Kollaard Associates
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Civil • Geotechnical •
Structural • Environmental •
Hydrogeology •

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REPORT ON

HYDROGEOLOGICAL INVESTIGATION
9460 MITCH OWENS ROAD,
5606, 5630 & 5592 BOUNDARY ROAD
CITY OF OTTAWA
ONTARIO

Submitted to:

Touchstone Contracting & Engineering Ltd.
PO Box 115
Manotick, Ontario K4M 1B3

DATE May 7, 2019

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May 7, 2019

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Touchstone Contracting & Engineering Ltd.
PO Box 115
Manotick, Ontario K4M 1B3

Attention: Mr. David Kurosky

RE: ADDITIONAL HYDROGEOLOGICAL INVESTIGATION
PROPOSED LIGHT INDUSTRIAL WAREHOUSE
9460 MITCH OWENS ROAD, 5606, 5630, 5592 BOUNDARY ROAD
CITY OF OTTAWA, ONTARIO

Dear Sir:

This letter presents the results of additional evaluation of the water quality and quantity for the well that will supply water for the above noted proposed light industrial development at 9460 Mitch Owens Road in the City of Ottawa, Ontario (see Key Plan, Figure 1). The additional hydrogeological investigation consisted of updating water quality and quantity information that was originally prepared in November 2010 by Houle Chevrier Engineering Ltd. entitled "*Well Evaluation Report, Mitch Owens and Boundary Road, Ottawa, Ontario*". The original report was updated in a letter dated December 21, 2018 by GEMTEC Consulting Engineers and Scientists Ltd. The City of Ottawa provided review comments on April 4, 2019.

It is understood that the proposed light industrial development is to consist of a warehouse and office building.

A Ministry of the Environment Well Record for the subject well (TW1), provided by the well driller, is provided as Attachment A. The well that was tested for this update is the same well that was subject of the previous 2010 report and subsequent update by GEMTEC in December 2018. The well location is as shown on the well record map (central to west portion of the site).

A previous six hour pumping test was carried out at the well, TW1, in 2010. The results indicated that a pumping rate of 14 litres per minute was sustained for 6 hours and was monitored until about 90 percent recovery had occurred. Water samples were tested for the subdivision list of parameters. The soils were also investigated with regards to terrain analysis and sewage construction requirements.

The scope of field work that was carried out for this updated hydrogeological investigation consisted of the following:

- shock chlorination of the well and subsequent flushing;
- a 6.5 hour duration pumping test with recovery monitoring was carried out;
- one water sample was obtained and tested for MOE subdivision list of parameters.

The updated information is provided below and additional discussion with regards to water treatment is provided to address the City of Ottawa review comments.

Groundwater Supply Evaluation

Water Demand

The water demand is calculated using the information from the sewage system design. The sewage design flows were provided by the client indicating a daily sewage design flow of 5609 litres per day. The water use at the site is based on an office space, and a transport transfer faciltiy consisting of numerous loading bays where goods will be unloaded and redistributed. Staff consists of dock workers, truck drivers and office staff. There will be showers and washrooms to service the staff. The water use at the site is only for domestic uses (sinks, showers, toilets). There is no industrial use of water proposed for the site. The sewage system design flow represents a maximum use or peak day.

The peak water demand was calculated based on a typical eight hour operation schedule as follows:

Peak hourly water demand = 5609 litres / 1 day x 1 day / 8 hours
= 701.1 litres / hour
= 11.7 litres/min

Water Quantity

The well was pumped for a total of 390 minutes (6.5 hours) at a pumping rate of about 14.2 litres per minute in order to obtain approximately 5540 litres of water, which is approximately equal to the sewage system daily design flow. Over the course of the pumping test, the water level in the well dropped some 5.55 metres. At the end of the pumping test, about 12 hours were required for 95 percent recovery of the total drawdown in the static water level created during pumping.

Based on the pumping rate used for the well (14.2 litres/minute), it is considered that the well yield can meet the expected water demand based on the sewage system design flow, without the need for storage. However, it is considered that the well should be supplied with a flow restrictor to limit water pumping to the rate used for the pumping test to prevent overpumping. If instantaneous peak water demand is expected to be higher than 14.2 litres/minute, then a water storage reservoir should be installed. Water demand must not exceed the sewage design flow of ~5610 litres per day.

The pumping test drawdown and recovery data and plots for TW1 are provided as Attachment A. The drawdown and recovery data provided were measured with reference to the top of the well casing at the test well location.

The pumping test data for the test well was analyzed using the method of Cooper and Jacob (1946). Although the assumptions on which these equations are based are not strictly met, this method provides a reasonable estimate of the aquifer transmissivity.

Transmissivity was calculated using the following relationship:

$$T = \frac{2.3Q}{4\pi ds}$$

where Q is the pump rate, m^3/day
ds is the change in drawdown over one time log cycle, m
T is the transmissivity, m^2/day

Based on the pumping test drawdown data the transmissivity of the aquifer is estimated to be about 2.0 m^2/day. Based on the recovery data the aquifer transmissivity is estimated to be about 1.9 m^2/day.

Water Quality

The water quality was previously addressed in the GEMTEC December 2018 report. The additional water quality results that were obtained by Kollaard Associates Inc. confirmed the water quality findings. The GEMTEC report indicated that colour, hydrogen sulphide, turbidity (lab based measurement) and pH were above their aesthetic objectives. The current testing results indicated that all of these parameters were within the acceptable limits.

The current testing resulted in the following aesthetic exceedances, which also exceeded during the 2010 water sampling and testing, as summarized in the Table below.

Parameter	Concentration/Level	ODWSOG Aesthetic Objective (AO)	Maximum Treatability Limit (MCCRT)
Chlorides	286 mg/l	250 mg/l	250 mg/l
Sulphates	589 mg/l	500 mg/l	500 mg/l
Total Dissolved Solids	1850 mg/l	500 mg/l	NA
Sodium	387 mg/l	200 mg/l	200 mg/l
Iron	0.50 mg/l	0.3 mg/l	10 mg/l
Hardness	269 mg/l	500 mg/l	NA

Discussion of Water Quality

Total Dissolved Solids

The total dissolved solids (TDS) were measured at 1850 milligrams per litre after ~ six hours of pumping, above the ODWS of 500 milligrams per litre. The Ryznar Stability Index (RSI) and Langelier Saturation Index (LSI) were calculated for the sample obtained and gave an RSI value of ~7.1, and LSI of ~0.5, respectively, indicating that the calcium carbonate formation in the water probably does not lead to a protective corrosion inhibitor film. The LSI is above zero but not by much, which indicates that there is only borderline scale potential. The effect of elevated TDS levels on drinking water depends on the individual components, which are principally chlorides, sulphates, calcium, magnesium and bicarbonates. Depending on which parameters are elevated, TDS exceedances can include hardness, taste, mineral deposition or corrosion. In this case, the water samples had higher levels of chlorides, sodium and sulphates. In this case, the effect of elevated TDS is considered to be the potential for corrosion, due to sulphates and chlorides. All of the above noted parameters may be removed by reverse osmosis. However reverse osmosis systems require high water pressure, are relatively costly and increase water demand. They are typically only used to treat water used for drinking and consumption. The water supply for the site is for an industrial user, for sinks, toilets and showers for employees. The site is not for domestic uses

(i.e. no cooking or human consumption). Therefore, there are no concerns with making the water palatable for human consumption.

Chlorides
The chloride levels at the well are 286 mg/l (and up to 314 mg/l from previous report). At levels above the AO, chloride has a detectable salty taste. The treatability limit for chlorides pertains to the water palatability. In this case, the water is not for domestic use nor intended for human consumption, so treatment to reduce chloride is not required for that purpose.

Sodium
The sodium level is 387 mg/l, which is above the aesthetic objective and the medical advisory limit of 20 mg/l. The ODWSOG states that *"the local Medical Officer of Health should be notified when the sodium concentration exceeds 20 mg/l so that this information may be communicated to local physicians for their use with patients on sodium restricted diets."*

In this case, the water is not for domestic use nor intended for human consumption, so treatment to reduce sodium is not required for that purpose.

Hardness
The hardness level was measured to be 269 mg/l. Normally, water is treated through the use of a water softener to reduce hardness. In this case, the hardness provides some potential for scale formation which can reduce the corrosive potential of the water supply. It is strongly recommended that no water treatment to reduce hardness should be used for the water supply (see recommended water treatment below).

Iron
The iron level at TW1 after ~six hours of pumping is 0.50 milligrams per litre, which exceeds the ODWS aesthetic objective of 0.3 milligrams per litre. No treatment to reduce iron is recommended for this site.

Sulphates
The sulphate level is at 589 mg/l, which is above the aesthetic objective and MCCRT of 500 mg/l. The source of the sulphates is considered to be naturally occurring mineral salts in the bedrock at the site. According to Health Canada, sulphate is one of the least toxic anions. Water containing 1000 mg/l (as magnesium sulphate) acts as a purgative, but concentration below that level is physiologically harmless to the general population. The aesthetic objective is set at 500 mg/l due to taste. Sulphate can interfere with disinfection through chlorine in the distribution system. The presence of sulphate salts in the water could also increase corrosion of metal pipes. Health Canada recommends that health authorities be notified of sources of drinking water that contain sulphate concentrations in excess of 500 mg/l.

The ODWSOG indicates that sulphate consumption at levels above 500 mg/l may results in diarrhea or stomach upset, but the body adapts if exposed routinely. For this industrial site, human consumption of the water is not intended, so sulphate reduction is not proposed for this purpose.

It should be noted that the Ontario Well Regulation 903 Well Abandonment 21 (4) states that a well that produces mineralized water must be abandoned. Mineralized water is defined as greater than 6000 mg/l TDS OR greater than 500 mg/l chlorides OR greater than 500 mg/l as sulphate. However, 21 (10) states that subsection (4) does not apply if the well owner has written consent of the Director (O. Reg 372/07, s. 20).

Another exception to the abandonment requirement is applies for a well that is used for agriculture AND is not used as a source of human consumption.

In this case, based on the above noted information, the following considerations are made with respect to the presence of sulphates above the MCCRT:

- sulphate level is much less than the 1000 mg/l identified by Health Canada as being of concern for the general population and is only of concern for aesthetic purposes
- the subject well is for use at a dry industrial property to run toilets, sinks and showers and is not intended for either residential or human consumption
- there are exceptions applied within the well regulation for cases where the water is not used as a source of human consumption
- mitigative measures are proposed to reduce the potential for corrosion in the water supply due to sulphates as part of the Water Treatment Recommendations

Water Treatment Recommendations

In this case, the effect of elevated TDS, chlorides and sulphates is considered to be the potential for corrosion, due to sulphates and chlorides. All of the above noted parameters may be removed by reverse osmosis. However reverse osmosis systems require high water pressure, are relatively costly and increase water demand. They are typically only used to treat water used for drinking and consumption. The water supply for the site is for an industrial user, for sinks, toilets and showers for employees. The site is not for domestic uses (i.e. no cooking or human consumption). Therefore, there are no concerns with making the water palatable for human consumption. The provision of drinking water for the site can be made through supplying potable bottled water.

The presence of TDS, sulphates and chlorides in the water supply indicates that the water may be corrosive. Corrosive water can cause dissolution of metal pipes, solders and plumbing fixtures which can release metals (such as lead, copper and other metals) into the water causing aesthetic and health-related issues if consumed. The RSI and LSI indicate only mild corrosion, however, slight changes in temperature, pH or water quality may increase the corrosive potential. The following is proposed to mitigate the impacts of corrosion on the water supply and plumbing:

- approved plastic PVC, CPVC or Cross-Linked polyethylene (PEX) pipe and fittings for water supply and plumbing pipes and fittings, which shall be CSA approved for water supply usage.
- Installation of stainless steel fixtures (especially the interior parts that are directly exposed to the water).
- It is strongly recommended that none of the following water treatment systems are installed, without consultation with a qualified water treatment professional, as they can cause the treated water to be more corrosive: water softener, aeration devices for iron, sulphur or odour removal, increased hot water temperatures, chlorination

Drinking Water Options

There are two options to provide water for drinking at the site. One is a point of use reverse osmosis system which could supply a single faucet in the staff area that would be labelled for this purpose. The second option is the provision of bottled water through a water dispenser (water cooler).

All other faucets within the building should be labelled "Not intended for human consumption".

Wellhead Protection

The supply well is located southwest of the proposed building, while the location of the proposed septic system is within the northeast portion of the site, with sufficient separation distance between them. The well casing was observed to extend at least 400 millimetres above grade. If required after finished grading, the top of the well casing shall be extended to ensure that is at least 400 millimetres above the finished grade at the well location.

Additionally, the ground surface shall be graded such that it is the highest point on the ground surface within 3 metres radially from the exterior of the well casing and shall ensure that water does not collect or pond near the well head. The well record indicates that the well was properly grouted and cased to a depth of about 6.7 metres below the existing ground surface. It is recommended that the current well cap be replaced with a properly vented, vermin proof well cap and that a lock is provided on the well to prevent unlawful access. The site plan indicates that the well is to be provided with bollards to prevent physical damage. With these measures in place, it is considered that an adequate amount of wellhead protection is going to be in place to protect the water supply for the proposed light industrial use of the property. The well location is also appropriate for access in case of repairs and well maintenance.

