Houle Chevrier Engineering Ltd.
180 Wescar Lane
R.R. 2
Carp, Ontario K0A 1L0
Tel.: (613) 836-1422
Fax: (613) 836-9731
www.hceng.ca

REPORT ON

HYDROGEOLOGICAL EVALUATION
PROPOSED COMMERCIAL DEVELOPMENT
35 SAPPERS RIDGE
OTTAWA, ONTARIO

Submitted to:

Apex Developments Inc.
900 Morrison Drive
Ottawa, Ontario
K2H 8K7

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August 2013

Our Ref: 13-106

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August 26, 2013

Our ref: 13-106

Apex Developments Inc.
900 Morrison Drive
Ottawa, Ontario
K2H 8K7

Attention: Mr. Matthew Firestone

RE: HYDROGEOLOGICAL INVESTIGATION
PROPOSED COMMERCIAL DEVELOPMENT
35 SAPPERS RIDGE
HAWTHORNE INDUSTRIAL PARK
OTTAWA, ONTARIO

Dear Sir:

This letter presents the results of a hydrogeological investigation carried out as part of a site plan approval at 35 Sappers Ridge in Ottawa, Ontario (refer to Key Plan, Figure 1).

The purpose of the investigation was to confirm the following:

- That the quality of the water in a drilled well at the site meets the Ministry of the Environment (MOE) Regulations, Standards, Guidelines and Objectives; and,
- That there is sufficient quantity of groundwater from the well for the intended use.

BACKGROUND

The hydrogeological investigation was required to demonstrate that the test well is capable of providing sufficient yields and quality of water to service the proposed development located at 35 Sappers Ridge in Hawthorne Industrial Park. It is our understanding that the hydrogeological assessment is required as part of the site plan approval process.

The well will be used to service up to three (3) commercial buildings, which will be subdivided into smaller units and rented to occupants. At the time of the hydrogeological assessment , the exact occupant use of the rental units was unknown. The wastewater from the site will be disposed of in an onsite septic system.

The subject site is situated in an industrial park setting (Hawthorne Industrial Park). It is noted that the majority of the lots in the industrial park are currently undeveloped.

SITE GEOLOGY

A site specific geotechnical investigation was carried out on the subject site by Houle Chevrier Engineering Ltd. The results of the investigation are presented in our report entitled "Geotechnical Investigation, Proposed Commercial Development, Hawthorne Business Park (Lot H), Ottawa, Ontario" dated May of 2013.

The results of the geotechnical investigation indicated that the overburden soils at the subject site generally consist of:

- Fill material consisting of varying amounts of clay, silt, sand, gravel and debris (concrete, brick, asphalt and organics). The thickness of the fill material ranged from about 3.1 to 4.0 metres in thickness at the test hole locations;

- Former topsoil was encountered in several areas of the subject site underlying the fill material. Where encountered, the fill material ranged in thickness from about 0.5 to 0.6 metres;

- Silty clay was encountered below the fill material and/or former topsoil in several locations. The silty clay was noted to range in thickness from about 0.2 to 0.8 metres;

- Silty sand to sand with trace to some silt was encountered below the fill, former topsoil and/or silty clay throughout the site. The sand was determined to overlie the bedrock; and,

- Bedrock and/or inferred bedrock was encountered at the site at depths ranging from about 6.9 to 9.8 metres below ground surface. Where cored, the bedrock was determined to be sandstone.

Groundwater seepage/inflow was noted on the test pit side walls at depths ranging from 0.9 to 1.8 metres (averaging 1.4 metres) below ground surface. It should be noted that groundwater levels will fluctuate seasonally and may be higher during wet periods of the year, such as the early spring or fall, or following periods of heavy precipitation.

WELL CONTRUCTION

The water supply well at 35 Sappers Ridge was drilled on July 18, 2013, by a licensed MOE well contractor (J. R. Drilling Co. Ltd.; License No. 3749) using a rotary air percussion drill rig. The approximate location of the water well is provided on the Site Plan, Figure 2. A copy of the MOE Water Well Record is provided in Attachment A.

A steel well casing was sealed into the bedrock using pressure grouting techniques. High early strength cement was used to seal the steel well casing into the bedrock utilizing a pressure grouting method from 12.2 metres below ground surface up to the ground surface. The grouting of the well casing was observed by Houle Chevrier Engineering Ltd. staff on July 17, 2013. The well casing was determined based on the specified minimum well casing length as stated in Schedule F - Covenant 1 of the Subdivision Agreement provided to us for review. The Subdivision Agreement states that a minimum of 12 metres of well casing is required AND the well casing is to extend a minimum of 1 metre into competent bedrock. Based on the casing

length and depth to bedrock reported to us at the time of the well grouting inspection, both of these well construction requirements were met.

The construction details from the MOE Water Well Record are summarized in the following table:

Well Construction Details	
Depth to Bedrock	7.3 metres
Length of Well Casing	12.8 metres
Length of Well Casing below ground surface	12.2 metres
Length of Casing set into Bedrock	4.4 metres
Depth Water Found	41.1 metres
Total Well Depth	47.2 metres

GROUNDWATER QUANTITY

A pumping test was carried out on the water well by a member of Houle Chevrier Engineering Ltd. staff on July 24, 2013. After an initial flow rate adjustment (initial flow rate was estimated to be approximately 80 litres per minute) within the first six (6) minutes of pumping, the well was pumped at a constant rate of 41 litres per minute for a period of eight (8) hours and fourteen (14) minutes. The water from the pumping test was discharged to the ground surface at a distance of approximately 4 metres towards the west boundary of the subject site and directed to a roadside drainage ditch.

The selected pumping rate was chosen to demonstrate sufficient well capacity to service the proposed site use. Based on information provided to us by Novatech Engineering Consultants Ltd. regarding the septic system design to service the proposed buildings, the daily design flow of the septic system is about 8,400 litres per day. A copy of an email providing septic design flow calculations dated June 13, 2013 prepared by Novatech Engineering Ltd. is provided in Attachment B.

Water level measurements were taken at regular intervals throughout the pumping test. Water levels were also taken during the recovery phase of the pumping test (after the pump was turned off). The drawdown and recovery data and drawdown graph are provided in Attachment C.

The transmissivity of the water supply aquifer was estimated from the pump test drawdown and recovery data using Aquifer Test Pro 4.2, a commercially available software program from Waterloo Hydrogeologic Inc. An analysis of the pump test and recovery data was carried out using the Theis method of analysis. The results of the Aquifer Test Pro 4.2 analysis are provided in Attachment D.

The fit of the Theis curve is considered to be good. The Theis analysis indicates that the transmissivity of the water supply aquifer is approximately 18 m^2/day. The storage coefficient cannot be readily obtained from a single pumping well and, therefore, no comments are provided regarding the storage coefficient.

A qualitative evaluation of the pumping test data indicates that the quantity of water available from the well is more than sufficient for the proposed commercial use. The maximum drawdown in the water level in the well was about 2.9 metres following about 8 hours of pumping at a flow rate of 41 litres per minute. Based on the depth of the well and the static water level, the remaining available drawdown in the well after eight (8) hours of pumping was approximately 36.6 metres.

The pumping test discharged a total of about 20,250 litres from the well over the course of the pumping test. The pumping test demonstrates that the onsite water well is capable of providing at least 20,250 litres over a period of approximately eight hours, which is approximately 2.4 times the estimated total demand. Furthermore, the water level in the well recovered about 95 percent of the drawdown within a period of 2 hours and 36 minutes after the pump was stopped. Full recovery (100 percent) was achieved approximately 4 hours and 53 minutes after the pump was stopped. The recovery of the well is deemed to be very good.

In our opinion, the quantity of water available from the well is more than sufficient based on the volume of water pumped in combination with the excellent recovery of the well and the large remaining available drawdown at the end of the pumping test. The sustained flow rate in combination with the available drawdown remaining indicates that the well should be capable of providing adequate quantities of groundwater for the proposed site use. Furthermore, the recovery of the well following the extended pumping test indicates that the water well should be able to sustain repeated pumping in the long term.

GROUNDWATER QUALITY

Water samples were collected by Houle Chevrier Engineering Ltd. after four (4) and eight (8) hours of pumping and submitted to Exova Ottawa laboratory for analysis of subdivision package parameters. A copy of the laboratory certificates of analysis for the water samples are provided in Attachment E. In addition, due to the location of the site within an industrial setting, a water sample was collected after 8 hours of pumping and submitted to Exova Ottawa laboratory for analysis of Petroleum Hydrocarbons (PHC's F1 to F4), Polynuclear Aromatic Hydrocarbons (PAH's) and Volatile Organic Compounds (VOC's). The results of the additional chemical testing are also provided in Attachment E.

Field measurements for temperature, pH, conductivity, Total Dissolved Solids (TDS), turbidity and total chlorine were taken at regular intervals throughout the pumping test and are summarized in Table 1 following the text of this report.

The results of the laboratory analysis on the water samples are summarized in Table 2 along with the applicable standards, guidelines and objectives provided in the Ontario Drinking Water Standards (ODWS).

Due to total coliform bacteria exceedances of the Ontario Drinking Water Standards (ODWS) in the four (4) and eight (8) hour water samples, the test well was chlorinated and pumped by the water well driller. Two (2) additional water samples were collected by Houle Chevrier Engineering Ltd. staff on August 2, 2013. The following steps were taken when collecting the additional water samples:

- Field test for total chlorine in the discharge water confirmed the absence of chlorine;
- Continue pumping for fifteen (15) minutes;

- Field test for total chlorine in the discharge water confirmed the continued absence of chlorine;
- Collected water sample TW1-R1;
- Continue pumping for fifteen (15) minutes;
- Field test for total chlorine in the discharge water confirmed the continued absence of chlorine;
- Collected water sample TW1-R2; and,
- Shut off pump.

The results of the additional bacteriological testing are provided in Table 2. A copy of the laboratory certificate of analysis for the additional bacteriological sampling carried out on August 2, 2013 is provided in Attachment F.

The following comments are provided regarding the drinking water quality and exceedances of the ODWS:

Bacteriological Results

Total chlorine measurements made at regular intervals during the pumping test confirmed that the total chlorine concentrations in the well water were non-detectable at the time of bacteriological sampling on July 24, 2013.

The results of the bacteriological analysis of the July 24, 2013 water samples indicated low levels (1 count per 100 mL) of total coliform bacteria in both the 4 and 8 hour water samples. Additionally, it was noted that a low count (5 counts per 100 mL) of faecal streptococcus bacteria was present in the 4 hour water sample. The remaining bacteriological parameters met the ODWS standards for bacteriological parameters.

