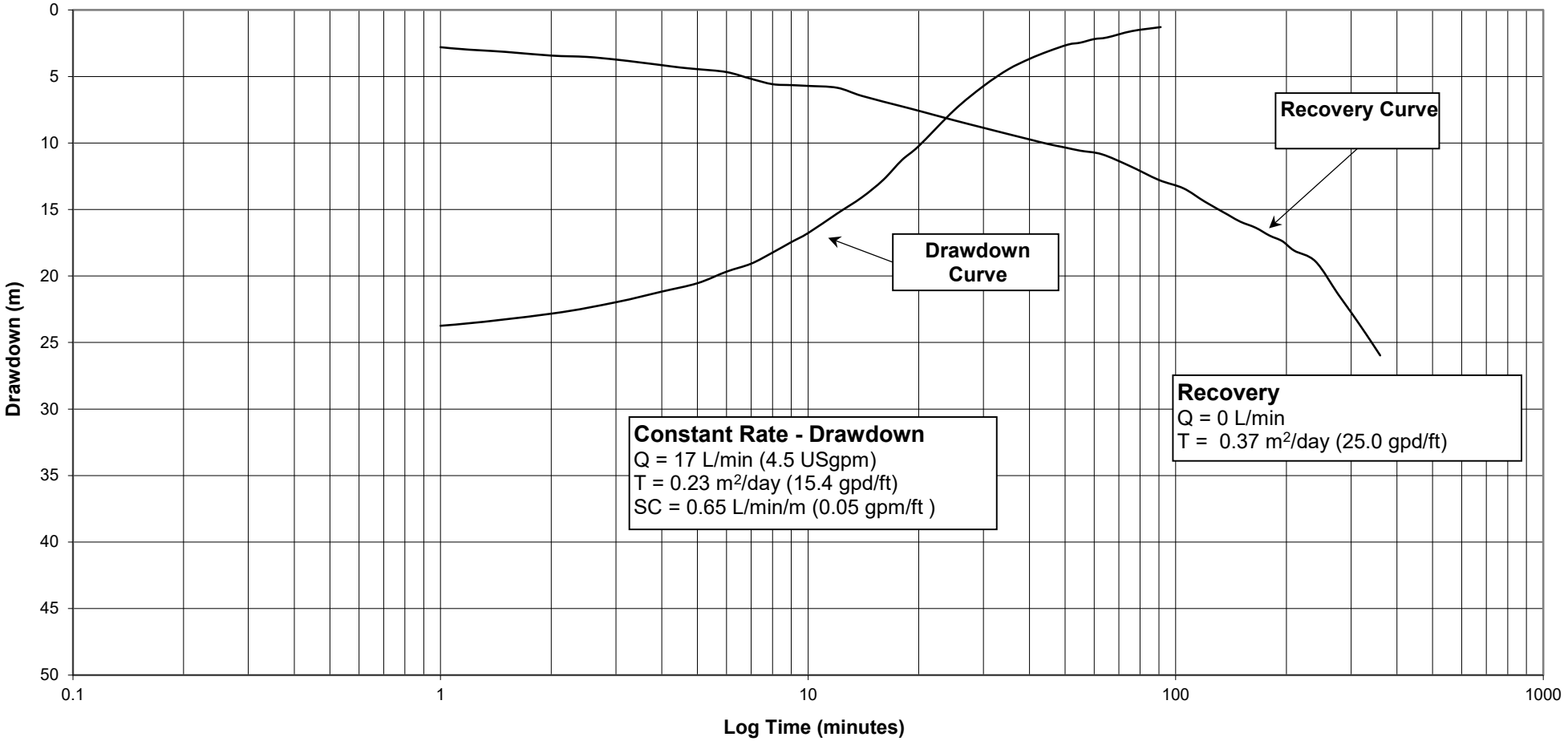
JOB NUMBER: 12614051

DRAWING NUMBER: B-3

GHD

347 PIDO ROAD, UNIT 29
PETERBOROUGH, ON K9J 6X7
www.ghd.com

CONSTANT RATE: DRAWDOWN and RECOVERY VS LOG TIME
A397958: September 30, 2024



TRANSMISSIVITY

Drilled Well
MECP Well ID: A397958
Static Level = 6.13 mbtoc (5.63 mbgs)

Note: m = metres; mbtoc = metres below top of casing; mbgs = metres below ground surface; Stick up = 0.50 m

DATE: SEPTEMBER 2024

LOCATION: 14 William St. Buckhorn, Ontario

JOB NUMBER: 12614051

DRAWING NUMBER: B-4

GHD

347 PIDO ROAD, UNIT 29
PETERBOROUGH, ON K9J 6X7

www.ghd.com

Appendix C

Certificates of Chemical Analysis

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

Project : 126140514-02, Buckhorn

07-October-2024

GHD Limited - 735
Attn : Gus Bolin

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

Phone: 705-749-3317
Fax:

Date Rec. : 30 September 2024
LR Report: **CA15809-SEP24**
Reference: SSOW, 126140514-02, Gus Bolin