Recommendations for wellhead protection include ensuring that potential contaminant sources are at least 15 metres and preferably at least 30 metres or more from the well. Possible contaminant sources include; chemical storage, garage and related chemicals, such as antifreeze, gasoline, oils, vehicle/boat/equipment storage, sewer lines, septic systems, animal enclosures, manure or compost piles. If liquid chemicals, such as antifreeze, oil and gasoline/diesel, and their waste products, are to be stored at the site, they should be done in containers approved for that purpose. The container(s) should be labelled with their contents. Secondary containment should be installed around all bulk liquid chemical or waste storage containers, to collect and contain leaks and spills from the tank and all connections.

Recommendations for well maintenance include; inspect wellhead annually to ensure that the casing is structurally sound, verify well cap is sealed and that surface water is not pooling around wellhead.

Based on the results of this evaluation it is considered that the well in question should supply water of adequate quantity and quality for the proposed development with suitable mitigative measures and wellhead protection as indicated above.

We trust this letter provides sufficient information for your purposes. If you have any questions concerning this letter, please do not hesitate to contact our office.

Yours truly,

Kollaard Associates Inc.

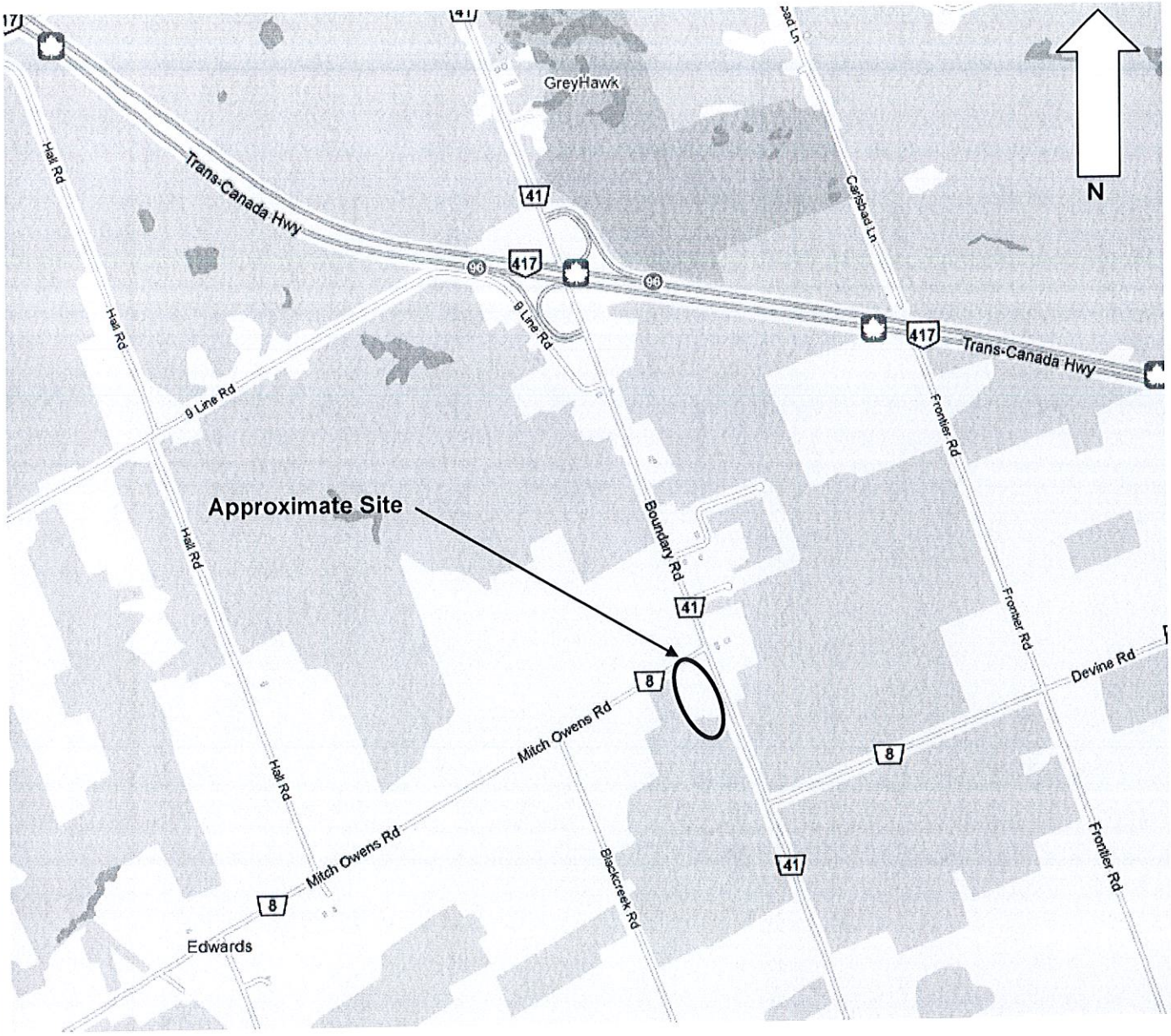
Colleen Vermeersch, P. Eng.

Attachments:

Figure 1	- Key Plan
Attachment A	- Well Record
Attachment B	- Pumping Test Data
Attachment C	- Well Water Laboratory Test Results

KEY PLAN

FIGURE 1



NOT TO SCALE

Kollaard Associates
Engineers

Project No. 190298

Date April 2019

ATTACHMENT A

MOE WELL RECORD FOR TW1

Ontario Ministry of the Environment

Well Tag Number (Place sticker and print number below): A036338

Well Record

Regulation 903 Ontario Water Resources Ac

page ___ of ___

Instructions for Completing Form

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

Ministry Use Only

MUN | CON | LOT

Well Owner's Information and Location of Well Information

First Name	Last Name	Mailing Address (Street Number/Name, RR, Lot, Concession)
Oleary's limited		5630 Boundary Rd

County/District/Municipality	Township/City/Town/Village	Province	Postal Code	Telephone Number (include area code
Ottawa Carleton	Ottawa	Ontario		

Address of Well Location (County/District/Municipality)	Township	Lot	Concession
5630 Boundary Rd	Osgoode	1	11

RR#/Street Number/Name	City/Town/Village	Site/Compartment/Block/Tract etc.
	Ottawa	Plan M-5R-13558

GPS Reading	NAD	Zone	Easting	Northing	Unit Make/Model	Mode of Operation
	83	18	7[illegible]4651	4[illegible]36181		☐ Undifferentiated ☐ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see Instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To (Metres)
Brown	Sand	some stones		0	12'
Grey	clay	with silt layers		12	81'
Grey	Hardpan	with stones		81'	93'
Grey	shale	rock very	soft	93'	95'

Hole Diameter

Depth From	Depth To (Metres)	Diameter (Centimetres)
95	0	12"

Water Record

Water found at ___ Metres / Kind of Water

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

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

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

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

Chlorinated ☐ Yes ☐ No

Construction Record

Casing

Inside diam (centimetres)	Material	Wall thickness (centimetres)	Depth From	Depth To (Metres)
6"	☒ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	1188	55'	+2'
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			

Screen

Outside diam	Material	Slot No.	Depth From	Depth To (Metres)
6"	☒ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	35	95'	85'

No Casing or Screen

☐ Open hole

Test of Well Yield

Pumping test method: pumped

	Draw Down Time (min)	Draw Down Water Level (Metres)	Recovery Time (min)	Recovery Water Lev (Metres)
Static Level		12.12'		
1		14.19	1	
2		16.77	2	
3		18.33	3	
4		20.12	4	
5		25.51	5	
10		29.41	10	
15		32.61	15	
20		35.81	20	
25		43.2	25	
30		47.35	30	
40		51.12	40	
50		55.91	50	
60		61.23	60	

Pump intake set at - (metres) 90'

Pumping rate - (litres/min) 10gpm

Duration of pumping 1 hrs + 0 min

Final water level end of pumping ___ metres

☐ Shallow ☒ Deep

Recommended pump depth. 90' metres

Recommended pump rate. 10 gpm (litres/min)

If flowing give rate - (litres/min)

If pumping discontinued, give reason.

Plugging and Sealing Record

☒ Annular space ☐ Abandonment

Depth set at - Metres From	Depth set at - Metres To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
88'	0'	45 Bags cement	

Method of Construction

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

Water Use

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

Final Status of Well

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

Well Contractor/Technician Information

Name of Well Contractor	Well Contractor's Licence No.
Olympic Drilling Ltd	4006

Business Address (street name, number, city etc.): 6662 Bank st Metcalfe Ont

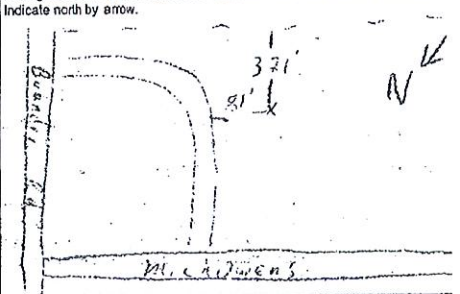
Name of Well Technician (last name, first name)	Well Technician's Licence No.
Wayne Renwick	327

Signature of Technician/Contractor: X Wayne Renwick

Date Submitted YYYY MM DD

Location of Well

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



Audit No. Z 40182

Was the well owner's information package delivered? ☐ Yes ☐ No

Date Well Completed YYYY MM D

Date Delivered YYYY MM D

Ministry Use Only

Data Source | Contractor

Date Received YYYY MM DD | Date of Inspection YYYY MM D

Remarks | Well Record Number

0506E (09/03)

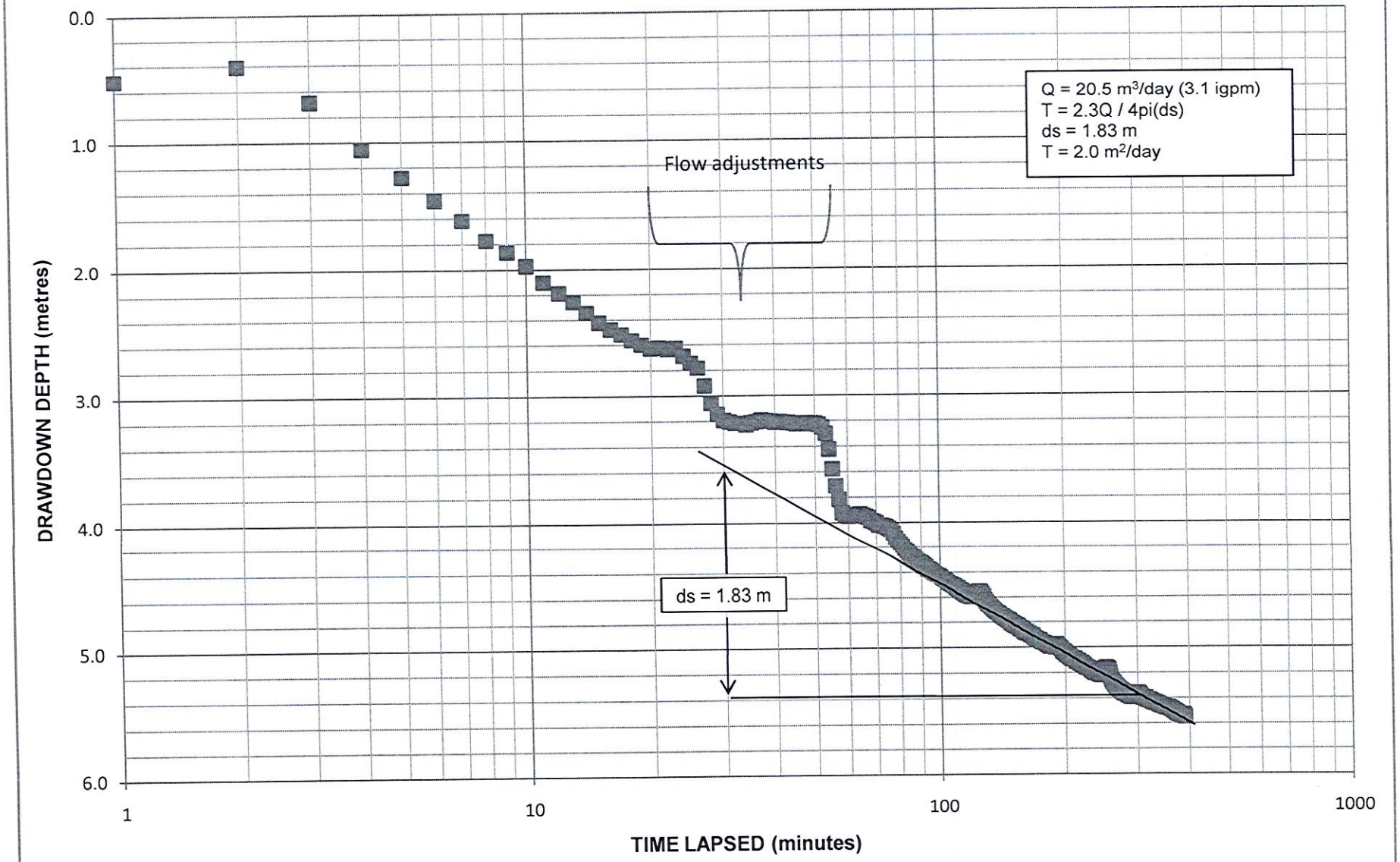
Contractor's Copy ☐ Ministry's Copy ☐ Well Owner's Copy ☐