Additional water samples were collected on August 2, 2013 following chlorination and pumping of the test well by the water well driller. Total chlorine measurements made prior to the collection of the bacteriological samples confirmed that total chlorine concentrations in the well water were non-detectable at the time of bacteriological sampling on August 2, 2013.

The results of the bacteriological analysis of the August 2, 2013 water samples indicated that all the bacteriological parameters met their respective ODWS standards. In addition, the concentration of other bacteria indicator species, such as faecal coliform and faecal streptococcus bacteria, were determined to be non-detectable in all of the water samples.

Based on the bacteriological testing on August 2, 2013, the water is suitable for consumption.

Chemical Results

The results of the chemical testing on the water samples indicate the operational guideline for hardness was exceeded in both of the water samples. The aesthetic objective for hydrogen sulphide was exceeded in the 4 hour sample but not the 8 hour sample due to an elevated minimum detection limit for this parameter in the 4 hour sample. The aesthetic objectives for total dissolved solids (TDS), turbidity, iron and manganese were exceeded in the 4 and 8 hour samples.

It is also noted that the laboratory certificates of analysis indicate that the maximum acceptable concentration for turbidity is 1.0 NTU. The health related maximum acceptable concentration for turbidity is 1.0 NTU, which is applicable for water undergoing disinfection processes. For the purposes of this investigation, the aesthetic objective of 5.0 NTU for turbidity provided in the ODWS is used. The field testing results indicate that the water met the aesthetic objective for turbidity after 8 hours of pumping.

The concentration of sodium in the water supply met the ODWS aesthetic objective for sodium; however, the concentration exceeded the warning level for persons on sodium restricted diets.

The above noted exceedances are discussed in the follow sections:

Hardness

The hardness of the water samples ranged from 548 to 557 mg/L as $CaCO_3$, which exceeds the ODWS operational guideline for hardness. Water having a hardness above 100 milligrams per litre as $CaCO_3$ is often softened for prior to use. Water softeners are widely used throughout rural areas to treat hardness and there is no upper treatable limit for hardness. Based on the document MOE Procedure D-5-5, there is no upper treatable limit for hardness using conventional water softeners.

It is noted that the ODWS states that hardness levels in excess of 500 mg/L as $CaCO_3$ is considered to be unacceptable for most domestic purposes; however, the subject site is to be used for industrial purposes and, therefore, the elevated hardness levels are not considered to preclude use of the test well for the proposed development.

Water softening by conventional sodium ion exchange water softeners that use sodium chloride may introduce relatively high concentrations of sodium into the drinking water, which may be of concern to persons on a sodium restricted diet. Due to the high levels of hardness, it is recommended that the use of potassium chloride in the water softener (which adds potassium to the water instead of sodium) be considered as a means of keeping sodium concentrations in softened water at the background level.

Total Dissolved Solids (TDS)

The levels of TDS in the water sample from the test well ranged from 882 to 889 mg/L and were above the ODWS aesthetic objective of 500 milligrams per litre. As per Table 3 in the Appendix of the MOE Guideline D-5-5, rationale must be provided that corrosion, encrustation or taste problems will not occur when there are exceedances of the ODWS for TDS.

To determine the corrosive nature of the groundwater, the Langelier Index (LI) was calculated for the 8 hour water sample obtained from the test well. These values are based on the TDS, temperature, pH, alkalinity (as $CaCO_3$), and calcium in the sample. A copy of the calculation to determine the LI value is provided in Attachment G.

The LI was calculated to be +0.8 for the 8 hour water sample. Available information indicates that the desired range of LI to prevent corrosion and scaling is an LI between -0.5 and 0.5. At a LI between 0.5 and 1.0, some faint to mild scale coating may be expected. Based on the marginal exceedance of the LI value for the 8 hour sample from this well and the recommendation for water softening, the degree of scaling of plumbing should be acceptable. Based on our experience of conducting interviews at sites with TDS levels of less than 1,000

mg/L, no taste problems are expected. However, it is noted that taste preferences can be subjective and differ from individual to individual.

Turbidity

The laboratory Certificates of Analysis indicates that the level of turbidity in test well TW1 exceeded the ODWS aesthetic objective for both the 4 and 8 hour samples. The level of turbidity measured in the field during the pumping test (refer to Table 1) for test well TW1 was 4.0 NTU after 8 hours of pumping, which is below the aesthetic objective of the ODWS. The elevated levels of turbidity shown the laboratory results of analysis may be due to precipitation of iron compounds during transport to the laboratory and to temperature changes. This is supported by the levels of iron detected in the test well. Based on the field turbidity measurements made at the time of water sampling for TW1, the level of turbidity meets the ODWS aesthetic objective.

Hydrogen Sulphide

An exceedance of hydrogen sulphide was noted in the 4 hour water sample. The reported concentration of hydrogen sulphide (<0.10 mg/L) is attributed to the elevated detection limit for hydrogen sulphide in the 4 hour water sample. The 8 hour water sample was below the method of detection of the laboratory and below the aesthetic objective of the ODWS. Based on the 8 hour water sample laboratory analysis result, the concentration of hydrogen sulphide meets the ODWS aesthetic objective.

Iron

The iron concentration in the 4 and 8 hour water samples ranged from 1.04 to 1.14 mg/L and exceeded the ODWS aesthetic objective for iron. The MOE Procedure D-5-5 document indicates that iron concentrations up to 5.0 mg/L are considered treatable by conventional water softeners. The iron concentration in the test well is well below the treatable limit for water softeners provided by MOE Procedure D-5-5 and is not of concern.

Manganese

The manganese concentration was 0.22 mg/L in both the 4 and 8 hour water samples and is above the aesthetic objective of 0.05 mg/L listed by the ODWS. The MOE Procedure D-5-5 document indicates that manganese concentrations up to 1.0 mg/L are considered treatable by conventional water softeners. The manganese concentration in the water samples are well below the treatable limit for water softeners provided by MOE Procedure D-5-5 and are not of concern.

Sodium

The concentration of sodium in the water supply was 70 mg/L in both the 4 and 8 hour water samples and met the ODWS aesthetic objective of 200 mg/L for sodium; however, the concentration exceeded the 20 mg/L warning level for persons on sodium restricted diets. Warning should be posted at possible drinking water locations throughout the development indicating that elevated sodium concentrations are present and may be of concern to persons on sodium restricted diets.

Water softening of the water supply with a conventional water softener using sodium chloride water softening salt may significantly increase the sodium concentration of the water. Based on the high level of hardness detected in the testing, it is possible that the resulting sodium concentrations could exceed the ODWS aesthetic objective of 200 mg/L. Therefore, it is recommended that consideration be given to using potassium chloride salt in the conventional water softeners in lieu of sodium chloride salt.

COMMENTS ON ADDITIONAL CHEMICAL TESTING

A water sample was collected from the test well after 8 hours of pumping and was analyzed for Petroleum Hydrocarbons (PHC's F1 to F4), Polynuclear Aromatic Hydrocarbons (PAH's) and Volatile Organic Compounds (VOC's). The results of the additional chemical testing are provided in Attachment E.

The concentrations of all parameters for PHC's, PAH's and VOC's were below the method of detection of the laboratory and any applicable standards of the ODWS. No impacts from the industrial setting of the surrounding land use were detected in the water sample. Based on the chemical testing of the 8 hour water sample, no impacts from surrounding land use were detected in the test well.

CONCLUSIONS

Based on the results of the pumping test carried out on July 24, 2013, the quantity of water from the test well is considered to be sufficient for the proposed commercial use.

Initial bacteriological testing of the test well indicated low level exceedances of the ODWS bacteriological limits for total coliform bacteria. The test well was subsequently chlorinated and pumped by the water well driller and follow up water sampling was carried out by Houle Chevrier Engineering Ltd. staff on August 2, 2013. Based on the results of the follow up water sampling, the water from the test well meets all the bacteriological standards of the ODWS.

The laboratory analysis and field measurements of water quality indicate that the water meets the ODWS standards, guidelines and objectives, with the exception of the operational guideline exceedance for hardness and the aesthetic objectives for total dissolved solids, iron and manganese. The operational guideline exceedance for hardness is considered to be treatable through the use of conventional water softening. It is noted that hardness levels in excess of 500 mg/L as $CaCO_3$ were detected which the ODWS states is unacceptable for most domestic uses; however, since the water supply is to be used in an industrial setting, the hardness level is considered to be acceptable if properly treated. Due to the high level of hardness, it is recommended that potassium chloride salt be considered for use in the water softener in order to maintain sodium concentrations at background levels.

The concentration of TDS was noted to exceed the ODWS aesthetic objective. The Langelier Index for the 8 hour water sample was calculated as 0.8 which indicates that faint to mild scaling of plumbing may be expected. This is considered to be acceptable for the proposed industrial site use following treatment with a conventional water softener. Based on our experience with TDS concentrations less than 1,000 mg/L, taste problems are not expected to occur; however, it is noted that taste preferences can be subjective and differ from individual to individual.

It is noted that levels of turbidity and hydrogen sulphide (4 hour sample only) reported in the laboratory results exceeded their respective ODWS aesthetic objectives; however, these

parameters were determined to be acceptable based on field measurements and the 8 hour water sample, respectively.

The concentrations of iron and manganese were above the aesthetic objectives of the ODWS but below the maximum reasonably treatable limits provided by the document MOE Procedure D-5-5 using a conventional water softener. Based on a recommendation for water softening, these parameters are not of concern.

Based on the results of our investigation, the water quality meets the ODWS guidelines, objectives and standards (with the exception of hardness, TDS, iron and manganese) and the well pump test has demonstrated that there is sufficient quantity of water available at the subject site for the proposed use.

No detectable concentrations of PHC's, PAH's and/or VOC's were identified in the 8 hour water sample. Based on the 8 hour water sample, no impacts from the industrial site setting were detected in test well.

RECOMMENDATIONS

The following recommendations are provided based on the results of the hydrogeological investigation:

- The water supply for both hot and cold water should be treated by a conventional water softener. The water softener should be appropriately sized by a water treatment specialist to treat the elevated hardness levels;

- Consideration should be given to the use of potassium chloride salt as opposed to sodium chloride salt in the conventional water softener in order to maintain sodium concentrations at the background level; and,

- Warnings should be posted at drinking water locations to notify users that elevated sodium concentrations are present in the water at levels that may be of concern to persons on sodium restricted diets.

We trust that this letter is sufficient for your purposes. If you require additional information or if we could be of further assistance to you on this project, please do not hesitate to call.