Copy: 1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	3: Analysis Completed Date	5: RL	8: 14 William - 1 Hour	9: 14 William - 6 Hours
Sample Date & Time				30-Sep-24 10:00	30-Sep-24 15:00
Temp Upon Receipt [°C]	***	***	***	***	***
UV Transmittance [%T]	02-Oct-24	02-Oct-24	---	86.5	88.6
Alkalinity [mg/L as CaCO3]	02-Oct-24	03-Oct-24	2	208	193
Colour [TCU]	01-Oct-24	01-Oct-24	3	10	8
Conductivity [uS/cm]	02-Oct-24	03-Oct-24	2	1560	1420
pH [No unit]	02-Oct-24	03-Oct-24	0.05	7.97	8.11
TSS [mg/L]	01-Oct-24	02-Oct-24	2	6	5
TDS [mg/L]	01-Oct-24	02-Oct-24	30	857	826
Turbidity [NTU]	01-Oct-24	02-Oct-24	0.1	2.0	0.45
Organic N [mg/L]	01-Oct-24	07-Oct-24	0.05	< 0.05	< 0.05
TKN [as N mg/L]	01-Oct-24	07-Oct-24	0.05	< 0.05	< 0.05
NH3+NH4 [as N mg/L]	01-Oct-24	02-Oct-24	0.04	< 0.04	< 0.04
TOC [mg/L]	01-Oct-24	02-Oct-24	1	3	2
DOC [mg/L]	01-Oct-24	02-Oct-24	1	3	3
Cl [mg/L]	01-Oct-24	02-Oct-24	0.20	390	350
F [mg/L]	01-Oct-24	02-Oct-24	0.06	0.49	0.62
NO2 [as N mg/L]	01-Oct-24	02-Oct-24	0.030	< 0.03	< 0.03
NO3 [as N mg/L]	01-Oct-24	02-Oct-24	0.06	2.50	1.55
SO4 [mg/L]	01-Oct-24	02-Oct-24	0.20	24	23
Total P [mg/L]	01-Oct-24	02-Oct-24	0.03	< 0.03	< 0.03
Tot.Reactive P [mg/L]	01-Oct-24	03-Oct-24	0.03	< 0.03	< 0.03
Hg (diss) [mg/L]	02-Oct-24	02-Oct-24	0.00001	< 0.00001	0.00002
Hardness (dissolved) [mg/L as CaCO3]	02-Oct-24	03-Oct-24	0.05	282	288
Al (diss) [mg/L]	02-Oct-24	03-Oct-24	0.001	0.004	0.003
Sb (diss) [mg/L]	02-Oct-24	03-Oct-24	0.0009	< 0.0009	< 0.0009
As (diss) [mg/L]	02-Oct-24	03-Oct-24	0.0002	< 0.0002	0.0002
Ba (diss) [mg/L]	02-Oct-24	03-Oct-24	8e-05	0.385	0.328
B (diss) [mg/L]	02-Oct-24	03-Oct-24	0.002	0.055	0.119

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

Project : 126140514-02, Buckhorn

LR Report : **CA15809-SEP24**

Analysis	1: Analysis Start Date	3: Analysis Completed Date	5: RL	8: 14 William - 1 Hour	9: 14 William - 6 Hours
Cd (diss) [mg/L]	02-Oct-24	03-Oct-24	3e-06	0.000095	0.000099
Ca (diss) [mg/L]	02-Oct-24	03-Oct-24	0.01	101	102
Cr (diss) [mg/L]	02-Oct-24	03-Oct-24	8e-05	0.00013	0.00017
Cu (diss) [mg/L]	02-Oct-24	03-Oct-24	0.0002	0.006	0.005
Fe (diss) [mg/L]	02-Oct-24	03-Oct-24	0.007	0.018	< 0.007
Pb (diss) [mg/L]	02-Oct-24	03-Oct-24	9e-05	< 0.00009	< 0.00009
Mg (diss) [mg/L]	02-Oct-24	03-Oct-24	0.001	7.38	8.18
Mn (diss) [mg/L]	02-Oct-24	03-Oct-24	1e-05	0.271	1.19
K (diss) [mg/L]	02-Oct-24	03-Oct-24	0.009	4.62	4.01
Na (diss) [mg/L]	02-Oct-24	03-Oct-24	0.01	192	158
Se (diss) [mg/L]	02-Oct-24	03-Oct-24	4e-05	0.00011	0.00011
U (diss) [mg/L]	02-Oct-24	03-Oct-24	2e-06	0.0328	0.0321
Zn (diss) [mg/L]	02-Oct-24	03-Oct-24	0.002	0.009	0.007
Cation Sum [meq/L]	---	---	---	14.15	12.83
Anion Sum [meq/L]	---	---	---	15.60	14.29
Anion-Cation Balance [% difference]	---	---	---	-4.88	-5.41
Ion Ratio	---	---	---	0.91	0.90
TDS (calculated) [mg/L]	---	---	---	843	764
Conductivity (calc) [uS/cm]	---	---	---	1487	1356
Langelier's Index [@ 4° C]	---	---	---	0.29	0.41
Saturation pH [pHs @ 4°C]	---	---	---	7.68	7.70
Fecal Coliform [cfu/100mL]	01-Oct-24	03-Oct-24		---	0
E.coli [cfu/100mL]	01-Oct-24	03-Oct-24		---	0
Total Coliform [cfu/100mL]	01-Oct-24	03-Oct-24		---	0

MAC - Maximum Acceptable Concentration
AO/OG - Aesthetic Objective / Operational Guideline
NR - Not reportable under applicable Provincial drinking water regulations as per client.

Total phospuorous includes all Ortho-phosphates as well as Organics and hydrolyzable Phosphorous.

Temperature of Sample upon Receipt: 17 degrees C
Cooling Agent Present: No
Custody Seal Present: No

Chain of Custody Number: N/A

Jill Campbell

Jill Campbell, B.Sc.,GISAS
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0003882947