Cette formule est disponible en franç

ATTACHMENT B

PUMPING TEST DATA FOR TW1

TW1-WELL DRAWDOWN VS. TIME-KOLLAARD FILE 190298



Kollaard File 180696 Pump Rate 14.2 litres/minute

DRAWDOWN DATA TW-1

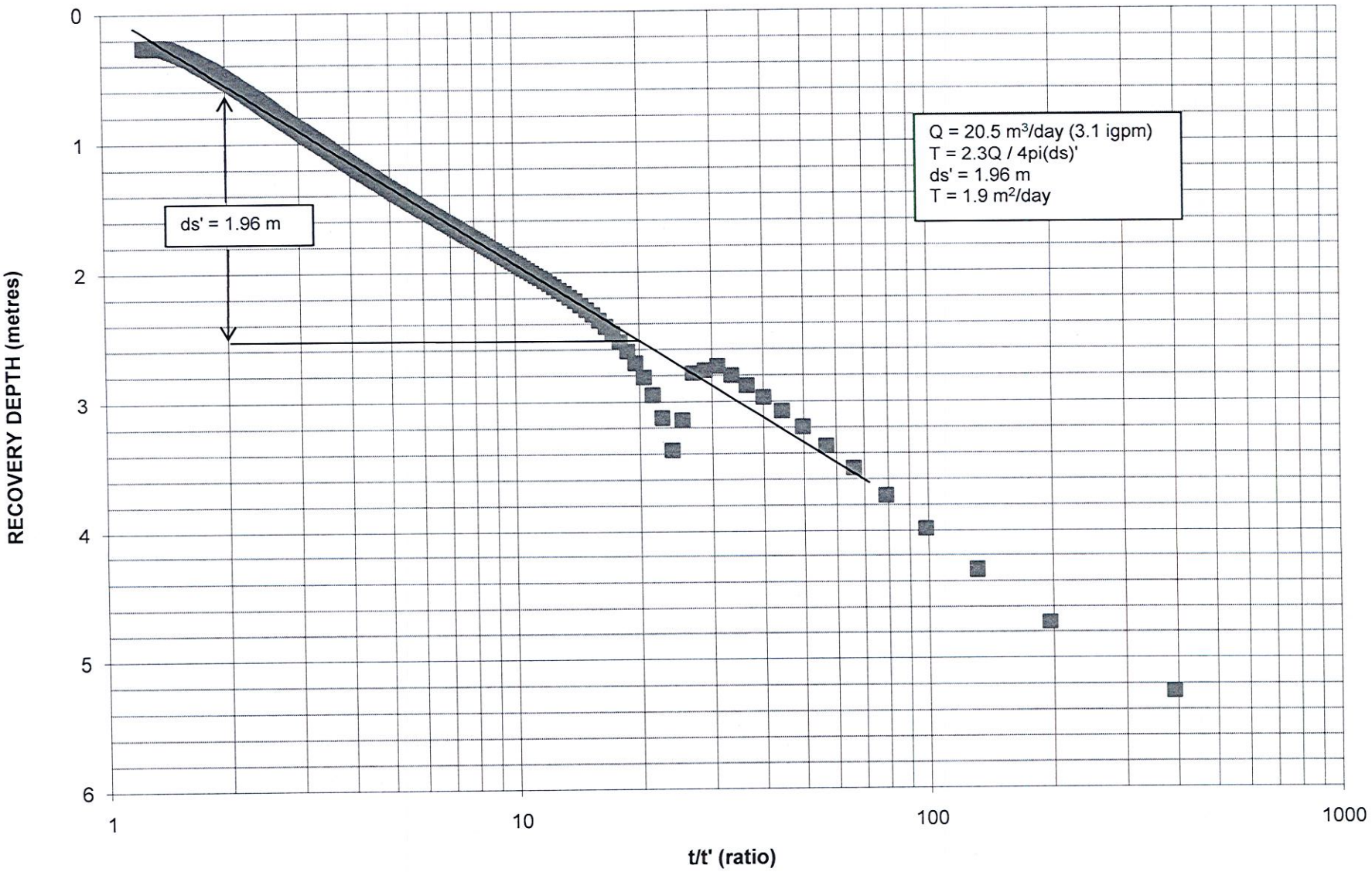
Time Lapsed (minutes)	Abs Pres (kPa)	Temp (°C)	Water Level (m)	Drawdown (m)
0	336.094	8.481	-3.477	-
1	331.069	8.481	-3.99	0.513
2	332.139	8.481	-3.881	0.404
3	329.374	8.481	-4.163	0.686
4	325.718	8.481	-4.535	1.058
5	323.579	8.481	-4.754	1.277
6	321.796	8.481	-4.935	1.458
7	320.251	8.481	-5.093	1.616
8	318.707	8.481	-5.25	1.773
9	317.786	8.481	-5.344	1.867
10	316.747	8.481	-5.45	1.973
11	315.47	8.481	-5.58	2.103
12	314.638	8.481	-5.665	2.188
13	313.955	8.481	-5.735	2.258
14	313.124	8.481	-5.82	2.343
15	312.352	8.481	-5.898	2.421
16	311.818	8.481	-5.953	2.476
17	311.432	8.481	-5.992	2.515
18	310.987	8.481	-6.038	2.561
19	310.63	8.481	-6.074	2.597
20	310.333	8.481	-6.104	2.627
21	310.393	8.481	-6.098	2.621
22	310.274	8.481	-6.11	2.633
23	310.363	8.481	-6.101	2.624
24	309.74	8.481	-6.165	2.688
25	309.206	8.481	-6.219	2.742
26	308.82	8.481	-6.259	2.782
27	307.455	8.481	-6.398	2.921
28	306.09	8.481	-6.537	3.06
29	305.259	8.481	-6.622	3.145
30	304.784	8.481	-6.67	3.193
31	304.665	8.481	-6.682	3.205
32	304.547	8.481	-6.694	3.217
33	304.547	8.481	-6.694	3.217
34	304.428	8.481	-6.706	3.229
35	304.576	8.481	-6.691	3.214
36	304.665	8.481	-6.682	3.205
37	304.784	8.481	-6.67	3.193
38	304.725	8.481	-6.676	3.199
39	304.695	8.481	-6.679	3.202
40	304.606	8.481	-6.688	3.211
41	304.665	8.481	-6.682	3.205
42	304.606	8.481	-6.688	3.211
43	304.576	8.481	-6.691	3.214
44	304.547	8.481	-6.694	3.217
45	304.487	8.481	-6.7	3.223
46	304.517	8.481	-6.697	3.22
47	304.547	8.481	-6.694	3.217
48	304.487	8.481	-6.7	3.223
49	304.547	8.481	-6.694	3.217
50	304.517	8.481	-6.697	3.22
51	304.428	8.481	-6.706	3.229
52	304.22	8.481	-6.728	3.251
53	303.746	8.481	-6.776	3.299
54	302.529	8.481	-6.9	3.423
55	301.016	8.481	-7.054	3.577
56	299.711	8.481	-7.187	3.71
57	298.673	8.481	-7.293	3.816
58	297.635	8.481	-7.399	3.922
59	297.457	8.481	-7.417	3.94
60	297.369	8.481	-7.426	3.949
61	297.457	8.481	-7.417	3.94
62	297.457	8.481	-7.417	3.94
63	297.517	8.481	-7.411	3.934
64	297.546	8.481	-7.408	3.931
65	297.457	8.481	-7.417	3.94
66	297.369	8.481	-7.426	3.949
67	297.28	8.481	-7.435	3.958
68	297.042	8.481	-7.46	3.983
69	296.983	8.481	-7.466	3.989
70	296.864	8.481	-7.478	4.001
71	296.687	8.481	-7.496	4.019
72	296.687	8.481	-7.496	4.019
73	296.622	8.382	-7.502	4.025
74	296.568	8.481	-7.508	4.031
75	296.449	8.481	-7.52	4.043
76	296.331	8.481	-7.532	4.055
77	296.034	8.481	-7.562	4.085
78	295.678	8.481	-7.599	4.122
79	295.412	8.481	-7.626	4.149
80	295.204	8.481	-7.647	4.17
81	294.996	8.481	-7.668	4.191
82	294.73	8.481	-7.695	4.218
83	294.581	8.481	-7.71	4.233
84	294.404	8.481	-7.729	4.252
85	294.166	8.481	-7.753	4.276
86	294.077	8.481	-7.762	4.285
87	293.9	8.481	-7.78	4.303
88	293.751	8.481	-7.795	4.318
89	293.662	8.481	-7.804	4.327
90	293.573	8.481	-7.813	4.336
91	293.425	8.481	-7.828	4.351
92	293.336	8.481	-7.837	4.36
93	293.158	8.481	-7.856	4.379

94	293.099	8.481	-7.862	4.385
95	293.04	8.481	-7.868	4.391
96	292.892	8.481	-7.883	4.406
97	292.803	8.481	-7.892	4.415
98	292.714	8.481	-7.901	4.424
99	292.684	8.481	-7.904	4.427
100	292.566	8.481	-7.916	4.439
101	292.417	8.481	-7.931	4.454
102	292.358	8.481	-7.937	4.46
103	292.269	8.481	-7.946	4.469
104	292.121	8.481	-7.961	4.484
105	292.032	8.481	-7.97	4.493
106	291.973	8.481	-7.976	4.499
107	291.913	8.481	-7.983	4.506
108	291.854	8.481	-7.989	4.512
109	291.701	8.382	-8.004	4.527
110	291.676	8.481	-8.007	4.53
111	291.528	8.481	-8.022	4.545
112	291.469	8.481	-8.028	4.551
113	291.38	8.481	-8.037	4.56
114	291.291	8.481	-8.046	4.569
115	291.232	8.481	-8.052	4.575
116	291.143	8.481	-8.061	4.584
117	291.113	8.481	-8.064	4.587
118	291.054	8.481	-8.07	4.593
119	291.024	8.481	-8.073	4.596
120	291.024	8.481	-8.073	4.596
121	291.143	8.481	-8.061	4.584
122	291.261	8.481	-8.049	4.572
123	291.261	8.481	-8.049	4.572
124	291.38	8.481	-8.037	4.56
125	291.35	8.481	-8.04	4.563
126	291.172	8.481	-8.058	4.581
127	290.995	8.481	-8.076	4.599
128	290.758	8.481	-8.1	4.623
129	290.609	8.481	-8.116	4.639
130	290.461	8.481	-8.131	4.654
131	290.372	8.481	-8.14	4.663
132	290.254	8.481	-8.152	4.675
133	290.165	8.481	-8.161	4.684
134	290.046	8.481	-8.173	4.696
135	289.957	8.481	-8.182	4.705
136	289.839	8.481	-8.194	4.717
137	289.779	8.481	-8.2	4.723
138	289.75	8.481	-8.203	4.726
139	289.602	8.481	-8.218	4.741
140	289.513	8.481	-8.227	4.75
141	289.513	8.481	-8.227	4.75
142	289.394	8.481	-8.239	4.762
143	289.335	8.481	-8.245	4.768
144	289.276	8.481	-8.251	4.774
145	289.216	8.481	-8.258	4.781
146	289.187	8.481	-8.261	4.784
147	289.098	8.481	-8.27	4.793
148	288.95	8.481	-8.285	4.808
149	288.95	8.481	-8.285	4.808
150	288.861	8.481	-8.294	4.817
151	288.831	8.481	-8.297	4.82
152	288.772	8.481	-8.303	4.826
153	288.742	8.481	-8.306	4.829
154	288.683	8.481	-8.312	4.835
155	288.594	8.481	-8.321	4.844
156	288.505	8.481	-8.33	4.853
157	288.505	8.481	-8.33	4.853
158	288.446	8.481	-8.336	4.859
159	288.327	8.481	-8.348	4.871
160	288.238	8.481	-8.357	4.88
161	288.268	8.481	-8.354	4.877
162	288.15	8.481	-8.366	4.889
163	288.15	8.481	-8.366	4.889
164	288.12	8.481	-8.369	4.892
165	288.031	8.481	-8.378	4.901
166	288.001	8.481	-8.381	4.904
167	288.001	8.481	-8.381	4.904
168	287.853	8.481	-8.397	4.92
169	287.794	8.481	-8.403	4.926
170	287.764	8.481	-8.406	4.929
171	287.705	8.481	-8.412	4.935
172	287.646	8.481	-8.418	4.941
173	287.675	8.481	-8.415	4.938
174	287.616	8.481	-8.421	4.944
175	287.498	8.481	-8.433	4.956
176	287.468	8.481	-8.436	4.959
177	287.438	8.481	-8.439	4.962
178	287.409	8.481	-8.442	4.965
179	287.379	8.481	-8.445	4.968
180	287.29	8.481	-8.454	4.977
181	287.231	8.481	-8.46	4.983
182	287.231	8.481	-8.46	4.983
183	287.142	8.481	-8.469	4.992
184	287.113	8.481	-8.472	4.995
185	287.083	8.481	-8.475	4.998
186	287.083	8.481	-8.475	4.998
187	287.142	8.481	-8.469	4.992
188	287.083	8.481	-8.475	4.998
189	287.053	8.481	-8.478	5.001
190	287.32	8.481	-8.451	4.974
191	287.35	8.481	-8.448	4.971
192	287.201	8.481	-8.463	4.986