Yours truly,

HOULE CHEVRIER ENGINEERING LTD.

James McEwen, B.Sc., B.Eng.
Hydrogeologist

Andrew Chevrier, M.Eng., P.Eng.
Principal

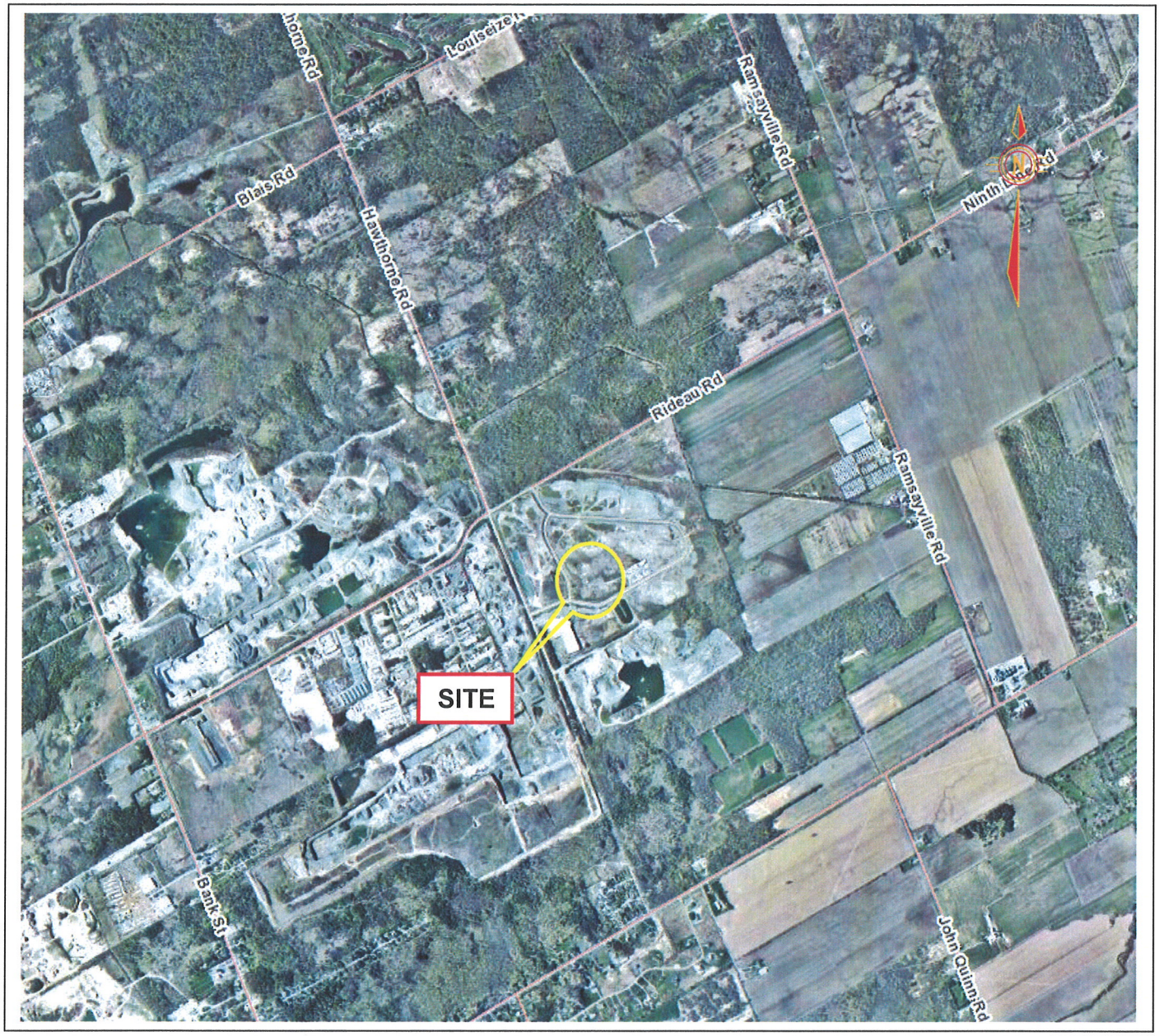
LICENSED PROFESSIONAL ENGINEER
A.F. CHEVRIER
PROVINCE OF ONTARIO

Figure 1 - Key Plan
Figure 2 - Site Plan

Table 1 - Field Measurements
Table 2 - Summary of Test Well Laboratory Reports Analysis

Attachments A, B, C, D, E, F and G

KEY PLAN	FIGURE 1

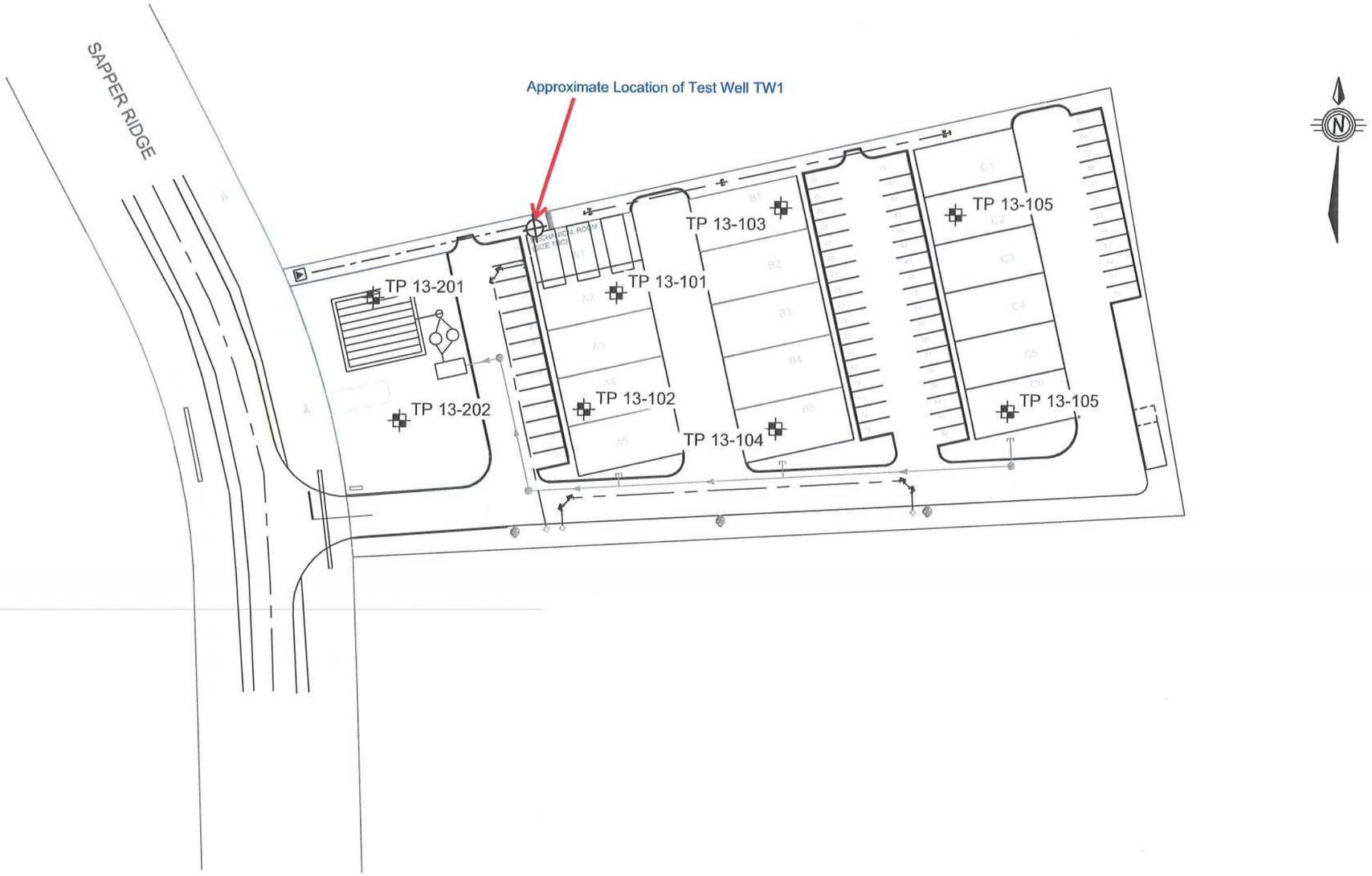


N.T.S

Houle Chevrier Engineering

Date: August 2013

Project: 13-106



Client: APEX DEVELOPMENTS INC.		Location: LOT H HAWTHORNE BUSINESS PARK OTTAWA, ON	Revision: 0
Drawn by: D.J.R	Approved by: A.F.C	Project No.: 13-106	Scale: 1 : 750
Houle Chevrier Engineering		Title: SITE PLAN	
		Date: AUGUST 2013	FIGURE 2

Table 1 - Summary of Test Well Field Measurements - July 24, 2013

Time from Start of Pumping (hours)	Temperature (°C)	Turbidity (NTU)	Total Chlorine (mg/L)	pH	Conductivity (uS)	Total Dissolved Solids (ppm)
1	10.8	12.4	0.0	7.1	1056	500
2	11.1	10.7	0.0	7.0	1075	517
3	11.2	9.8	0.0	7.0	1032	507
4	10.5	10.2	0.0	7.8	1027	509
5	11.2	8.7	0.0	7.1	1051	543
6	11.5	7.0	0.0	7.5	1027	527
7	11.3	6.1	0.0	7.6	1046	536
8	11.2	4.0	0.0	8.1	1053	548

Table 2 - Summary of Test Well Laboratory Reports Analysis - July 24 & August 2, 2013