193	287.113	8.481	-8.472	4.995
194	287.053	8.481	-8.478	5.001
195	286.994	8.481	-8.484	5.007
196	286.905	8.481	-8.493	5.016
197	286.757	8.481	-8.508	5.031
198	286.757	8.481	-8.508	5.031
199	286.668	8.481	-8.517	5.04
200	286.609	8.481	-8.523	5.046
201	286.52	8.481	-8.532	5.055
202	286.52	8.481	-8.532	5.055
203	286.461	8.481	-8.538	5.061
204	286.401	8.481	-8.545	5.068
205	286.372	8.481	-8.548	5.071
206	286.283	8.481	-8.557	5.08
207	286.224	8.481	-8.563	5.086
208	286.194	8.481	-8.566	5.089
209	286.164	8.481	-8.569	5.092
210	286.164	8.481	-8.569	5.092
211	286.164	8.481	-8.569	5.092
212	286.075	8.481	-8.578	5.101
213	285.957	8.481	-8.59	5.113
214	285.987	8.481	-8.587	5.11
215	285.987	8.481	-8.587	5.11
216	285.898	8.481	-8.596	5.119
217	285.809	8.481	-8.605	5.128
218	285.809	8.481	-8.605	5.128
219	285.838	8.481	-8.602	5.125
220	285.661	8.481	-8.62	5.143
221	285.72	8.481	-8.614	5.137
222	285.661	8.481	-8.62	5.143
223	285.601	8.481	-8.626	5.149
224	285.513	8.481	-8.635	5.158
225	285.513	8.481	-8.635	5.158
226	285.483	8.481	-8.638	5.161
227	285.453	8.481	-8.641	5.164
228	285.424	8.481	-8.644	5.167
229	285.424	8.481	-8.644	5.167
230	285.394	8.481	-8.647	5.17
231	285.276	8.481	-8.659	5.182
232	285.246	8.481	-8.662	5.185
233	285.187	8.481	-8.668	5.191
234	285.157	8.481	-8.671	5.194
235	285.098	8.481	-8.677	5.2
236	285.039	8.481	-8.683	5.206
237	285.098	8.481	-8.677	5.2
238	285.068	8.481	-8.681	5.204
239	285.004	8.382	-8.687	5.21
240	285.009	8.481	-8.687	5.21
241	285.009	8.481	-8.687	5.21
242	284.92	8.481	-8.696	5.219
243	284.92	8.481	-8.696	5.219
244	284.979	8.481	-8.69	5.213
245	284.861	8.481	-8.702	5.225
246	284.979	8.481	-8.69	5.213
247	285.187	8.481	-8.668	5.191
248	285.127	8.481	-8.675	5.198
249	285.276	8.481	-8.659	5.182
250	285.394	8.481	-8.647	5.17
251	285.513	8.481	-8.635	5.158
252	285.448	8.382	-8.642	5.165
253	285.453	8.481	-8.641	5.164
254	285.424	8.481	-8.644	5.167
255	285.335	8.481	-8.653	5.176
256	285.127	8.481	-8.675	5.198
257	284.861	8.481	-8.702	5.225
258	284.653	8.481	-8.723	5.246
259	284.505	8.481	-8.738	5.261
260	284.387	8.481	-8.75	5.273
261	284.328	8.481	-8.756	5.279
262	284.268	8.481	-8.762	5.285
263	284.15	8.481	-8.774	5.297
264	284.091	8.481	-8.78	5.303
265	284.061	8.481	-8.783	5.306
266	284.002	8.481	-8.789	5.312
267	283.942	8.481	-8.795	5.318
268	283.883	8.481	-8.801	5.324
269	283.824	8.481	-8.807	5.33
270	283.765	8.481	-8.813	5.336
271	283.706	8.481	-8.819	5.342
272	283.706	8.481	-8.819	5.342
273	283.646	8.481	-8.826	5.349
274	283.646	8.481	-8.826	5.349
275	283.617	8.481	-8.828	5.351
276	283.557	8.481	-8.835	5.358
277	283.498	8.481	-8.841	5.364
278	283.498	8.481	-8.841	5.364
279	283.469	8.481	-8.844	5.367
280	283.469	8.481	-8.844	5.367
281	283.498	8.481	-8.841	5.364
282	283.439	8.481	-8.847	5.37
283	283.35	8.481	-8.856	5.379
284	283.35	8.481	-8.856	5.379
285	283.35	8.481	-8.856	5.379
286	283.291	8.481	-8.862	5.385
287	283.261	8.481	-8.865	5.388
288	283.232	8.481	-8.868	5.391
289	283.202	8.481	-8.871	5.394
290	283.261	8.481	-8.865	5.388
291	283.261	8.481	-8.865	5.388

292	283.291	8.481	-8.862	5.385
293	283.232	8.481	-8.868	5.391
294	283.172	8.481	-8.874	5.397
295	283.261	8.481	-8.865	5.388
296	283.261	8.481	-8.865	5.388
297	283.291	8.481	-8.862	5.385
298	283.261	8.481	-8.865	5.388
299	283.261	8.481	-8.865	5.388
300	283.528	8.481	-8.838	5.361
301	283.469	8.481	-8.844	5.367
302	283.409	8.481	-8.85	5.373
303	283.38	8.481	-8.853	5.376
304	283.261	8.481	-8.865	5.388
305	283.202	8.481	-8.871	5.394
306	283.202	8.481	-8.871	5.394
307	283.202	8.481	-8.871	5.394
308	283.143	8.481	-8.877	5.4
309	283.113	8.481	-8.88	5.403
310	283.172	8.481	-8.874	5.397
311	283.138	8.382	-8.877	5.4
312	283.083	8.481	-8.883	5.406
313	283.172	8.481	-8.874	5.397
314	283.024	8.481	-8.889	5.412
315	283.024	8.481	-8.889	5.412
316	282.965	8.481	-8.895	5.418
317	282.935	8.481	-8.898	5.421
318	282.965	8.481	-8.895	5.418
319	282.995	8.481	-8.892	5.415
320	282.906	8.481	-8.901	5.424
321	282.906	8.481	-8.901	5.424
322	282.93	8.382	-8.899	5.422
323	282.906	8.481	-8.901	5.424
324	282.817	8.481	-8.91	5.433
325	282.817	8.481	-8.91	5.433
326	282.817	8.481	-8.91	5.433
327	282.758	8.481	-8.916	5.439
328	282.817	8.481	-8.91	5.433
329	282.787	8.481	-8.913	5.436
330	282.698	8.481	-8.922	5.445
331	282.758	8.481	-8.916	5.439
332	282.758	8.481	-8.916	5.439
333	282.698	8.481	-8.922	5.445
334	282.698	8.481	-8.922	5.445
335	282.639	8.481	-8.928	5.451
336	282.669	8.481	-8.925	5.448
337	282.58	8.481	-8.934	5.457
338	282.58	8.481	-8.934	5.457
339	282.58	8.481	-8.934	5.457
340	282.58	8.481	-8.934	5.457
341	282.521	8.481	-8.94	5.463
342	282.491	8.481	-8.943	5.466
343	282.521	8.481	-8.94	5.463
344	282.491	8.481	-8.943	5.466
345	282.491	8.481	-8.943	5.466
346	282.491	8.481	-8.943	5.466
347	282.461	8.481	-8.946	5.469
348	282.402	8.481	-8.952	5.475
349	282.432	8.481	-8.949	5.472
350	282.373	8.481	-8.955	5.478
351	282.373	8.481	-8.955	5.478
352	282.402	8.481	-8.952	5.475
353	282.313	8.481	-8.961	5.484
354	282.373	8.481	-8.955	5.478
355	282.432	8.481	-8.949	5.472
356	282.432	8.481	-8.949	5.472
357	282.343	8.481	-8.958	5.481
358	282.343	8.481	-8.958	5.481
359	282.313	8.481	-8.961	5.484
360	282.254	8.481	-8.967	5.49
361	282.224	8.481	-8.971	5.494
362	282.284	8.481	-8.964	5.487
363	282.224	8.481	-8.971	5.494
364	282.165	8.481	-8.977	5.5
365	282.136	8.481	-8.98	5.503
366	282.136	8.481	-8.98	5.503
367	282.106	8.481	-8.983	5.506
368	282.136	8.481	-8.98	5.503
369	282.047	8.481	-8.989	5.512
370	282.047	8.481	-8.989	5.512
371	281.988	8.481	-8.995	5.518
372	282.017	8.481	-8.992	5.515
373	281.899	8.481	-9.004	5.527
374	281.958	8.481	-8.998	5.521
375	281.928	8.481	-9.001	5.524
376	281.839	8.481	-9.01	5.533
377	281.869	8.481	-9.007	5.53
378	281.839	8.481	-9.01	5.533
379	281.839	8.481	-9.01	5.533
380	281.839	8.481	-9.01	5.533
381	281.835	8.382	-9.01	5.533
382	281.78	8.481	-9.016	5.539
383	281.839	8.481	-9.01	5.533
384	281.839	8.481	-9.01	5.533
385	281.869	8.481	-9.007	5.53
386	281.751	8.481	-9.019	5.542
387	281.839	8.481	-9.01	5.533
388	281.78	8.481	-9.016	5.539
389	281.691	8.481	-9.025	5.548
390	281.662	8.481	-9.028	5.551

TW1- WELL RECOVERY VS. TIME - KOLLAARD FILE 190298



Kollaard File 190298

RECOVERY DATA TW-1

t'	t/t'	Abs Pres (kPa)	Temp (°C)	Water Level (m)	Drawdown (m)	Recovery (%)
1	391.0	284.535	8.481	-8.735	5.258	5%
2	196.0	289.809	8.481	-8.197	4.72	15%
3	131.0	293.811	8.481	-7.789	4.312	22%
4	98.5	297.042	8.481	-7.46	3.983	28%
5	79.0	299.563	8.481	-7.202	3.725	33%
6	66.0	301.639	8.481	-6.991	3.514	37%
7	56.7	303.301	8.481	-6.821	3.344	40%
8	49.8	304.754	8.481	-6.673	3.196	42%
9	44.3	305.941	8.481	-6.552	3.075	45%
10	40.0	306.98	8.481	-6.446	2.969	47%
11	36.5	307.87	8.481	-6.355	2.878	48%
12	33.5	308.642	8.481	-6.277	2.8	50%
13	31.0	309.354	8.481	-6.204	2.727	51%
14	28.9	309.928	8.481	-6.237	2.76	50%
15	27.0	308.82	8.481	-6.259	2.782	50%
16	25.4	305.288	8.481	-6.619	3.142	43%
17	23.9	303.034	8.481	-6.849	3.372	39%
18	22.7	305.466	8.481	-6.601	3.124	44%
19	21.5	307.187	8.481	-6.425	2.948	47%
20	20.5	308.523	8.481	-6.289	2.812	49%
21	19.6	309.591	8.481	-6.18	2.703	51%
22	18.7	310.482	8.481	-6.089	2.612	53%
23	18.0	311.194	8.481	-6.016	2.539	54%
24	17.3	311.818	8.481	-5.953	2.476	55%
25	16.6	312.352	8.481	-5.898	2.421	56%
26	16.0	312.827	8.481	-5.85	2.373	57%
27	15.4	313.272	8.481	-5.805	2.328	58%
28	14.9	313.629	8.481	-5.768	2.291	59%
29	14.4	313.985	8.481	-5.732	2.255	59%
30	14.0	314.312	8.481	-5.698	2.221	60%
31	13.6	314.579	8.481	-5.671	2.194	60%
32	13.2	314.876	8.481	-5.641	2.164	61%
33	12.8	315.113	8.481	-5.617	2.14	61%
34	12.5	315.381	8.481	-5.589	2.112	62%
35	12.1	315.618	8.481	-5.565	2.088	62%
36	11.8	315.826	8.481	-5.544	2.067	63%
37	11.5	316.064	8.481	-5.52	2.043	63%
38	11.3	316.242	8.481	-5.502	2.025	64%
39	11.0	316.45	8.481	-5.48	2.003	64%
40	10.8	316.628	8.481	-5.462	1.985	64%
41	10.5	316.806	8.481	-5.444	1.967	65%
42	10.3	317.014	8.481	-5.423	1.946	65%
43	10.1	317.192	8.481	-5.405	1.928	65%
44	9.9	317.341	8.481	-5.39	1.913	66%
45	9.7	317.519	8.481	-5.371	1.894	66%
46	9.5	317.667	8.481	-5.356	1.879	66%
47	9.3	317.816	8.481	-5.341	1.864	66%
48	9.1	317.964	8.481	-5.326	1.849	67%
49	9.0	318.142	8.481	-5.308	1.831	67%
50	8.8	318.261	8.481	-5.296	1.819	67%
51	8.6	318.41	8.481	-5.281	1.804	68%
52	8.5	318.529	8.481	-5.268	1.791	68%
53	8.4	318.677	8.481	-5.253	1.776	68%
54	8.2	318.826	8.481	-5.238	1.761	68%
55	8.1	318.944	8.481	-5.226	1.749	68%
56	8.0	319.063	8.481	-5.214	1.737	69%
57	7.8	319.182	8.481	-5.202	1.725	69%
58	7.7	319.301	8.481	-5.19	1.713	69%
59	7.6	319.42	8.481	-5.178	1.701	69%
60	7.5	319.538	8.481	-5.166	1.689	70%
61	7.4	319.657	8.481	-5.153	1.676	70%
62	7.3	319.776	8.481	-5.141	1.664	70%
63	7.2	319.895	8.481	-5.129	1.652	70%
64	7.1	320.014	8.481	-5.117	1.64	70%
65	7.0	320.103	8.481	-5.108	1.631	71%
66	6.9	320.222	8.481	-5.096	1.619	71%
67	6.8	320.311	8.481	-5.087	1.61	71%
68	6.7	320.4	8.481	-5.078	1.601	71%
69	6.7	320.519	8.481	-5.066	1.589	71%
70	6.6	320.637	8.481	-5.054	1.577	72%
71	6.5	320.727	8.481	-5.044	1.567	72%
72	6.4	320.816	8.481	-5.035	1.558	72%
73	6.3	320.905	8.481	-5.026	1.549	72%
74	6.3	320.994	8.481	-5.017	1.54	72%
75	6.2	321.113	8.481	-5.005	1.528	72%
76	6.1	321.202	8.481	-4.996	1.519	73%
77	6.1	321.261	8.481	-4.99	1.513	73%
78	6.0	321.35	8.481	-4.981	1.504	73%
79	5.9	321.44	8.481	-4.972	1.495	73%
80	5.9	321.529	8.481	-4.963	1.486	73%
81	5.8	321.618	8.481	-4.953	1.476	73%
82	5.8	321.707	8.481	-4.944	1.467	74%
83	5.7	321.766	8.481	-4.938	1.461	74%
84	5.6	321.855	8.481	-4.929	1.452	74%
85	5.6	321.945	8.481	-4.92	1.443	74%
86	5.5	322.034	8.481	-4.911	1.434	74%
87	5.5	322.123	8.481	-4.902	1.425	74%
88	5.4	322.182	8.481	-4.896	1.419	74%
89	5.4	322.271	8.481	-4.887	1.41	75%
90	5.3	322.331	8.481	-4.881	1.404	75%
91	5.3	322.42	8.481	-4.872	1.395	75%
92	5.2	322.509	8.481	-4.863	1.386	75%
93	5.2	322.539	8.481	-4.86	1.383	75%
94	5.1	322.598	8.481	-4.854	1.377	75%
95	5.1	322.687	8.481	-4.844	1.367	75%
96	5.1	322.747	8.481	-4.838	1.361	75%
97	5.0	322.866	8.481	-4.826	1.349	76%
98	5.0	322.925	8.481	-4.82	1.343	76%
99	4.9	322.984	8.481	-4.814	1.337	76%
100	4.9	323.014	8.481	-4.811	1.334	76%
101	4.9	323.133	8.481	-4.799	1.322	76%
102	4.8	323.192	8.481	-4.793	1.316	76%
103	4.8	323.252	8.481	-4.787	1.31	76%
104	4.8	323.341	8.481	-4.778	1.301	77%
105	4.7	323.371	8.481	-4.775	1.298	77%
106	4.7	323.46	8.481	-4.766	1.289	77%
107	4.6	323.49	8.481	-4.763	1.286	77%
108	4.6	323.579	8.481	-4.754	1.277	77%
109	4.6	323.638	8.481	-4.747	1.27	77%
110	4.5	323.698	8.481	-4.741	1.264	77%
111	4.5	323.757	8.481	-4.735	1.258	77%
112	4.5	323.816	8.481	-4.729	1.252	77%
113	4.5	323.876	8.481	-4.723	1.246	78%
114	4.4	323.935	8.481	-4.717	1.24	78%
115	4.4	323.995	8.481	-4.711	1.234	78%
116	4.4	324.054	8.481	-4.705	1.228	78%
117	4.3	324.084	8.481	-4.702	1.225	78%
118	4.3	324.173	8.481	-4.693	1.216	78%
119	4.3	324.232	8.481	-4.687	1.21	78%
120	4.3	324.292	8.481	-4.681	1.204	78%
121	4.2	324.322	8.481	-4.678	1.201	78%
122	4.2	324.351	8.481	-4.675	1.198	78%
123	4.2	324.44	8.481	-4.666	1.189	79%
124	4.1	324.5	8.481	-4.66	1.183	79%
125	4.1	324.53	8.481	-4.657	1.18	79%
126	4.1	324.589	8.481	-4.651	1.174	79%
127	4.1	324.648	8.481	-4.644	1.167	79%
128	4.0	324.708	8.481	-4.638	1.161	79%
129	4.0	324.738	8.481	-4.635	1.158	79%
130	4.0	324.797	8.481	-4.629	1.152	79%
131	4.0	324.856	8.481	-4.623	1.146	79%
132	4.0	324.916	8.481	-4.617	1.14	79%
133	3.9	324.946	8.481	-4.614	1.137	80%
134	3.9	325.005	8.481	-4.608	1.131	80%
135	3.9	325.064	8.481	-4.602	1.125	80%
136	3.9	325.094	8.481	-4.599	1.122	80%
137	3.8	325.154	8.481	-4.593	1.116	80%
138	3.8	325.183	8.481	-4.59	1.113	80%
139	3.8	325.243	8.481	-4.584	1.107	80%
140	3.8	325.302	8.481	-4.578	1.101	80%
141	3.8	325.332	8.481	-4.575	1.098	80%
142	3.7	325.362	8.481	-4.572	1.095	80%
143	3.7	325.421	8.481	-4.566	1.089	80%
144	3.7	325.48	8.481	-4.56	1.083	80%
145	3.7	325.54	8.481	-4.554	1.077	81%

146	3.7	325.57	8.481	-4.55	1.073	81%
147	3.7	325.629	8.481	-4.544	1.067	81%
148	3.6	325.659	8.481	-4.541	1.064	81%
149	3.6	325.689	8.481	-4.538	1.061	81%
150	3.6	325.748	8.481	-4.532	1.055	81%
151	3.6	325.778	8.481	-4.529	1.052	81%
152	3.6	325.837	8.481	-4.523	1.046	81%
153	3.5	325.926	8.481	-4.514	1.037	81%
154	3.5	325.956	8.481	-4.511	1.034	81%
155	3.5	325.986	8.481	-4.508	1.031	81%
156	3.5	326.015	8.481	-4.505	1.028	81%
157	3.5	326.075	8.481	-4.499	1.022	82%
158	3.5	326.105	8.481	-4.496	1.019	82%
159	3.5	326.134	8.481	-4.493	1.016	82%
160	3.4	326.194	8.481	-4.487	1.01	82%
161	3.4	326.223	8.481	-4.484	1.007	82%
162	3.4	326.283	8.481	-4.478	1.001	82%
163	3.4	326.313	8.481	-4.475	0.998	82%
164	3.4	326.342	8.481	-4.472	0.995	82%
165	3.4	326.372	8.481	-4.469	0.992	82%
166	3.3	326.431	8.481	-4.463	0.986	82%
167	3.3	326.461	8.481	-4.46	0.983	82%
168	3.3	326.461	8.481	-4.46	0.983	82%
169	3.3	326.521	8.481	-4.454	0.977	82%
170	3.3	326.55	8.481	-4.451	0.974	82%
171	3.3	326.61	8.481	-4.444	0.967	83%
172	3.3	326.61	8.481	-4.444	0.967	83%
173	3.3	326.64	8.481	-4.441	0.964	83%
174	3.2	326.699	8.481	-4.435	0.958	83%
175	3.2	326.758	8.481	-4.429	0.952	83%
176	3.2	326.758	8.481	-4.429	0.952	83%
177	3.2	326.818	8.481	-4.423	0.946	83%
178	3.2	326.848	8.481	-4.42	0.943	83%
179	3.2	326.848	8.481	-4.42	0.943	83%
180	3.2	326.907	8.481	-4.414	0.937	83%
181	3.2	326.966	8.481	-4.408	0.931	83%
182	3.1	326.937	8.481	-4.411	0.934	83%
183	3.1	326.996	8.481	-4.405	0.928	83%
184	3.1	327.026	8.481	-4.402	0.925	83%
185	3.1	327.085	8.481	-4.396	0.919	83%
186	3.1	327.115	8.481	-4.393	0.916	83%
187	3.1	327.145	8.481	-4.39	0.913	84%
188	3.1	327.174	8.481	-4.387	0.91	84%
189	3.1	327.234	8.481	-4.381	0.904	84%
190	3.1	327.264	8.481	-4.378	0.901	84%
191	3.0	327.293	8.481	-4.375	0.898	84%
192	3.0	327.293	8.481	-4.375	0.898	84%
193	3.0	327.323	8.481	-4.372	0.895	84%
194	3.0	327.353	8.481	-4.369	0.892	84%
195	3.0	327.412	8.481	-4.363	0.886	84%
196	3.0	327.412	8.481	-4.363	0.886	84%
197	3.0	327.472	8.481	-4.357	0.88	84%
198	3.0	327.472	8.481	-4.357	0.88	84%
199	3.0	327.501	8.481	-4.354	0.877	84%
200	3.0	327.531	8.481	-4.351	0.874	84%
201	2.9	327.561	8.481	-4.347	0.87	84%
202	2.9	327.591	8.481	-4.344	0.867	84%
203	2.9	327.62	8.481	-4.341	0.864	84%
204	2.9	327.68	8.481	-4.335	0.858	85%
205	2.9	327.709	8.481	-4.332	0.855	85%
206	2.9	327.709	8.481	-4.332	0.855	85%
207	2.9	327.769	8.481	-4.326	0.849	85%
208	2.9	327.799	8.481	-4.323	0.846	85%
209	2.9	327.828	8.481	-4.32	0.843	85%
210	2.9	327.828	8.481	-4.32	0.843	85%
211	2.8	327.858	8.481	-4.317	0.84	85%
212	2.8	327.888	8.481	-4.314	0.837	85%
213	2.8	327.918	8.481	-4.311	0.834	85%
214	2.8	327.947	8.481	-4.308	0.831	85%
215	2.8	327.977	8.481	-4.305	0.828	85%
216	2.8	327.977	8.481	-4.305	0.828	85%
217	2.8	328.007	8.481	-4.302	0.825	85%
218	2.8	328.066	8.481	-4.296	0.819	85%
219	2.8	328.066	8.481	-4.296	0.819	85%
220	2.8	328.096	8.481	-4.293	0.816	85%
221	2.8	328.155	8.481	-4.287	0.81	85%
222	2.8	328.155	8.481	-4.287	0.81	85%
223	2.7	328.185	8.481	-4.284	0.807	85%
224	2.7	328.215	8.481	-4.281	0.804	86%
225	2.7	328.215	8.481	-4.281	0.804	86%
226	2.7	328.274	8.481	-4.275	0.798	86%
227	2.7	328.304	8.481	-4.272	0.795	86%
228	2.7	328.304	8.481	-4.272	0.795	86%
229	2.7	328.334	8.481	-4.269	0.792	86%
230	2.7	328.363	8.481	-4.266	0.789	86%
231	2.7	328.393	8.481	-4.263	0.786	86%
232	2.7	328.453	8.481	-4.256	0.779	86%
233	2.7	328.453	8.481	-4.256	0.779	86%
234	2.7	328.482	8.481	-4.254	0.777	86%
235	2.7	328.482	8.481	-4.254	0.777	86%
236	2.7	328.512	8.481	-4.25	0.773	86%
237	2.6	328.542	8.481	-4.247	0.77	86%
238	2.6	328.571	8.481	-4.244	0.767	86%
239	2.6	328.601	8.481	-4.241	0.764	86%
240	2.6	328.601	8.481	-4.241	0.764	86%
241	2.6	328.661	8.481	-4.235	0.758	86%
242	2.6	328.661	8.481	-4.235	0.758	86%
243	2.6	328.69	8.481	-4.232	0.755	86%
244	2.6	328.72	8.481	-4.229	0.752	86%
245	2.6	328.78	8.481	-4.223	0.746	87%
246	2.6	328.78	8.481	-4.223	0.746	87%
247	2.6	328.809	8.481	-4.22	0.743	87%
248	2.6	328.809	8.481	-4.22	0.743	87%
249	2.6	328.869	8.481	-4.214	0.737	87%
250	2.6	328.898	8.481	-4.211	0.734	87%
251	2.6	328.928	8.481	-4.208	0.731	87%
252	2.5	328.928	8.481	-4.208	0.731	87%
253	2.5	328.958	8.481	-4.205	0.728	87%
254	2.5	328.988	8.481	-4.202	0.725	87%
255	2.5	328.988	8.481	-4.202	0.725	87%
256	2.5	329.017	8.481	-4.199	0.722	87%
257	2.5	329.047	8.481	-4.196	0.719	87%
258	2.5	329.077	8.481	-4.193	0.716	87%
259	2.5	329.107	8.481	-4.19	0.713	87%
260	2.5	329.136	8.481	-4.187	0.71	87%
261	2.5	329.166	8.481	-4.184	0.707	87%
262	2.5	329.166	8.481	-4.184	0.707	87%
263	2.5	329.196	8.481	-4.181	0.704	87%
264	2.5	329.225	8.481	-4.178	0.701	87%
265	2.5	329.225	8.481	-4.178	0.701	87%
266	2.5	329.255	8.481	-4.175	0.698	87%
267	2.5	329.255	8.481	-4.175	0.698	87%
268	2.5	329.285	8.481	-4.172	0.695	87%
269	2.4	329.315	8.481	-4.169	0.692	88%
270	2.4	329.344	8.481	-4.166	0.689	88%
271	2.4	329.344	8.481	-4.166	0.689	88%
272	2.4	329.374	8.481	-4.163	0.686	88%
273	2.4	329.404	8.481	-4.16	0.683	88%
274	2.4	329.433	8.481	-4.157	0.68	88%
275	2.4	329.433	8.481	-4.157	0.68	88%
276	2.4	329.463	8.481	-4.154	0.677	88%
277	2.4	329.493	8.481	-4.15	0.673	88%
278	2.4	329.523	8.481	-4.147	0.67	88%
279	2.4	329.523	8.481	-4.147	0.67	88%
280	2.4	329.582	8.481	-4.141	0.664	88%
281	2.4	329.582	8.481	-4.141	0.664	88%
282	2.4	329.612	8.481	-4.138	0.661	88%
283	2.4	329.612	8.481	-4.138	0.661	88%
284	2.4	329.642	8.481	-4.135	0.658	88%
285	2.4	329.671	8.481	-4.132	0.655	88%
286	2.4	329.671	8.481	-4.132	0.655	88%
287	2.4	329.671	8.481	-4.132	0.655	88%
288	2.4	329.701	8.481	-4.129	0.652	88%
289	2.3	329.731	8.481	-4.126	0.649	88%
290	2.3	329.731	8.481	-4.126	0.649	88%
291	2.3	329.76	8.481	-4.123	0.646	88%
292	2.3	329.76	8.481	-4.123	0.646	88%
293	2.3	329.79	8.481	-4.12	0.643	88%
294	2.3	329.82	8.481	-4.117	0.64	88%