GROUP	PARAMETER	UNITS	TW1 - 4hr	TW1 - 8hr	TW1 - R1	TW1 - R2	ONTARIO DRINKING	TYPE OF STANDARD
Bacteria	Escherichia Coli	ct/100mL	0	0	0	0	0	MAC[1]
	Faecal Coliforms	ct/100mL	0	0	0	0	-	-
	Faecal Streptococcus	ct/1mL	5	0	0	0	-	-
	Heterotrophic Plate Count	ct/100mL	8	0	97	15	-	-
	Total Coliforms	ct/100mL	1	1	0	0	0	MAC
Calculations	Hardness as CaCO3	mg/L	548	557	-	-	100	OG
	Ion Balance	-	1.01	1.02	-	-	-	-
	TDS (COND - CALC)	mg/L	882	889	-	-	500	AO
General Chemistry	Alkalinity as CaCO3	mg/L	219	221	-	-	30 - 500	OG[2]
	Chloride	mg/L	69	69	-	-	250	AO[3]
	Colour	TCU	2	2	-	-	5	AO
	Conductivity	µS/cm	1260	1270	-	-	-	-
	Dissolved Organic Carbon	mg/L	2.1	2.2	-	-	5	AO
	Fluoride	mg/L	0.36	0.36	-	-	1.5	MAC
	Nitrite	mg/L	<0.10	<0.10	-	-	1.0	MAC [4]
	Nitrate	mg/L	<0.10	<0.10	-	-	10.0	MAC [4]
	pH	-	8.07	8.05	-	-	6.5 - 8.5	OG
	Sulphate	mg/L	372	371	-	-	500	AO
	Turbidity	NTU	7.4	7.9	-	-	5	AO
Hydrogen Sulphide	Hydrogen Sulphide	mg/L	<0.10	<0.01	-	-	0.05	AO
Metals	Calcium	mg/L	114	116	-	-	-	-
	Iron	mg/L	1.14	1.04	-	-	0.3	AO
	Potassium	mg/L	9	9	-	-	-	-
	Magnesium	mg/L	64	65	-	-	-	-
	Manganese	mg/L	0.22	0.22	-	-	0.05	AO
	Sodium	mg/L	70	70	-	-	20 / 200	AO [5]
Nutrients	Ammonia	mg/L	0.22	0.21	-	-	-	-
	Phenols	mg/L	<0.001	<0.001	-	-	-	-
	Tannin & Lignin	mg/L	0.20	0.30	-	-	-	-
	Total Kjeldahl Nitrogen	mg/L	0.22	0.21	-	-	-	-
	Organic Nitrogen	mg/L	0.00	0.00	-	-	0.15	OG [6]

NOTES:

1. MAC = Maximum Acceptable Concentration
2. OG = Operational Guideline
3. AO = Aesthetic Objective
4. The total of Nitrate and Nitrite should not exceed 10 mg/litre
5. The aesthetic objective for sodium is 200 mg/litre. The local medical officer of health should be notified when the sodium concentration exceeds 20 mg/litre for persons on sodium restricted diets.
6. Organic Nitrogen is calculated as the difference between total Kjeldahl nitrogen and ammonia nitrogen.
7. '-' signifies no value provided in the ODWS guideline.

ATTACHMENT A

ONTARIO MINISTRY OF THE ENVIRONMENT
TEST WELL WATER WELL RECORD

Ontario — Ministry of the Environment

Measurements recorded in: ☐ Metric ☒ Imperial

Well Tag No: A 089801

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
	APEX DEVELOPMENTS INC.	info@apexdevco.com	

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
206 - 900 Morrison Drive	OHawa	ON	K2H8K7	6132282757

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
35 Sappers Ridge			

County/District/Municipality	City/Town/Village	Province	Postal Code
	OHawa	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Subtot Number	Other
NAD 83	18	75[illegible]6	5031811		

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
	Fill		loose	0	8
grey	Clay	gravel	packed	8	24
	limestone			24	155

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
40	0	High Early Cement	13.95

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
5 5/8	Steel	1.88	40	+2.

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	Depth (m/ft) To

Water Details

Water found at Depth	Kind of Water	Depth (m/ft) From	Depth (m/ft) To	Hole Diameter (cm/in)
135 (m/ft) ☐ Gas	☒ Fresh ☐ Untested ☐ Other, specify	0	40	10 5/8
(m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify	40	155	6 1/8
(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): 130

Pumping rate (l/min / GPM): 10

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 34

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

Recommended pump depth (m/ft): 130

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

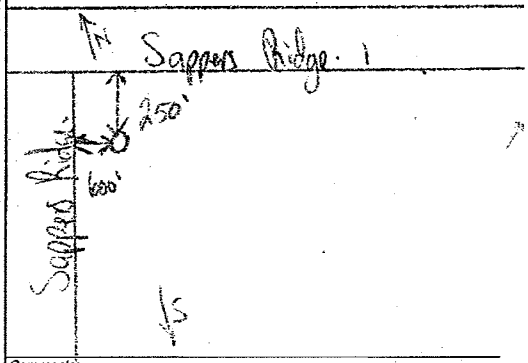
Well production (l/min / GPM): 15

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	25		
1	27'	1	31.6
2	28'	2	30.5
3	29'4"	3	29.5
4	30'	4	29.0
5	30'2"	5	28.6
10	31'4"	10	28.3
15	32'2"	15	28.0
20	32'7"	20	29.5
25	33'2"	25	27.0
30	33'5"	30	26.0
40	34'	40	25.0
50	34'6"	50	25.0
60	34'	60	25.0

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.
J.R. Drilling Co. Ltd.	3 1 7 1 4 1 9

Business Address (Street Number/Name)	Municipality
C23 Mishen Rd. R.R. #5	Shawville

Province	Postal Code	Business E-mail Address
QC	J0X2Y0	info@jrwaterwelldrilling.com

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
8197674751138H	McLaughney, Brady

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
3 1 6 4 1 1		2 0 0 8 0 9 0 8

Well owner's information package delivered	Date Package Delivered	Ministry Use Only
☒ Yes ☐ No	2 0 0 8 0 8 0 6	Audit No. Z103282
	Date Work Completed	
	2 0 0 8 0 8 0 6	

0506E (12/2007) — Contractor's Copy — © Queen's Printer for Ontario, 2007

ATTACHMENT B

EMAIL REGARDING SEPTIC SYSTEM DAILY DESIGN FLOW
PREPARED BY NOVATECH ENGINEERING CONSULTANTS LTD.
DATED JUNE 13, 2013

Lisa Bowley

From: Lisa Bowley
Sent: June-13-13 10:00 AM
To: 'jmcewen@hceng.ca'
Cc: 'cdavies@clelandjardine.com'; 'hood@csv.ca'; 'matthew.p.firestone@gmail.com'; 'snoruziaan@gmail.com'; 'mcarriere@gwal.com'; 'mfontyn@gwal.com'; 'mcleland@clelandjardine.com'; 'MAssal@taplenconstruction.com'; Susan Gordon; Adam Thompson
Subject: Hawthorne: Water Demand

James,

We have discussed the septic system design flow for 35 Sappers Ridge with the Ottawa Septic System Office. The total theoretical design flow for the development is 8,400 L/day based on the following assumptions:

Employees:

- Each condominium unit is in operation 8 hours per day, 7 days per week
- Number of Employees = 5/day/condominium unit (regulated by the condo association)
- Number of Condominium Units = 16
- Flow per Employee = 75L/8hr shift
- Total = 5 employees x 16 units x 75L/8hr shift = 6,000L/d

Floor Drains in Rear Bays:

- Rear Bay Floor Drains = 16 drains (internal oil & grit separator)
- Trap Size = 3inch, equivalent to 3 fixture units
- Fixture Unit = 50L/d
- Total = 16 drains x 3 fixture units x 50L/d = 2,400L/d

It is understood that any additional effluent in the rear bays (other then water, oil and grit) would be captured and hauled off-site.

Please call to discuss the well layout coordination.

Thank you,

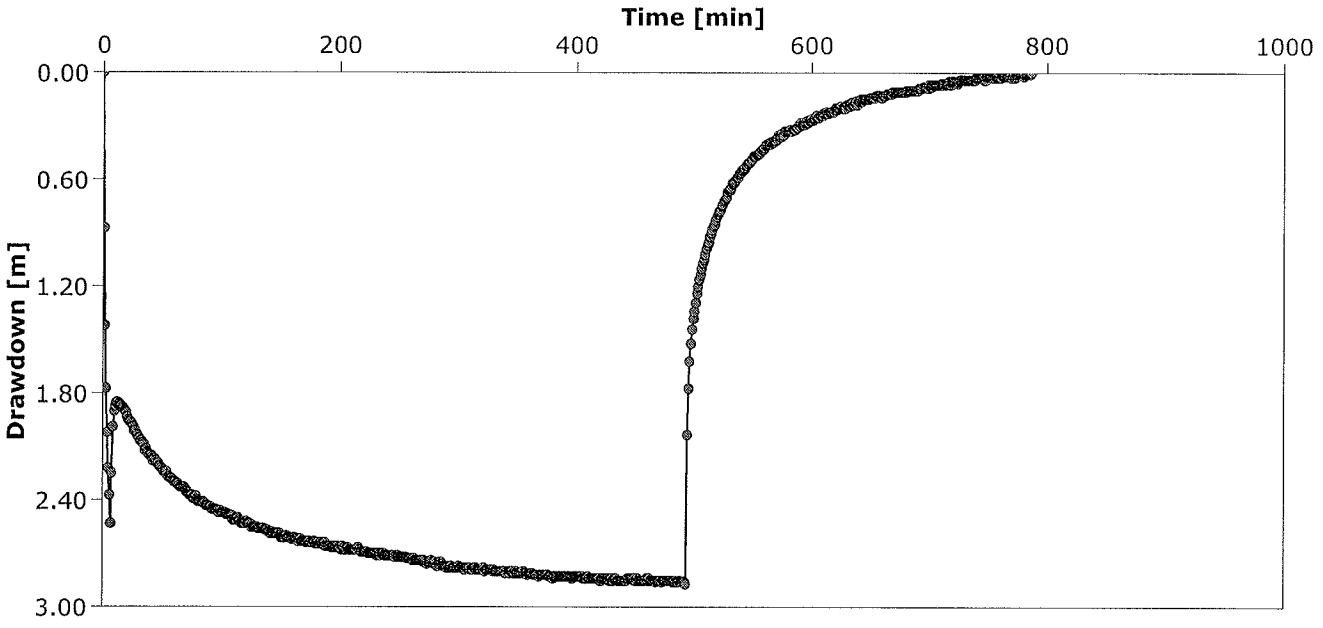
Lisa Bowley, P.Eng.
****
Novatech Engineering Consultants Ltd.
Suite 200, 240 Michael Cowpland Drive
Kanata . Ontario . Canada . K2M 1P6
Tel: (613) 254-9643 x246
Fax: (613) 254-5867
Email: l.bowley@novatech-eng.com
Web: http://www.novatech-eng.com

ATTACHMENT C

DRAWDOWN AND RECOVERY DATA

Houle Chevrier Engineering Ltd. 180 Wescar Lane R.R. 2 Carp, Ontario K0A 1L0	Pumping Test Analysis Report
	Project: Hydrogeological Investigation
	Number: 13-106
	Client: Apex Developments Inc.

Location: 35 Sappers Ridge	Pumping Test: TW1 Pumping Test	Pumping Well: TW1
Test Conducted by: BC		Test Date: 7/24/2013
Analysis Performed by: JM	Water Level vs. Time	Analysis Date: 8/17/2013
Aquifer Thickness:	Discharge: variable, average rate 0.020488 [m³/min]	



Houle Chevrier Engineering Ltd.
180 Wescar Lane
R.R. 2
Carp, Ontario
K0A 1L0

Pumping Test - Water Level Data

Project: Hydrogeological Investigation

Number: 13-106

Client: Apex Developments Inc.

Location: 35 Sappers Ridge	Pumping Test: TW1 Pumping Test	Pumping Well: TW1
Test Conducted by: BC	Test Date: 7/24/2013	Discharge: variable, average rate 0.020488 [m³/min]
Observation Well: TW1A	Static Water Level [m]: 7.69	Radial Distance to PW [m]: 0.16

	Time [min]	Water Level [m]	Drawdown [m]
1	0	7.69	0.00
2	1	8.56	0.87
3	2	9.11	1.42
4	3	9.46	1.77
5	4	9.71	2.02
6	5	9.91	2.22
7	6	10.06	2.37
8	7	10.22	2.53
9	8	9.94	2.25
10	9	9.68	1.99
11	10	9.59	1.90
12	11	9.56	1.87
13	12	9.54	1.85
14	13	9.54	1.85
15	14	9.55	1.86
16	15	9.56	1.87
17	16	9.56	1.87
18	17	9.57	1.88
19	18	9.58	1.89
20	19	9.59	1.90
21	20	9.60	1.91
22	21	9.62	1.93
23	22	9.64	1.95
24	23	9.65	1.96
25	24	9.65	1.96
26	25	9.66	1.97
27	26	9.68	1.99
28	27	9.70	2.01
29	28	9.70	2.01
30	29	9.72	2.03
31	30	9.73	2.04
32	31	9.74	2.05
33	32	9.76	2.07
34	33	9.76	2.07
35	34	9.77	2.08
36	35	9.78	2.09
37	36	9.81	2.12
38	37	9.80	2.11
39	38	9.82	2.13
40	39	9.83	2.14
41	40	9.84	2.15
42	41	9.84	2.15
43	42	9.85	2.16
44	43	9.87	2.18
45	44	9.86	2.17
46	45	9.87	2.18
47	46	9.88	2.19
48	47	9.88	2.19
49	48	9.90	2.21
50	49	9.90	2.21
51	50	9.91	2.22

Houle Chevrier Engineering Ltd.
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Project: Hydrogeological Investigation

Number: 13-106

Client: Apex Developments Inc.

	Time [min]	Water Level [m]	Drawdown [m]
52	51	9.92	2.23
53	52	9.93	2.24
54	53	9.93	2.24
55	54	9.93	2.24
56	55	9.95	2.26
57	56	9.96	2.27
58	57	9.96	2.27
59	58	9.97	2.28
60	59	9.97	2.28
61	60	9.98	2.29
62	61	9.99	2.30
63	62	9.99	2.30
64	63	10.00	2.31
65	64	10.00	2.31
66	65	10.01	2.32
67	66	10.02	2.33
68	67	10.02	2.33
69	68	10.02	2.33
70	69	10.02	2.33
71	70	10.03	2.34
72	71	10.04	2.35
73	72	10.04	2.35
74	73	10.05	2.36
75	74	10.06	2.37
76	75	10.06	2.37
77	76	10.06	2.37
78	77	10.08	2.39
79	78	10.08	2.39
80	79	10.07	2.38
81	80	10.09	2.40
82	81	10.10	2.41
83	82	10.10	2.41
84	83	10.10	2.41
85	84	10.10	2.41
86	85	10.10	2.41
87	86	10.11	2.42
88	87	10.11	2.42
89	88	10.12	2.43
90	89	10.12	2.43
91	90	10.12	2.43
92	91	10.13	2.44
93	92	10.13	2.44
94	93	10.14	2.45
95	94	10.14	2.45
96	95	10.14	2.45
97	96	10.14	2.45
98	97	10.15	2.46
99	98	10.15	2.46
100	99	10.16	2.47
101	100	10.15	2.46
102	101	10.16	2.47
103	102	10.16	2.47
104	103	10.16	2.47
105	104	10.16	2.47
106	105	10.17	2.48
107	106	10.17	2.48

Houle Chevrier Engineering Ltd.
180 Wescar Lane
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K0A 1L0

Project: Hydrogeological Investigation

Number: 13-106

Client: Apex Developments Inc.

	Time [min]	Water Level [m]	Drawdown [m]
108	107	10.17	2.48
109	108	10.18	2.49
110	109	10.18	2.49
111	110	10.18	2.49
112	111	10.20	2.51
113	112	10.20	2.51
114	113	10.20	2.51
115	114	10.20	2.51
116	115	10.19	2.50
117	116	10.21	2.52
118	117	10.21	2.52
119	118	10.22	2.53
120	119	10.22	2.53
121	120	10.22	2.53
122	121	10.22	2.53
123	122	10.21	2.52
124	123	10.22	2.53
125	124	10.22	2.53
126	125	10.22	2.53
127	126	10.24	2.55
128	127	10.23	2.54
129	128	10.24	2.55
130	129	10.24	2.55
131	130	10.24	2.55
132	131	10.24	2.55
133	132	10.25	2.56
134	133	10.25	2.56
135	134	10.25	2.56
136	135	10.25	2.56
137	136	10.25	2.56
138	137	10.25	2.56
139	138	10.26	2.57
140	139	10.26	2.57
141	140	10.26	2.57
142	141	10.27	2.58
143	142	10.27	2.58
144	143	10.28	2.59
145	144	10.27	2.58
146	145	10.28	2.59
147	146	10.28	2.59
148	147	10.28	2.59
149	148	10.28	2.59
150	149	10.28	2.59
151	150	10.28	2.59
152	151	10.29	2.60
153	152	10.30	2.61
154	153	10.30	2.61
155	154	10.30	2.61
156	155	10.30	2.61
157	156	10.29	2.60
158	157	10.30	2.61
159	158	10.30	2.61
160	159	10.30	2.61
161	160	10.30	2.61
162	161	10.31	2.62
163	162	10.30	2.61

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Project: Hydrogeological Investigation

Number: 13-106

Client: Apex Developments Inc.

	Time [min]	Water Level [m]	Drawdown [m]
164	163	10.30	2.61
165	164	10.31	2.62
166	165	10.31	2.62
167	166	10.32	2.63
168	167	10.31	2.62
169	168	10.31	2.62
170	169	10.32	2.63
171	170	10.32	2.63
172	171	10.32	2.63
173	172	10.32	2.63
174	173	10.33	2.64
175	174	10.32	2.63
176	175	10.32	2.63
177	176	10.33	2.64
178	177	10.33	2.64
179	178	10.33	2.64
180	179	10.32	2.63
181	180	10.33	2.64
182	181	10.34	2.65
183	182	10.34	2.65
184	183	10.33	2.64
185	184	10.34	2.65
186	185	10.33	2.64
187	186	10.34	2.65
188	187	10.34	2.65
189	188	10.33	2.64
190	189	10.35	2.66
191	190	10.35	2.66
192	191	10.35	2.66
193	192	10.35	2.66
194	193	10.35	2.66
195	194	10.36	2.67
196	195	10.35	2.66
197	196	10.35	2.66
198	197	10.36	2.67
199	198	10.36	2.67
200	199	10.35	2.66
201	200	10.36	2.67
202	201	10.36	2.67
203	202	10.37	2.68
204	203	10.35	2.66
205	204	10.37	2.68
206	205	10.36	2.67
207	206	10.37	2.68
208	207	10.36	2.67
209	208	10.36	2.67
210	209	10.37	2.68
211	210	10.37	2.68
212	211	10.37	2.68
213	212	10.37	2.68
214	213	10.37	2.68
215	214	10.37	2.68
216	215	10.37	2.68
217	216	10.36	2.67
218	217	10.36	2.67
219	218	10.37	2.68

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Client: Apex Developments Inc.

	Time [min]	Water Level [m]	Drawdown [m]
220	219	10.38	2.69
221	220	10.38	2.69
222	221	10.38	2.69
223	222	10.38	2.69
224	223	10.38	2.69
225	224	10.38	2.69
226	225	10.39	2.70
227	226	10.39	2.70
228	227	10.39	2.70
229	228	10.39	2.70
230	229	10.39	2.70
231	230	10.39	2.70
232	231	10.39	2.70
233	232	10.40	2.71
234	233	10.39	2.70
235	234	10.39	2.70
236	235	10.40	2.71
237	236	10.39	2.70
238	237	10.39	2.70
239	238	10.39	2.70
240	239	10.40	2.71
241	240	10.40	2.71
242	241	10.40	2.71
243	242	10.40	2.71
244	243	10.40	2.71
245	244	10.40	2.71
246	245	10.40	2.71
247	246	10.40	2.71
248	247	10.40	2.71
249	248	10.41	2.72
250	249	10.40	2.71
251	250	10.40	2.71
252	251	10.41	2.72
253	252	10.41	2.72
254	253	10.41	2.72
255	254	10.41	2.72
256	255	10.41	2.72
257	256	10.41	2.72
258	257	10.41	2.72
259	258	10.42	2.73
260	259	10.42	2.73
261	260	10.42	2.73
262	261	10.42	2.73
263	262	10.42	2.73
264	263	10.43	2.74
265	264	10.42	2.73
266	265	10.43	2.74
267	266	10.43	2.74
268	267	10.43	2.74
269	268	10.43	2.74
270	269	10.43	2.74
271	270	10.43	2.74
272	271	10.43	2.74
273	272	10.44	2.75
274	273	10.43	2.74
275	274	10.44	2.75

Houle Chevrier Engineering Ltd.
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	Time [min]	Water Level [m]	Drawdown [m]
276	275	10.45	2.76
277	276	10.44	2.75
278	277	10.44	2.75
279	278	10.44	2.75
280	279	10.43	2.74
281	280	10.44	2.75
282	281	10.45	2.76
283	282	10.44	2.75
284	283	10.45	2.76
285	284	10.46	2.77
286	285	10.45	2.76
287	286	10.44	2.75
288	287	10.44	2.75
289	288	10.45	2.76
290	289	10.46	2.77
291	290	10.46	2.77
292	291	10.46	2.77
293	292	10.47	2.78
294	293	10.46	2.77
295	294	10.47	2.78
296	295	10.46	2.77
297	296	10.46	2.77
298	297	10.47	2.78
299	298	10.47	2.78
300	299	10.47	2.78
301	300	10.47	2.78
302	301	10.47	2.78
303	302	10.46	2.77
304	303	10.47	2.78
305	304	10.47	2.78
306	305	10.47	2.78
307	306	10.47	2.78
308	307	10.48	2.79
309	308	10.48	2.79
310	309	10.47	2.78
311	310	10.47	2.78
312	311	10.47	2.78
313	312	10.48	2.79
314	313	10.48	2.79
315	314	10.48	2.79
316	315	10.47	2.78
317	316	10.47	2.78
318	317	10.48	2.79
319	318	10.48	2.79
320	319	10.48	2.79
321	320	10.48	2.79
322	321	10.48	2.79
323	322	10.48	2.79
324	323	10.47	2.78
325	324	10.49	2.80
326	325	10.48	2.79
327	326	10.48	2.79
328	327	10.48	2.79
329	328	10.48	2.79
330	329	10.48	2.79
331	330	10.48	2.79

Houle Chevrier Engineering Ltd.
180 Wescar Lane
R.R. 2
Carp, Ontario
K0A 1L0

Project: Hydrogeological Investigation

Number: 13-106

Client: Apex Developments Inc.