295	2.3	329.82	8.481	-4.117	0.64	88%
296	2.3	329.82	8.481	-4.117	0.64	88%
297	2.3	329.879	8.481	-4.111	0.634	89%
298	2.3	329.909	8.481	-4.108	0.631	89%
299	2.3	329.879	8.481	-4.111	0.634	89%
300	2.3	329.909	8.481	-4.108	0.631	89%
301	2.3	329.939	8.481	-4.105	0.628	89%
302	2.3	329.939	8.481	-4.105	0.628	89%
303	2.3	329.969	8.481	-4.102	0.625	89%
304	2.3	329.998	8.481	-4.099	0.622	89%
305	2.3	329.998	8.481	-4.099	0.622	89%
306	2.3	329.998	8.481	-4.099	0.622	89%
307	2.3	330.058	8.481	-4.093	0.616	89%
308	2.3	330.087	8.481	-4.09	0.613	89%
309	2.3	330.117	8.481	-4.087	0.61	89%
310	2.3	330.117	8.481	-4.087	0.61	89%
311	2.3	330.117	8.481	-4.087	0.61	89%
312	2.3	330.147	8.481	-4.084	0.607	89%
313	2.2	330.177	8.481	-4.081	0.604	89%
314	2.2	330.177	8.481	-4.081	0.604	89%
315	2.2	330.177	8.481	-4.081	0.604	89%
316	2.2	330.206	8.481	-4.078	0.601	89%
317	2.2	330.206	8.481	-4.078	0.601	89%
318	2.2	330.236	8.481	-4.075	0.598	89%
319	2.2	330.236	8.481	-4.075	0.598	89%
320	2.2	330.266	8.481	-4.072	0.595	89%
321	2.2	330.266	8.481	-4.072	0.595	89%
322	2.2	330.266	8.481	-4.072	0.595	89%
323	2.2	330.296	8.481	-4.069	0.592	89%
324	2.2	330.325	8.481	-4.066	0.589	89%
325	2.2	330.325	8.481	-4.066	0.589	89%
326	2.2	330.325	8.481	-4.066	0.589	89%
327	2.2	330.385	8.481	-4.059	0.582	90%
328	2.2	330.385	8.481	-4.059	0.582	90%
329	2.2	330.385	8.481	-4.059	0.582	90%
330	2.2	330.385	8.481	-4.059	0.582	90%
331	2.2	330.414	8.481	-4.057	0.58	90%
332	2.2	330.444	8.481	-4.053	0.576	90%
333	2.2	330.444	8.481	-4.053	0.576	90%
334	2.2	330.444	8.481	-4.053	0.576	90%
335	2.2	330.474	8.481	-4.05	0.573	90%
336	2.2	330.474	8.481	-4.05	0.573	90%
337	2.2	330.504	8.481	-4.047	0.57	90%
338	2.2	330.504	8.481	-4.047	0.57	90%
339	2.2	330.533	8.481	-4.044	0.567	90%
340	2.1	330.533	8.481	-4.044	0.567	90%
341	2.1	330.533	8.481	-4.044	0.567	90%
342	2.1	330.533	8.481	-4.044	0.567	90%
343	2.1	330.563	8.481	-4.041	0.564	90%
344	2.1	330.593	8.481	-4.038	0.561	90%
345	2.1	330.593	8.481	-4.038	0.561	90%
346	2.1	330.623	8.481	-4.035	0.558	90%
347	2.1	330.623	8.481	-4.035	0.558	90%
348	2.1	330.652	8.481	-4.032	0.555	90%
349	2.1	330.652	8.481	-4.032	0.555	90%
350	2.1	330.682	8.481	-4.029	0.552	90%
351	2.1	330.682	8.481	-4.029	0.552	90%
352	2.1	330.712	8.481	-4.026	0.549	90%
353	2.1	330.712	8.481	-4.026	0.549	90%
354	2.1	330.742	8.481	-4.023	0.546	90%
355	2.1	330.742	8.481	-4.023	0.546	90%
356	2.1	330.771	8.481	-4.02	0.543	90%
357	2.1	330.801	8.481	-4.017	0.54	90%
358	2.1	330.801	8.481	-4.017	0.54	90%
359	2.1	330.831	8.481	-4.014	0.537	90%
360	2.1	330.831	8.481	-4.014	0.537	90%
361	2.1	330.86	8.481	-4.011	0.534	90%
362	2.1	330.86	8.481	-4.011	0.534	90%
363	2.1	330.86	8.481	-4.011	0.534	90%
364	2.1	330.89	8.481	-4.008	0.531	90%
365	2.1	330.89	8.481	-4.008	0.531	90%
366	2.1	330.89	8.481	-4.008	0.531	90%
367	2.1	330.92	8.481	-4.005	0.528	90%
368	2.1	330.92	8.481	-4.005	0.528	90%
369	2.1	330.92	8.481	-4.005	0.528	90%
370	2.1	330.95	8.481	-4.002	0.525	91%
371	2.1	330.95	8.481	-4.002	0.525	91%
372	2.0	330.979	8.481	-3.999	0.522	91%
373	2.0	330.979	8.481	-3.999	0.522	91%
374	2.0	330.979	8.481	-3.999	0.522	91%
375	2.0	330.979	8.481	-3.999	0.522	91%
376	2.0	331.009	8.481	-3.996	0.519	91%
377	2.0	331.009	8.481	-3.996	0.519	91%
378	2.0	331.009	8.481	-3.996	0.519	91%
379	2.0	331.009	8.481	-3.996	0.519	91%
380	2.0	331.069	8.481	-3.99	0.513	91%
381	2.0	331.069	8.481	-3.99	0.513	91%
382	2.0	331.069	8.481	-3.99	0.513	91%
383	2.0	331.098	8.481	-3.987	0.51	91%
384	2.0	331.098	8.481	-3.987	0.51	91%
385	2.0	331.098	8.481	-3.987	0.51	91%
386	2.0	331.128	8.481	-3.984	0.507	91%
387	2.0	331.128	8.481	-3.984	0.507	91%
388	2.0	331.128	8.481	-3.984	0.507	91%
389	2.0	331.128	8.481	-3.984	0.507	91%
390	2.0	331.158	8.481	-3.981	0.504	91%
391	2.0	331.158	8.481	-3.981	0.504	91%
392	2.0	331.158	8.481	-3.981	0.504	91%
393	2.0	331.187	8.481	-3.978	0.501	91%
394	2.0	331.187	8.481	-3.978	0.501	91%
395	2.0	331.217	8.481	-3.975	0.498	91%
396	2.0	331.247	8.481	-3.972	0.495	91%
397	2.0	331.217	8.481	-3.975	0.498	91%
398	2.0	331.247	8.481	-3.972	0.495	91%
399	2.0	331.247	8.481	-3.972	0.495	91%
400	2.0	331.247	8.481	-3.972	0.495	91%
401	2.0	331.306	8.481	-3.966	0.489	91%
402	2.0	331.277	8.481	-3.969	0.492	91%
403	2.0	331.306	8.481	-3.966	0.489	91%
404	2.0	331.336	8.481	-3.963	0.486	91%
405	2.0	331.336	8.481	-3.963	0.486	91%
406	2.0	331.336	8.481	-3.963	0.486	91%
407	2.0	331.336	8.481	-3.963	0.486	91%
408	2.0	331.366	8.481	-3.959	0.482	91%
409	2.0	331.366	8.481	-3.959	0.482	91%
410	2.0	331.366	8.481	-3.959	0.482	91%
411	1.9	331.366	8.481	-3.959	0.482	91%
412	1.9	331.366	8.481	-3.959	0.482	91%
413	1.9	331.396	8.481	-3.956	0.479	91%
414	1.9	331.396	8.481	-3.956	0.479	91%
415	1.9	331.396	8.481	-3.956	0.479	91%
416	1.9	331.425	8.481	-3.953	0.476	91%
417	1.9	331.425	8.481	-3.953	0.476	91%
418	1.9	331.455	8.481	-3.95	0.473	91%
419	1.9	331.455	8.481	-3.95	0.473	91%
420	1.9	331.455	8.481	-3.95	0.473	91%
421	1.9	331.485	8.481	-3.947	0.47	92%
422	1.9	331.485	8.481	-3.947	0.47	92%
423	1.9	331.514	8.481	-3.944	0.467	92%
424	1.9	331.514	8.481	-3.944	0.467	92%
425	1.9	331.514	8.481	-3.944	0.467	92%
426	1.9	331.544	8.481	-3.941	0.464	92%
427	1.9	331.544	8.481	-3.941	0.464	92%
428	1.9	331.544	8.481	-3.941	0.464	92%
429	1.9	331.574	8.481	-3.938	0.461	92%
430	1.9	331.574	8.481	-3.938	0.461	92%
431	1.9	331.574	8.481	-3.938	0.461	92%
432	1.9	331.574	8.481	-3.938	0.461	92%
433	1.9	331.604	8.481	-3.935	0.458	92%
434	1.9	331.604	8.481	-3.935	0.458	92%
435	1.9	331.604	8.481	-3.935	0.458	92%
436	1.9	331.633	8.481	-3.932	0.455	92%
437	1.9	331.633	8.481	-3.932	0.455	92%
438	1.9	331.663	8.481	-3.929	0.452	92%
439	1.9	331.663	8.481	-3.929	0.452	92%
440	1.9	331.693	8.481	-3.926	0.449	92%
441	1.9	331.693	8.481	-3.926	0.449	92%
442	1.9	331.693	8.481	-3.926	0.449	92%
443	1.9	331.693	8.481	-3.926	0.449	92%