	Time [min]	Water Level [m]	Drawdown [m]
332	331	10.49	2.80
333	332	10.48	2.79
334	333	10.49	2.80
335	334	10.49	2.80
336	335	10.49	2.80
337	336	10.49	2.80
338	337	10.49	2.80
339	338	10.49	2.80
340	339	10.49	2.80
341	340	10.49	2.80
342	341	10.50	2.81
343	342	10.50	2.81
344	343	10.49	2.80
345	344	10.49	2.80
346	345	10.50	2.81
347	346	10.49	2.80
348	347	10.49	2.80
349	348	10.50	2.81
350	349	10.50	2.81
351	350	10.49	2.80
352	351	10.50	2.81
353	352	10.50	2.81
354	353	10.50	2.81
355	354	10.50	2.81
356	355	10.50	2.81
357	356	10.49	2.80
358	357	10.50	2.81
359	358	10.50	2.81
360	359	10.50	2.81
361	360	10.51	2.82
362	361	10.50	2.81
363	362	10.50	2.81
364	363	10.50	2.81
365	364	10.50	2.81
366	365	10.51	2.82
367	366	10.51	2.82
368	367	10.51	2.82
369	368	10.51	2.82
370	369	10.52	2.83
371	370	10.51	2.82
372	371	10.51	2.82
373	372	10.51	2.82
374	373	10.51	2.82
375	374	10.51	2.82
376	375	10.51	2.82
377	376	10.51	2.82
378	377	10.51	2.82
379	378	10.52	2.83
380	379	10.52	2.83
381	380	10.52	2.83
382	381	10.53	2.84
383	382	10.52	2.83
384	383	10.52	2.83
385	384	10.52	2.83
386	385	10.52	2.83
387	386	10.52	2.83

Houle Chevrier Engineering Ltd.
180 Wescar Lane
R.R. 2
Carp, Ontario
K0A 1L0

Project: Hydrogeological Investigation

Number: 13-106

Client: Apex Developments Inc.

	Time [min]	Water Level [m]	Drawdown [m]
388	387	10.52	2.83
389	388	10.52	2.83
390	389	10.52	2.83
391	390	10.52	2.83
392	391	10.52	2.83
393	392	10.52	2.83
394	393	10.52	2.83
395	394	10.52	2.83
396	395	10.52	2.83
397	396	10.52	2.83
398	397	10.53	2.84
399	398	10.52	2.83
400	399	10.52	2.83
401	400	10.52	2.83
402	401	10.52	2.83
403	402	10.52	2.83
404	403	10.52	2.83
405	404	10.52	2.83
406	405	10.52	2.83
407	406	10.52	2.83
408	407	10.53	2.84
409	408	10.53	2.84
410	409	10.53	2.84
411	410	10.53	2.84
412	411	10.52	2.83
413	412	10.53	2.84
414	413	10.53	2.84
415	414	10.53	2.84
416	415	10.53	2.84
417	416	10.53	2.84
418	417	10.53	2.84
419	418	10.53	2.84
420	419	10.53	2.84
421	420	10.53	2.84
422	421	10.54	2.85
423	422	10.54	2.85
424	423	10.53	2.84
425	424	10.53	2.84
426	425	10.53	2.84
427	426	10.53	2.84
428	427	10.53	2.84
429	428	10.53	2.84
430	429	10.54	2.85
431	430	10.54	2.85
432	431	10.53	2.84
433	432	10.54	2.85
434	433	10.54	2.85
435	434	10.53	2.84
436	435	10.53	2.84
437	436	10.54	2.85
438	437	10.54	2.85
439	438	10.54	2.85
440	439	10.54	2.85
441	440	10.54	2.85
442	441	10.54	2.85
443	442	10.54	2.85

Houle Chevrier Engineering Ltd.
180 Wescar Lane
R.R. 2
Carp, Ontario
K0A 1L0

Project: Hydrogeological Investigation

Number: 13-106

Client: Apex Developments Inc.

	Time [min]	Water Level [m]	Drawdown [m]
444	443	10.54	2.85
445	444	10.54	2.85
446	445	10.53	2.84
447	446	10.53	2.84
448	447	10.53	2.84
449	448	10.53	2.84
450	449	10.53	2.84
451	450	10.53	2.84
452	451	10.54	2.85
453	452	10.54	2.85
454	453	10.53	2.84
455	454	10.54	2.85
456	455	10.54	2.85
457	456	10.54	2.85
458	457	10.54	2.85
459	458	10.54	2.85
460	459	10.54	2.85
461	460	10.54	2.85
462	461	10.53	2.84
463	462	10.54	2.85
464	463	10.53	2.84
465	464	10.54	2.85
466	465	10.54	2.85
467	466	10.54	2.85
468	467	10.54	2.85
469	468	10.54	2.85
470	469	10.55	2.86
471	470	10.54	2.85
472	471	10.54	2.85
473	472	10.54	2.85
474	473	10.54	2.85
475	474	10.55	2.86
476	475	10.54	2.85
477	476	10.54	2.85
478	477	10.54	2.85
479	478	10.54	2.85
480	479	10.54	2.85
481	480	10.54	2.85
482	481	10.54	2.85
483	482	10.54	2.85
484	483	10.55	2.86
485	484	10.55	2.86
486	485	10.54	2.85
487	486	10.55	2.86
488	487	10.55	2.86
489	488	10.55	2.86
490	489	10.54	2.85
491	490	10.55	2.86
492	491	10.54	2.85
493	492	10.55	2.86
494	493	10.55	2.86
495	494	10.56	2.87
496	495	9.72	2.03
497	496	9.46	1.77
498	497	9.31	1.62
499	498	9.21	1.52

	Time [min]	Water Level [m]	Drawdown [m]
500	499	9.13	1.44
501	500	9.07	1.38
502	501	9.03	1.34
503	502	8.98	1.29
504	503	8.93	1.24
505	504	8.89	1.20
506	505	8.85	1.16
507	506	8.82	1.13
508	507	8.79	1.10
509	508	8.76	1.07
510	509	8.74	1.05
511	510	8.71	1.02
512	511	8.68	0.99
513	512	8.66	0.97
514	513	8.64	0.95
515	514	8.61	0.92
516	515	8.59	0.90
517	516	8.57	0.88
518	517	8.55	0.86
519	518	8.54	0.85
520	519	8.52	0.83
521	520	8.50	0.81
522	521	8.48	0.79
523	522	8.47	0.78
524	523	8.46	0.77
525	524	8.44	0.75
526	525	8.43	0.74
527	526	8.41	0.72
528	527	8.40	0.71
529	528	8.39	0.70
530	529	8.36	0.67
531	530	8.35	0.66
532	531	8.35	0.66
533	532	8.34	0.65
534	533	8.31	0.62
535	534	8.31	0.62
536	535	8.30	0.61
537	536	8.29	0.60
538	537	8.28	0.59
539	538	8.28	0.59
540	539	8.26	0.57
541	540	8.25	0.56
542	541	8.24	0.55
543	542	8.24	0.55
544	543	8.23	0.54
545	544	8.22	0.53
546	545	8.21	0.52
547	546	8.20	0.51
548	547	8.20	0.51
549	548	8.19	0.50
550	549	8.18	0.49
551	550	8.18	0.49
552	551	8.16	0.47
553	552	8.16	0.47
554	553	8.16	0.47
555	554	8.15	0.46

Houle Chevrier Engineering Ltd.
180 Wescar Lane
R.R. 2
Carp, Ontario
K0A 1L0

Project: Hydrogeological Investigation

Number: 13-106

Client: Apex Developments Inc.

	Time [min]	Water Level [m]	Drawdown [m]
556	555	8.15	0.46
557	556	8.14	0.45
558	557	8.13	0.44
559	558	8.12	0.43
560	559	8.12	0.43
561	560	8.11	0.42
562	561	8.10	0.41
563	562	8.10	0.41
564	563	8.09	0.40
565	564	8.09	0.40
566	565	8.09	0.40
567	566	8.08	0.39
568	567	8.08	0.39
569	568	8.08	0.39
570	569	8.07	0.38
571	570	8.07	0.38
572	571	8.06	0.37
573	572	8.04	0.35
574	573	8.05	0.36
575	574	8.05	0.36
576	575	8.03	0.34
577	576	8.04	0.35
578	577	8.02	0.33
579	578	8.02	0.33
580	579	8.02	0.33
581	580	8.02	0.33
582	581	8.02	0.33
583	582	8.01	0.32
584	583	8.02	0.33
585	584	8.01	0.32
586	585	8.01	0.32
587	586	8.01	0.32
588	587	8.00	0.31
589	588	8.00	0.31
590	589	7.98	0.29
591	590	7.99	0.30
592	591	7.97	0.28
593	592	7.98	0.29
594	593	7.98	0.29
595	594	7.98	0.29
596	595	7.97	0.28
597	596	7.96	0.27
598	597	7.97	0.28
599	598	7.96	0.27
600	599	7.96	0.27
601	600	7.95	0.26
602	601	7.96	0.27
603	602	7.95	0.26
604	603	7.94	0.25
605	604	7.93	0.24
606	605	7.94	0.25
607	606	7.94	0.25
608	607	7.93	0.24
609	608	7.93	0.24
610	609	7.93	0.24
611	610	7.92	0.23

Houle Chevrier Engineering Ltd.
180 Wescar Lane
R.R. 2
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K0A 1L0

Project: Hydrogeological Investigation

Number: 13-106

Client: Apex Developments Inc.