444	1.9	331.693	8.481	-3.926	0.449	92%
445	1.9	331.723	8.481	-3.923	0.446	92%
446	1.9	331.752	8.481	-3.92	0.443	92%
447	1.9	331.752	8.481	-3.92	0.443	92%
448	1.9	331.752	8.481	-3.92	0.443	92%
449	1.9	331.752	8.481	-3.92	0.443	92%
450	1.9	331.752	8.481	-3.92	0.443	92%
451	1.9	331.782	8.481	-3.917	0.44	92%
452	1.9	331.782	8.481	-3.917	0.44	92%
453	1.9	331.782	8.481	-3.917	0.44	92%
454	1.9	331.782	8.481	-3.917	0.44	92%
455	1.9	331.812	8.481	-3.914	0.437	92%
456	1.9	331.842	8.481	-3.911	0.434	92%
457	1.9	331.842	8.481	-3.911	0.434	92%
458	1.9	331.842	8.481	-3.911	0.434	92%
459	1.8	331.842	8.481	-3.911	0.434	92%
460	1.8	331.871	8.481	-3.908	0.431	92%
461	1.8	331.871	8.481	-3.908	0.431	92%
462	1.8	331.871	8.481	-3.908	0.431	92%
463	1.8	331.871	8.481	-3.908	0.431	92%
464	1.8	331.901	8.481	-3.905	0.428	92%
465	1.8	331.871	8.481	-3.908	0.431	92%
466	1.8	331.901	8.481	-3.905	0.428	92%
467	1.8	331.931	8.481	-3.902	0.425	92%
468	1.8	331.931	8.481	-3.902	0.425	92%
469	1.8	331.931	8.481	-3.902	0.425	92%
470	1.8	331.931	8.481	-3.902	0.425	92%
471	1.8	331.931	8.481	-3.902	0.425	92%
472	1.8	331.931	8.481	-3.902	0.425	92%
473	1.8	331.931	8.481	-3.902	0.425	92%
474	1.8	331.96	8.481	-3.899	0.422	92%
475	1.8	331.96	8.481	-3.899	0.422	92%
476	1.8	331.96	8.481	-3.899	0.422	92%
477	1.8	331.96	8.481	-3.899	0.422	92%
478	1.8	331.99	8.481	-3.896	0.419	92%
479	1.8	331.99	8.481	-3.896	0.419	92%
480	1.8	331.99	8.481	-3.896	0.419	92%
481	1.8	331.99	8.481	-3.896	0.419	92%
482	1.8	331.99	8.481	-3.896	0.419	92%
483	1.8	331.99	8.481	-3.896	0.419	92%
484	1.8	332.03	8.481	-3.893	0.416	93%
485	1.8	332.02	8.481	-3.893	0.416	93%
486	1.8	332.05	8.481	-3.89	0.413	93%
487	1.8	332.02	8.481	-3.893	0.416	93%
488	1.8	332.05	8.481	-3.89	0.413	93%
489	1.8	332.05	8.481	-3.89	0.413	93%
490	1.8	332.05	8.481	-3.89	0.413	93%
491	1.8	332.079	8.481	-3.887	0.41	93%
492	1.8	332.109	8.481	-3.884	0.407	93%
493	1.8	332.079	8.481	-3.887	0.41	93%
494	1.8	332.109	8.481	-3.884	0.407	93%
495	1.8	332.079	8.481	-3.887	0.41	93%
496	1.8	332.109	8.481	-3.884	0.407	93%
497	1.8	332.109	8.481	-3.884	0.407	93%
498	1.8	332.109	8.481	-3.884	0.407	93%
499	1.8	332.109	8.481	-3.884	0.407	93%
500	1.8	332.139	8.481	-3.881	0.404	93%
501	1.8	332.139	8.481	-3.881	0.404	93%
502	1.8	332.139	8.481	-3.881	0.404	93%
503	1.8	332.139	8.481	-3.881	0.404	93%
504	1.8	332.169	8.481	-3.878	0.401	93%
505	1.8	332.169	8.481	-3.878	0.401	93%
506	1.8	332.169	8.481	-3.878	0.401	93%
507	1.8	332.198	8.481	-3.875	0.398	93%
508	1.8	332.169	8.481	-3.878	0.401	93%
509	1.8	332.198	8.481	-3.875	0.398	93%
510	1.8	332.198	8.481	-3.875	0.398	93%
511	1.8	332.169	8.481	-3.878	0.401	93%
512	1.8	332.198	8.481	-3.875	0.398	93%
513	1.8	332.198	8.481	-3.875	0.398	93%
514	1.8	332.198	8.481	-3.875	0.398	93%
515	1.8	332.198	8.481	-3.875	0.398	93%
516	1.8	332.198	8.481	-3.875	0.398	93%
517	1.8	332.228	8.481	-3.872	0.395	93%
518	1.8	332.228	8.481	-3.872	0.395	93%
519	1.8	332.228	8.481	-3.872	0.395	93%
520	1.8	332.228	8.481	-3.872	0.395	93%
521	1.7	332.228	8.481	-3.872	0.395	93%
522	1.7	332.258	8.481	-3.868	0.391	93%
523	1.7	332.228	8.481	-3.872	0.395	93%
524	1.7	332.258	8.481	-3.868	0.391	93%
525	1.7	332.258	8.481	-3.868	0.391	93%
526	1.7	332.258	8.481	-3.868	0.391	93%
527	1.7	332.258	8.481	-3.868	0.391	93%
528	1.7	332.258	8.481	-3.868	0.391	93%
529	1.7	332.288	8.481	-3.865	0.388	93%
530	1.7	332.288	8.481	-3.865	0.388	93%
531	1.7	332.288	8.481	-3.865	0.388	93%
532	1.7	332.288	8.481	-3.865	0.388	93%
533	1.7	332.317	8.481	-3.862	0.385	93%
534	1.7	332.317	8.481	-3.862	0.385	93%
535	1.7	332.317	8.481	-3.862	0.385	93%
536	1.7	332.317	8.481	-3.862	0.385	93%
537	1.7	332.347	8.481	-3.859	0.382	93%
538	1.7	332.347	8.481	-3.859	0.382	93%
539	1.7	332.347	8.481	-3.859	0.382	93%
540	1.7	332.377	8.481	-3.856	0.379	93%
541	1.7	332.377	8.481	-3.856	0.379	93%
542	1.7	332.377	8.481	-3.856	0.379	93%
543	1.7	332.347	8.481	-3.859	0.382	93%
544	1.7	332.377	8.481	-3.856	0.379	93%
545	1.7	332.377	8.481	-3.856	0.379	93%
546	1.7	332.377	8.481	-3.856	0.379	93%
547	1.7	332.377	8.481	-3.856	0.379	93%
548	1.7	332.377	8.481	-3.856	0.379	93%
549	1.7	332.406	8.481	-3.853	0.376	93%
550	1.7	332.436	8.481	-3.85	0.373	93%
551	1.7	332.406	8.481	-3.853	0.376	93%
552	1.7	332.436	8.481	-3.85	0.373	93%
553	1.7	332.436	8.481	-3.85	0.373	93%
554	1.7	332.436	8.481	-3.85	0.373	93%
555	1.7	332.436	8.481	-3.85	0.373	93%
556	1.7	332.436	8.481	-3.85	0.373	93%
557	1.7	332.466	8.481	-3.847	0.37	93%
558	1.7	332.466	8.481	-3.847	0.37	93%
559	1.7	332.466	8.481	-3.847	0.37	93%
560	1.7	332.466	8.481	-3.847	0.37	93%
561	1.7	332.466	8.481	-3.847	0.37	93%
562	1.7	332.496	8.481	-3.844	0.367	93%
563	1.7	332.496	8.481	-3.844	0.367	93%
564	1.7	332.496	8.481	-3.844	0.367	93%
565	1.7	332.525	8.481	-3.841	0.364	93%
566	1.7	332.525	8.481	-3.841	0.364	93%
567	1.7	332.525	8.481	-3.841	0.364	93%
568	1.7	332.525	8.481	-3.841	0.364	93%
569	1.7	332.525	8.481	-3.841	0.364	93%
570	1.7	332.525	8.481	-3.841	0.364	93%
571	1.7	332.555	8.481	-3.838	0.361	93%
572	1.7	332.555	8.481	-3.838	0.361	93%
573	1.7	332.555	8.481	-3.838	0.361	93%
574	1.7	332.555	8.481	-3.838	0.361	93%
575	1.7	332.555	8.481	-3.838	0.361	93%
576	1.7	332.555	8.481	-3.838	0.361	93%
577	1.7	332.585	8.481	-3.835	0.358	94%
578	1.7	332.585	8.481	-3.835	0.358	94%
579	1.7	332.585	8.481	-3.835	0.358	94%
580	1.7	332.585	8.481	-3.835	0.358	94%
581	1.7	332.615	8.481	-3.832	0.355	94%
582	1.7	332.615	8.481	-3.832	0.355	94%
583	1.7	332.615	8.481	-3.832	0.355	94%
584	1.7	332.615	8.481	-3.832	0.355	94%
585	1.7	332.615	8.481	-3.832	0.355	94%
586	1.7	332.615	8.481	-3.832	0.355	94%
587	1.7	332.644	8.481	-3.829	0.352	94%
588	1.7	332.644	8.481	-3.829	0.352	94%
589	1.7	332.615	8.481	-3.832	0.355	94%
590	1.7	332.644	8.481	-3.829	0.352	94%
591	1.7	332.644	8.481	-3.829	0.352	94%
592	1.7	332.674	8.481	-3.826	0.349	94%

593	1.7	332.674	8.481	-3.826	0.349	94%
594	1.7	332.674	8.481	-3.826	0.349	94%
595	1.7	332.674	8.481	-3.826	0.349	94%
596	1.7	332.674	8.481	-3.826	0.349	94%
597	1.7	332.674	8.481	-3.826	0.349	94%
598	1.7	332.674	8.481	-3.826	0.349	94%
599	1.7	332.674	8.481	-3.826	0.349	94%
600	1.7	332.704	8.481	-3.823	0.346	94%
601	1.6	332.704	8.481	-3.823	0.346	94%
602	1.6	332.674	8.481	-3.826	0.349	94%
603	1.6	332.674	8.481	-3.826	0.349	94%
604	1.6	332.704	8.481	-3.823	0.346	94%
605	1.6	332.704	8.481	-3.823	0.346	94%
606	1.6	332.704	8.481	-3.823	0.346	94%
607	1.6	332.734	8.481	-3.82	0.343	94%
608	1.6	332.704	8.481	-3.823	0.346	94%
609	1.6	332.704	8.481	-3.823	0.346	94%
610	1.6	332.734	8.481	-3.82	0.343	94%
611	1.6	332.704	8.481	-3.823	0.346	94%
612	1.6	332.734	8.481	-3.82	0.343	94%
613	1.6	332.704	8.481	-3.823	0.346	94%
614	1.6	332.734	8.481	-3.82	0.343	94%
615	1.6	332.763	8.481	-3.817	0.34	94%
616	1.6	332.763	8.481	-3.817	0.34	94%
617	1.6	332.734	8.481	-3.82	0.343	94%
618	1.6	332.734	8.481	-3.82	0.343	94%
619	1.6	332.763	8.481	-3.817	0.34	94%
620	1.6	332.763	8.481	-3.817	0.34	94%
621	1.6	332.763	8.481	-3.817	0.34	94%
622	1.6	332.793	8.481	-3.814	0.337	94%
623	1.6	332.763	8.481	-3.817	0.34	94%
624	1.6	332.763	8.481	-3.817	0.34	94%
625	1.6	332.763	8.481	-3.817	0.34	94%
626	1.6	332.793	8.481	-3.814	0.337	94%
627	1.6	332.793	8.481	-3.814	0.337	94%
628	1.6	332.793	8.481	-3.814	0.337	94%
629	1.6	332.793	8.481	-3.814	0.337	94%
630	1.6	332.823	8.481	-3.811	0.334	94%
631	1.6	332.793	8.481	-3.814	0.337	94%
632	1.6	332.793	8.481	-3.814	0.337	94%
633	1.6	332.823	8.481	-3.811	0.334	94%
634	1.6	332.823	8.481	-3.811	0.334	94%
635	1.6	332.823	8.481	-3.811	0.334	94%
636	1.6	332.823	8.481	-3.811	0.334	94%
637	1.6	332.823	8.481	-3.811	0.334	94%
638	1.6	332.852	8.481	-3.808	0.331	94%
639	1.6	332.852	8.481	-3.808	0.331	94%
640	1.6	332.852	8.481	-3.808	0.331	94%
641	1.6	332.852	8.481	-3.808	0.331	94%
642	1.6	332.852	8.481	-3.808	0.331	94%
643	1.6	332.852	8.481	-3.808	0.331	94%
644	1.6	332.823	8.481	-3.811	0.334	94%
645	1.6	332.852	8.481	-3.808	0.331	94%
646	1.6	332.852	8.481	-3.808	0.331	94%
647	1.6	332.852	8.481	-3.808	0.331	94%
648	1.6	332.852	8.481	-3.808	0.331	94%
649	1.6	332.852	8.481	-3.808	0.331	94%
650	1.6	332.852	8.481	-3.808	0.331	94%
651	1.6	332.852	8.481	-3.808	0.331	94%
652	1.6	332.852	8.481	-3.808	0.331	94%
653	1.6	332.882	8.481	-3.805	0.328	94%
654	1.6	332.882	8.481	-3.805	0.328	94%
655	1.6	332.882	8.481	-3.805	0.328	94%
656	1.6	332.882	8.481	-3.805	0.328	94%
657	1.6	332.882	8.481	-3.805	0.328	94%
658	1.6	332.882	8.481	-3.805	0.328	94%
659	1.6	332.912	8.481	-3.802	0.325	94%
660	1.6	332.912	8.481	-3.802	0.325	94%
661	1.6	332.912	8.481	-3.802	0.325	94%
662	1.6	332.912	8.481	-3.802	0.325	94%
663	1.6	332.912	8.481	-3.802	0.325	94%
664	1.6	332.912	8.481	-3.802	0.325	94%
665	1.6	332.912	8.481	-3.802	0.325	94%
666	1.6	332.942	8.481	-3.799	0.322	94%
667	1.6	332.942	8.481	-3.799	0.322	94%
668	1.6	332.942	8.481	-3.799	0.322	94%
669	1.6	332.942	8.481	-3.799	0.322	94%
670	1.6	332.942	8.481	-3.799	0.322	94%
671	1.6	332.942	8.481	-3.799	0.322	94%
672	1.6	332.942	8.481	-3.799	0.322	94%
673	1.6	332.942	8.481	-3.799	0.322	94%
674	1.6	332.942	8.481	-3.799	0.322	94%
675	1.6	332.971	8.481	-3.796	0.319	94%
676	1.6	332.971	8.481	-3.796	0.319	94%
677	1.6	332.971	8.481	-3.796	0.319	94%
678	1.6	332.971	8.481	-3.796	0.319	94%
679	1.6	332.971	8.481	-3.796	0.319	94%
680	1.6	332.971	8.481	-3.796	0.319	94%
681	1.6	332.971	8.481	-3.796	0.319	94%
682	1.6	332.971	8.481	-3.796	0.319	94%
683	1.6	332.971	8.481	-3.796	0.319	94%
684	1.6	332.971	8.481	-3.796	0.319	94%
685	1.6	332.971	8.481	-3.796	0.319	94%
686	1.6	333.001	8.481	-3.793	0.316	94%
687	1.6	333.001	8.481	-3.793	0.316	94%
688	1.6	333.001	8.481	-3.793	0.316	94%
689	1.6	332.971	8.481	-3.796	0.319	94%
690	1.6	332.971	8.481	-3.796	0.319	94%
691	1.6	333.001	8.481	-3.793	0.316	94%
692	1.6	333.001	8.481	-3.793	0.316	94%
693	1.6	333.001	8.481	-3.793	0.316	94%
694	1.6	333.031	8.481	-3.79	0.313	94%
695	1.6	333.031	8.481	-3.79	0.313	94%
696	1.6	333.031	8.481	-3.79	0.313	94%
697	1.6	333.031	8.481	-3.79	0.313	94%
698	1.6	333.031	8.481	-3.79	0.313	94%
699	1.6	333.031	8.481	-3.79	0.313	94%
700	1.6	333.031	8.481	-3.79	0.313	94%
701	1.6	333.031	8.481	-3.79	0.313	94%
702	1.6	333.031	8.481	-3.79	0.313	94%
703	1.6	333.031	8.481	-3.79	0.313	94%
704	1.6	333.031	8.481	-3.79	0.313	94%
705	1.6	333.031	8.481	-3.79	0.313	94%
706	1.6	333.061	8.481	-3.787	0.31	94%
707	1.6	333.061	8.481	-3.787	0.31	94%
708	1.6	333.061	8.481	-3.787	0.31	94%
709	1.6	333.061	8.481	-3.787	0.31	94%
710	1.5	333.061	8.481	-3.787	0.31	94%
711	1.5	333.061	8.481	-3.787	0.31	94%
712	1.5	333.061	8.481	-3.787	0.31	94%
713	1.5	333.061	8.481	-3.787	0.31	94%
714	1.5	333.061	8.481	-3.787	0.31	94%
715	1.5	333.09	8.481	-3.784	0.307	94%
716	1.5	333.09	8.481	-3.784	0.307	94%
717	1.5	333.09	8.481	-3.784	0.307	94%
718	1.5	333.12	8.481	-3.781	0.304	95%
719	1.5	333.09	8.481	-3.784	0.307	94%
720	1.5	333.12	8.481	-3.781	0.304	95%
721	1.5	333.12	8.481	-3.781	0.304	95%
722	1.5	333.12	8.481	-3.781	0.304	95%
723	1.5	333.12	8.481	-3.781	0.304	95%
724	1.5	333.12	8.481	-3.781	0.304	95%
725	1.5	333.12	8.481	-3.781	0.304	95%
726	1.5	333.12	8.481	-3.781	0.304	95%
727	1.5	333.12	8.481	-3.781	0.304	95%
728	1.5	333.15	8.481	-3.778	0.301	95%
729	1.5	333.15	8.481	-3.778	0.301	95%
730	1.5	333.15	8.481	-3.778	0.301	95%
731	1.5	333.15	8.481	-3.778	0.301	95%
732	1.5	333.15	8.481	-3.778	0.301	95%
733	1.5	333.15	8.481	-3.778	0.301	95%
734	1.5	333.15	8.481	-3.778	0.301	95%
735	1.5	333.15	8.481	-3.778	0.301	95%
736	1.5	333.18	8.481	-3.774	0.297	95%
737	1.5	333.18	8.481	-3.774	0.297	95%
738	1.5	333.18	8.481	-3.774	0.297	95%
739	1.5	333.18	8.481	-3.774	0.297	95%
740	1.5	333.18	8.481	-3.774	0.297	95%
741	1.5	333.18	8.481	-3.774	0.297	95%