	Time [min]	Water Level [m]	Drawdown [m]
612	611	7.92	0.23
613	612	7.91	0.22
614	613	7.92	0.23
615	614	7.92	0.23
616	615	7.91	0.22
617	616	7.91	0.22
618	617	7.91	0.22
619	618	7.91	0.22
620	619	7.91	0.22
621	620	7.89	0.20
622	621	7.90	0.21
623	622	7.90	0.21
624	623	7.89	0.20
625	624	7.89	0.20
626	625	7.88	0.19
627	626	7.89	0.20
628	627	7.89	0.20
629	628	7.89	0.20
630	629	7.89	0.20
631	630	7.87	0.18
632	631	7.87	0.18
633	632	7.87	0.18
634	633	7.88	0.19
635	634	7.86	0.17
636	635	7.86	0.17
637	636	7.87	0.18
638	637	7.86	0.17
639	638	7.85	0.16
640	639	7.87	0.18
641	640	7.85	0.16
642	641	7.85	0.16
643	642	7.84	0.15
644	643	7.85	0.16
645	644	7.84	0.15
646	645	7.84	0.15
647	646	7.84	0.15
648	647	7.84	0.15
649	648	7.84	0.15
650	649	7.84	0.15
651	650	7.83	0.14
652	651	7.83	0.14
653	652	7.83	0.14
654	653	7.83	0.14
655	654	7.83	0.14
656	655	7.82	0.13
657	656	7.82	0.13
658	657	7.82	0.13
659	658	7.82	0.13
660	659	7.82	0.13
661	660	7.83	0.14
662	661	7.82	0.13
663	662	7.82	0.13
664	663	7.82	0.13
665	664	7.81	0.12
666	665	7.81	0.12
667	666	7.81	0.12

Houle Chevrier Engineering Ltd.
180 Wescar Lane
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Carp, Ontario
K0A 1L0

Project: Hydrogeological Investigation

Number: 13-106

Client: Apex Developments Inc.

	Time [min]	Water Level [m]	Drawdown [m]
668	667	7.81	0.12
669	668	7.81	0.12
670	669	7.80	0.11
671	670	7.80	0.11
672	671	7.80	0.11
673	672	7.80	0.11
674	673	7.80	0.11
675	674	7.80	0.11
676	675	7.80	0.11
677	676	7.80	0.11
678	677	7.80	0.11
679	678	7.80	0.11
680	679	7.80	0.11
681	680	7.80	0.11
682	681	7.79	0.10
683	682	7.79	0.10
684	683	7.79	0.10
685	684	7.79	0.10
686	685	7.79	0.10
687	686	7.79	0.10
688	687	7.79	0.10
689	688	7.79	0.10
690	689	7.79	0.10
691	690	7.79	0.10
692	691	7.78	0.09
693	692	7.78	0.09
694	693	7.78	0.09
695	694	7.78	0.09
696	695	7.77	0.08
697	696	7.77	0.08
698	697	7.77	0.08
699	698	7.77	0.08
700	699	7.78	0.09
701	700	7.76	0.07
702	701	7.77	0.08
703	702	7.77	0.08
704	703	7.76	0.07
705	704	7.76	0.07
706	705	7.76	0.07
707	706	7.76	0.07
708	707	7.76	0.07
709	708	7.76	0.07
710	709	7.76	0.07
711	710	7.75	0.06
712	711	7.76	0.07
713	712	7.75	0.06
714	713	7.75	0.06
715	714	7.76	0.07
716	715	7.75	0.06
717	716	7.75	0.06
718	717	7.74	0.05
719	718	7.76	0.07
720	719	7.74	0.05
721	720	7.74	0.05
722	721	7.74	0.05
723	722	7.74	0.05

Houle Chevrier Engineering Ltd.
180 Wescar Lane
R.R. 2
Carp, Ontario
K0A 1L0

Project: Hydrogeological Investigation

Number: 13-106

Client: Apex Developments Inc.

	Time [min]	Water Level [m]	Drawdown [m]
724	723	7.74	0.05
725	724	7.75	0.06
726	725	7.74	0.05
727	726	7.73	0.04
728	727	7.73	0.04
729	728	7.73	0.04
730	729	7.73	0.04
731	730	7.73	0.04
732	731	7.73	0.04
733	732	7.73	0.04
734	733	7.73	0.04
735	734	7.73	0.04
736	735	7.73	0.04
737	736	7.73	0.04
738	737	7.73	0.04
739	738	7.73	0.04
740	739	7.73	0.04
741	740	7.72	0.03
742	741	7.72	0.03
743	742	7.72	0.03
744	743	7.72	0.03
745	744	7.72	0.03
746	745	7.72	0.03
747	746	7.72	0.03
748	747	7.73	0.04
749	748	7.73	0.04
750	749	7.71	0.02
751	750	7.71	0.02
752	751	7.71	0.02
753	752	7.71	0.02
754	753	7.71	0.02
755	754	7.72	0.03
756	755	7.71	0.02
757	756	7.72	0.03
758	757	7.71	0.02
759	758	7.71	0.02
760	759	7.72	0.03
761	760	7.71	0.02
762	761	7.72	0.03
763	762	7.70	0.01
764	763	7.71	0.02
765	764	7.71	0.02
766	765	7.71	0.02
767	766	7.71	0.02
768	767	7.71	0.02
769	768	7.71	0.02
770	769	7.71	0.02
771	770	7.72	0.03
772	771	7.71	0.02
773	772	7.70	0.01
774	773	7.72	0.03
775	774	7.71	0.02
776	775	7.70	0.01
777	776	7.70	0.01
778	777	7.70	0.01
779	778	7.70	0.01

Houle Chevrier Engineering Ltd.
180 Wescar Lane
R.R. 2
Carp, Ontario
K0A 1L0

Project: Hydrogeological Investigation

Number: 13-106

Client: Apex Developments Inc.

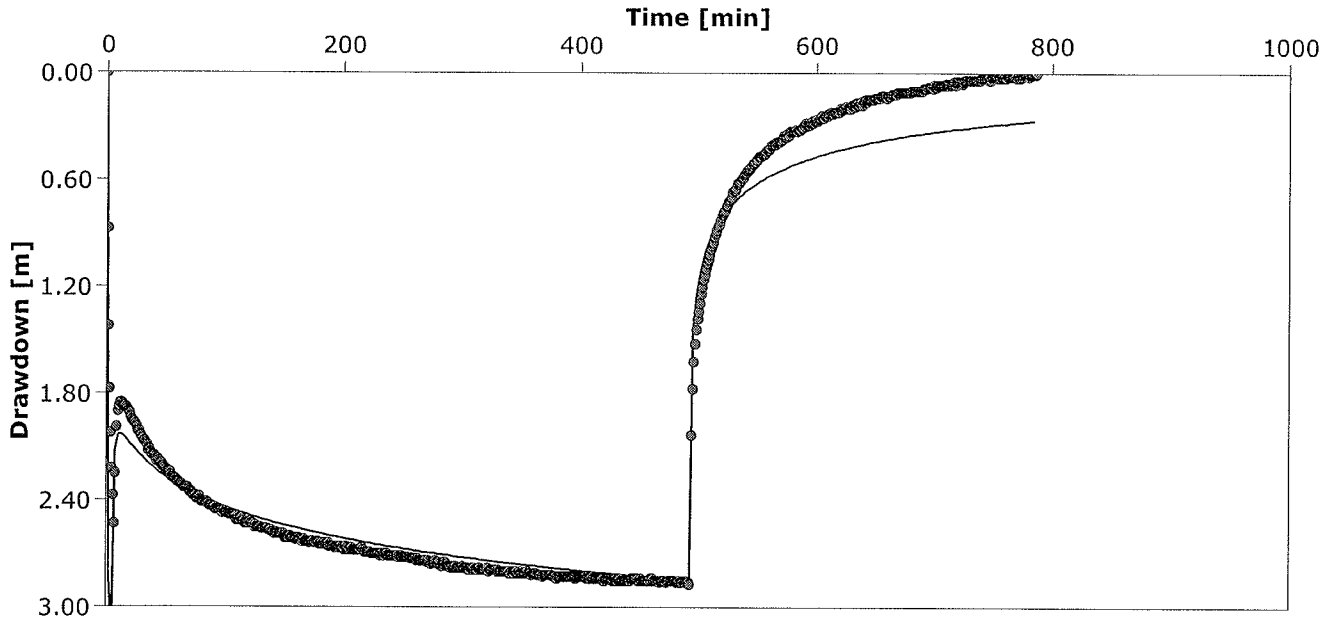
	Time [min]	Water Level [m]	Drawdown [m]
780	779	7.70	0.01
781	780	7.71	0.02
782	781	7.70	0.01
783	782	7.70	0.01
784	783	7.70	0.01
785	784	7.70	0.01
786	785	7.70	0.01
787	786	7.70	0.01
788	787	7.69	0.00

ATTACHMENT D

AQUIFER TEST PRO 4.2
PUMP TEST ANALYSIS

Houle Chevrier Engineering Ltd. 180 Wescar Lane R.R. 2 Carp, Ontario K0A 1L0	**Pumping Test Analysis Report**
	Project: Hydrogeological Investigation
	Number: 13-106
	Client: Apex Developments Inc.

Location: 35 Sappers Ridge	Pumping Test: TW1 Pumping Test	Pumping Well: TW1
Test Conducted by: BC		Test Date: 7/24/2013
Analysis Performed by: JM	Theis Analysis	Analysis Date: 8/17/2013
Aquifer Thickness:	Discharge: variable, average rate 0.020488 [m³/min]	



Calculation after Theis

Observation Well	Transmissivity [m²/d]	Storage coefficient	Radial Distance to PW [m]	
TW1A	1.75×10^{1}	Not applicable	0.16	

ATTACHMENT E

EXOVA ACCUTEST LABORATORY CERTIFICATE OF ANALYSIS

JULY 24, 2013

EXOVA OTTAWA

Certificate of Analysis

Exova

Client:	Houle Chevrier Engineering	Report Number:	1315861
	180 Wescar Lane, R.R. #2	Date Submitted:	2013-07-25
	Carp, ON	Date Reported:	2013-07-29
	K0A 1L0	Project:	13-104
Attention:	Mr. James McEwen	COC #:	172028
PO#:			
Invoice to:	Houle Chevrier Engineering		

Dear James McEwen:

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: Jennifer Mitchell 2013.07.29 10:40:22 -04'00'

Jennifer Mitchell
Laboratory Supervisor, Microbiology

Exova (Ottawa) is certified and accredited for specific parameters by:
CALA, Canadian Association for Laboratory Accreditation (to ISO 17025), OMAFRA, Ontario Ministry of Agriculture, Food and Rural Affairs(for farm soils), Licensed by Ontario MOE for specific tests in drinking water.