ATTACHMENT C

RESULTS OF LABORATORY TESTING OF WELL WATER SAMPLES

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Certificate of Analysis

Client: Kollaard Associates Inc.
210 Prescott St., Box 189
Kemptville, ON
K0G 1J0
Attention: Ms. Colleen Vermeersch
PO#: 180024
Invoice to: Kollaard Associates Inc.

Report Number: 1906237
Date Submitted: 2019-04-26
Date Reported: 2019-05-03
Project: 190298
COC #: 200989

Dear Colleen Vermeersch:

Please find attached the analytical results for your samples. If you have any questions regarding this report, please do not hesitate to call (613-727-5692).

Report Comments:

APPROVAL: Addrine Thomas 2019.05.03 10:14:15 -04'00'

Addrine Thomas, Inorganics Supervisor

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Report Number: 1906237
Date Submitted: 2019-04-26
Date Reported: 2019-05-03
Project: 190298
COC #: 200989

				Lab I.D.	1423042
				Sample Matrix	Water
				Sample Type	
				Sampling Date	2019-04-25
				Sample I.D.	TW1 6hr
Group	**Analyte**	**MRL**	**Units**	**Guideline**	
Anions	Cl	1	mg/L	AO 250	286*
	F	0.10	mg/L	MAC 1.5	0.40
	N-NO2	0.10	mg/L	MAC 1.0	<0.10
	N-NO3	0.10	mg/L	MAC 10.0	<0.10
	SO4	1	mg/L	AO 500	589*
General Chemistry	Alkalinity as CaCO3	5	mg/L	OG 500	228
	Colour	2	TCU	AO 5	2
	Conductivity	5	uS/cm		2470
	pH	1.00		6.5-8.5	8.02
	S2-	0.01	mg/L	AO 0.05	<0.01
	TDS (COND - CALC)	1	mg/L	AO 500	1850*
	Turbidity	0.1	NTU	AO 5.0	4.3
Hardness	Hardness as CaCO3	1	mg/L	OG 100	269*
Indices/Calc	Ion Balance	0.01			0.91
Metals	Ca	1	mg/L		35
	Fe	0.03	mg/L	AO 0.3	0.50*
	K	1	mg/L		19
	Mg	1	mg/L		44
	Mn	0.01	mg/L	AO 0.05	0.02
	Na	2	mg/L	AO 200	387*
Subcontract-Inorg	DOC	0.5	mg/L	AO 5	4.5
	N-NH3	0.04	mg/L		1.10
	Phenols	0.001	mg/L		<0.001
	Tannin & Lignin	0.1	mg/L		0.1
	Total Kjeldahl Nitrogen	0.1	mg/L		1.1

Guideline = ODWSOG *** = Guideline Exceedence**

Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

Certificate of Analysis

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Attention: Ms. Colleen Vermeersch
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Invoice to: Kollaard Associates Inc.

Report Number: 1906237
Date Submitted: 2019-04-26
Date Reported: 2019-05-03
Project: 190298
COC #: 200989

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 364457 **Analysis/Extraction Date** 2019-04-27 **Analyst** Z_S **Method** SM2320,2510,4500H/F			
Alkalinity (CaCO3)	<5 mg/L	100	90-110
Conductivity	<5 uS/cm	100	90-110
F	<0.10 mg/L	90	90-110
pH		99	90-110
Run No 364461 **Analysis/Extraction Date** 2019-04-28 **Analyst** K_J **Method** C SM2130B			
Turbidity	<0.1 NTU	101	70-130
Run No 364462 **Analysis/Extraction Date** 2019-04-29 **Analyst** K_J **Method** C SM2120C			
Colour	<2 TCU	100	90-110
Run No 364572 **Analysis/Extraction Date** 2019-04-29 **Analyst** SKH **Method** EPA 200.8			
Iron	<0.03 mg/L	94	91-109
Manganese	<0.01 mg/L	97	92.9-107
Run No 364588 **Analysis/Extraction Date** 2019-04-29 **Analyst** AA **Method** SM 4110			
N-NO2	<0.10 mg/L	109	90-110

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Client: Kollaard Associates Inc.
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Attention: Ms. Colleen Vermeersch
PO#: 180024
Invoice to: Kollaard Associates Inc.

Report Number: 1906237
Date Submitted: 2019-04-26
Date Reported: 2019-05-03
Project: 190298
COC #: 200989

QC Summary

Analyte	Blank	QC % Rec	QC Limits
N-NO3	<0.10 mg/L	102	90-110
Run No 364603 **Analysis/Extraction Date** 2019-04-30 **Analyst** SKH **Method** M SM3120B-3500C			
Calcium	<1 mg/L	106	90-110
Run No 364740 **Analysis/Extraction Date** 2019-05-01 **Analyst** AET **Method** C SM4500-S2-D			
S2-	<0.01 mg/L	103	80-120
Run No 364833 **Analysis/Extraction Date** 2019-04-30 **Analyst** REE **Method** SUBCONTRACT P-INORG			
DOC	<0.5 mg/L	92	
N-NH3	<0.01 mg/L	99	
Phenols	<0.001 mg/L	84	69-132
Tannin & Lignin	<0.1 mg/L	110	
Total Kjeldahl Nitrogen	<0.1 mg/L	97	81-126
Run No 364846 **Analysis/Extraction Date** 2019-05-02 **Analyst** H_D **Method** M SM3120B-3500C			
Potassium	<1 mg/L	103	87-113
Magnesium	<1 mg/L	102	76-124
Sodium	<2 mg/L	92	82-118

Guideline = ODWSOG *** = Guideline Exceedence**

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Certificate of Analysis

Client: Kollaard Associates Inc.
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Attention: Ms. Colleen Vermeersch
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Invoice to: Kollaard Associates Inc.

Report Number: 1906237
Date Submitted: 2019-04-26
Date Reported: 2019-05-03
Project: 190298
COC #: 200989

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 364880 **Analysis/Extraction Date** 2019-05-03 **Analyst** AA **Method** SM 4110			
Chloride	<1 mg/L	100	90-110
SO4	<1 mg/L	100	90-110
Run No 364881 **Analysis/Extraction Date** 2019-05-03 **Analyst** AET **Method** C SM2340B			
Hardness as CaCO3			
Ion Balance			
TDS (COND - CALC)			

Guideline = ODWSOG *** = Guideline Exceedence**

Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

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Attention: Ms. Colleen Vermeersch
PO#: 180024
Invoice to: Kollaard Associates Inc.

Report Number: 1906236
Date Submitted: 2019-04-26
Date Reported: 2019-04-28
Project: 190298
COC #: 200989

Dear Colleen Vermeersch:

Please find attached the analytical results for your samples. If you have any questions regarding this report, please do not hesitate to call (613-727-5692).

Report Comments:

APPROVAL: Dragana Dzeletovic 2019.04.28 12:17:11 -04'00'

Dragana Dzeletovic, Team Leader

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Date Reported: 2019-04-28
Project: 190298
COC #: 200989

				Lab I.D.	1423041
				Sample Matrix	Water
				Sample Type	-
				Sampling Date	2019-04-25
				Sample I.D.	TW1 6hr
Group	**Analyte**	**MRL**	**Units**	**Guideline**	
Microbiology	Escherichia Coli	0	ct/100mL	MAC 0	0
	Faecal Coliforms	0	ct/100mL		0
	Heterotrophic Plate Count	0	ct/1mL		0
	Total Coliforms	0	ct/100mL	MAC 0	0

Guideline = ODWSOG *** = Guideline Exceedence**

Results relate only to the parameters tested on the samples submitted.
Analytical Method: AMBCOLM1
additional QA/QC information available on request.

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Ryznar Stability Index

RSI = 2(pH_s) - pH

RSI << 6 → the scale tendency increases as the index decreases
RSI >> 7 → the calcium carbonate formation probably does not lead to a protective corrosion inhibitor film
RSI >> 8 → mild steel corrosion becomes an increasing problem

Langelier Saturation Index

LSI = pH - pH_s

If LSI is negative → no potential to scale, the water will dissolve $CaCO_3$
If LSI is positive → scale can form and $CaCO_3$ precipitation may occur
If LSI is close to zero → borderline scale potential, water quality or temperature change or evaporation could change the index

where pH measured from sample
pH_s = pH at saturation in calcite or calcium carbonate

$$pH_s = (9.3 + A + B) - (C + D)$$

$$A = \frac{\log_{10}[TDS] - 1}{10}$$

$$B = -13.12 \times \log_{10}(°C + 273) + 34.55$$

$$C = \log_{10}[Ca^{2+} as CaCO_3] - 0.4$$

$$D = \log_{10}[alkalinity as CaCO_3]$$

	TW1-6hr
pH	8.02
hardness [mg/l as $CaCo_3$]	269
Alkalinity [mg/l as $CaCo_3$]	228
total dissolved solids [mg/l]	1850
temperature (°C)	8.48
→→ RSI	7.08
→→ LSI	0.47