Please note: Field data, where presented on the report, has been provided by the client and is presented for informational purposes only.

EXOVA OTTAWA

Certificate of Analysis

Exova

Client: Houle Chevrier Engineering
180 Wescar Lane, R.R. #2
Carp, ON
K0A 1L0
Attention: Mr. James McEwen
PO#:
Invoice to: Houle Chevrier Engineering

Report Number: 1315861
Date Submitted: 2013-07-25
Date Reported: 2013-07-29
Project: 13-104
COC #: 172028

Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1045649 Water 2013-07-24 TW1-4hr	1045650 Water 2013-07-24 TW1-8 hr
Microbiology	Escherichia Coli	0	ct/100mL	MAC-0		0	0
	Faecal Coliforms	0	ct/100mL			0	0
	Faecal Streptococcus	0	ct/100mL			5	0
	Heterotrophic Plate Count	0	ct/1mL			8	0
	Total Coliforms	0	ct/100mL	MAC-0		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

EXOVA OTTAWA

Certificate of Analysis

Exova

Client: Houle Chevrier Engineering
180 Wescar Lane, R.R. #2
Carp, ON
K0A 1L0
Attention: Mr. James McEwen
PO#:
Invoice to: Houle Chevrier Engineering

Report Number: 1315860
Date Submitted: 2013-07-25
Date Reported: 2013-07-31
Project: 13-104
COC #: 172028

Dear James McEwen:

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:

Revised Report - TKN and NH3 results have been corrected.

APPROVAL: Digitally signed by Lorna Wilson Date: 2013.07.31 15:52:14 -04'00'

Lorna Wilson
Laboratory Supervisor, Inorganics

APPROVAL: Charlie Qu 2013.07.31 15:56:53 -04'00'

Charlie (Long) Qu
Laboratory Supervisor, Organics

Client: Houle Chevrier Engineering
180 Wescar Lane, R.R. #2
Carp, ON
K0A 1L0
Attention: Mr. James McEwen
PO#:
Invoice to: Houle Chevrier Engineering

Report Number: 1315860
Date Submitted: 2013-07-25
Date Reported: 2013-07-31
Project: 13-104
COC #: 172028

Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1045651 Water 2013-07-24 TW1-4Hr	1045652 Water 2013-07-24 TW1-8Hr
Calculations	Hardness as CaCO3	1	mg/L	OG-100		548*	557*
	Ion Balance	0.01				1.01	1.02
	TDS (COND - CALC)	1	mg/L	AO-500		882*	889*
General Chemistry	Alkalinity as CaCO3	5	mg/L	OG-500		219	221
	Cl	1	mg/L	AO-250		69	69
	Colour	2	TCU	AO-5		2	2
	Conductivity	5	uS/cm			1260	1270
	DOC	0.5	mg/L	AO-5		2.1	2.2
	F	0.10	mg/L	MAC-1.5		0.36	0.36
	N-NO2	0.10	mg/L	MAC-1.0		<0.10	<0.10
	N-NO3	0.10	mg/L	MAC-10.0		<0.10	<0.10
	pH	1.00		6.5-8.5		8.07	8.05
	S2-	0.01	mg/L	AO-0.05			<0.01
		0.10	mg/L	AO-0.05		<0.10	
	SO4	3	mg/L	AO-500		372	371
	Turbidity	0.1	NTU	MAC-1.0		7.4*	7.9*
Hydrocarbons	F1 (C6-C10)	0.1	mg/L				<0.1
	F2 (C10-C16)	0.1	mg/L				<0.1
	F3 (C16-C34)	0.2	mg/L				<0.2
	F4 (C34-C50)	0.2	mg/L				<0.2
Metals	Ca	1	mg/L			114	116
	Fe	0.03	mg/L	AO-0.3		1.14*	1.04*
	K	1	mg/L			9	9
	Mg	1	mg/L			64	65
	Mn	0.01	mg/L	AO-0.05		0.22*	0.22*
	Na	2	mg/L	AO-200		70	70

Guideline = ODWSOG *** = Guideline Exceedence**
** = Analysis completed at Mississauga, Ontario.
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

Client: Houle Chevrier Engineering
180 Wescar Lane, R.R. #2
Carp, ON
K0A 1L0
Attention: Mr. James McEwen
PO#:
Invoice to: Houle Chevrier Engineering

Report Number: 1315860
Date Submitted: 2013-07-25
Date Reported: 2013-07-31
Project: 13-104
COC #: 172028

Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1045651 Water 2013-07-24 TW1-4Hr	1045652 Water 2013-07-24 TW1-8Hr
Nutrients	N-NH3	0.02	mg/L			0.22	0.21
	Phenols	0.001	mg/L			<0.001	<0.001
	Tannin & Lignin	0.1	mg/L			0.2	0.3
	Total Kjeldahl Nitrogen	0.10	mg/L			0.22	0.21
Semi-Volatiles	1-methylnaphthalene	0.1	ug/L				<0.1
	2-methylnaphthalene	0.1	ug/L				<0.1
	Acenaphthene	0.1	ug/L				<0.1
	Acenaphthylene	0.1	ug/L				<0.1
	Anthracene	0.1	ug/L				<0.1
	Benzo(a)anthracene	0.1	ug/L				<0.1
	Benzo(a)pyrene	0.01	ug/L	MAC-0.01			<0.01
	Benzo(b)fluoranthene	0.05	ug/L				<0.05
	Benzo(g,h,i)perylene	0.1	ug/L				<0.1
	Benzo(k)fluoranthene	0.05	ug/L				<0.05
	Chrysene	0.05	ug/L				<0.05
	Dibenzo(a,h)anthracene	0.1	ug/L				<0.1
	Fluoranthene	0.1	ug/L				<0.1
	Fluorene	0.1	ug/L				<0.1
	Indeno(1,2,3-c,d)pyrene	0.1	ug/L				<0.1
	Naphthalene	0.1	ug/L				<0.1
	Phenanthrene	0.1	ug/L				<0.1
	Pyrene	0.1	ug/L				<0.1
VOCs	1,1,1,2-tetrachloroethane	0.5	ug/L				<0.5
	1,1,1-trichloroethane	0.4	ug/L				<0.4
	1,1,2,2-tetrachloroethane	0.5	ug/L				<0.5
	1,1,2-trichloroethane	0.4	ug/L				<0.4

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K0A 1L0
Attention: Mr. James McEwen
PO#:
Invoice to: Houle Chevrier Engineering

Report Number: 1315860
Date Submitted: 2013-07-25
Date Reported: 2013-07-31
Project: 13-104
COC #: 172028

Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1045651 Water 2013-07-24 TW1-4Hr	1045652 Water 2013-07-24 TW1-8Hr
VOCs	1,1-dichloroethane	0.4	ug/L				<0.4
	1,1-dichloroethylene	0.5	ug/L	MAC-14			<0.5
	1,2-dibromoethane	0.2	ug/L				<0.2
	1,2-dichlorobenzene	0.4	ug/L	MAC-200			<0.4
	1,2-dichloroethane	0.2	ug/L	IMAC-5			<0.2
	1,2-dichloroethane-d4	1	%				96
	1,2-dichloropropane	0.5	ug/L				<0.5
	1,3,5-trimethylbenzene	0.3	ug/L				<0.3
	1,3-dichlorobenzene	0.4	ug/L				<0.4
	1,4-dichlorobenzene	0.4	ug/L	MAC-5			<0.4
	4-bromofluorobenzene	1	%				98
	Benzene	0.5	ug/L	MAC-5			<0.5
	Bromodichloromethane	0.3	ug/L				<0.3
	Bromoform	0.4	ug/L				<0.4
	Bromomethane	0.5	ug/L				<0.5
	c-1,2-Dichloroethylene	0.4	ug/L				<0.4
	c-1,3-Dichloropropylene	0.2	ug/L				<0.2
	Carbon Tetrachloride	0.2	ug/L	MAC-5			<0.2
	Chloroethane	0.2	ug/L				<0.2
	Chloroform	0.5	ug/L				<0.5
	Chloromethane	0.2	ug/L				<0.2
	Dibromochloromethane	0.3	ug/L				<0.3
	Dichlorodifluoromethane	0.5	ug/L				<0.5
	Dichloromethane	4.0	ug/L	MAC-50			<4.0
	Ethylbenzene	0.5	ug/L	AO-2.4			<0.5
	m/p-xylene	0.5	ug/L				<0.5

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Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1045651 Water 2013-07-24 TW1-4Hr	1045652 Water 2013-07-24 TW1-8Hr
VOCs	Monochlorobenzene	0.2	ug/L	MAC-80			<0.2
	o-xylene	0.5	ug/L				<0.5
	Styrene	0.5	ug/L				<0.5
	t-1,2-Dichloroethylene	0.4	ug/L				<0.4
	t-1,3-Dichloropropylene	0.2	ug/L				<0.2
	Tetrachloroethylene	0.3	ug/L	MAC-30			<0.3
	Toluene	0.5	ug/L	AO-24			<0.5
	Toluene-d8	1	%				101
	Trichloroethylene	0.3	ug/L	MAC-5			<0.3
	Trichlorofluoromethane	0.5	ug/L				<0.5
	Vinyl Chloride	0.2	ug/L	MAC-2			<0.2
	Xylene; total	1.0	ug/L	AO-300			<1.0

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QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 0 **Analysis Date** 2013-07-30 **Method** C SM2340B			
Hardness as CaCO3			
Ion Balance			
TDS (COND - CALC)			
Xylene; total			
Run No 255011 **Analysis Date** 2013-07-26 **Method** C SM2130B			
Turbidity	<0.1 NTU	107	73-127
Run No 255028 **Analysis Date** 2013-07-26 **Method** EPA 200.8			
Fe	<0.03 mg/L	95	88-112
Mn	<0.01 mg/L	101	91-109
Run No 255030 **Analysis Date** 2013-07-26 **Method** M SM3120B-3500C			
Ca	<1 mg/L	99	80-120
K	<1 mg/L	104	80-120
Mg	<1 mg/L	97	80-120
Na	<2 mg/L	104	80-120

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QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 255059 **Analysis Date** 2013-07-29 **Method** C SM2120C			
Colour	<2 TCU	100	90-110
Run No 255061 **Analysis Date** 2013-07-26 **Method** C SM5310C			
DOC	<0.5 mg/L	102	84-116
Run No 255086 **Analysis Date** 2013-07-26 **Method** SM 2320B			
Alkalinity as CaCO3	<5 mg/L	98	95-105
Conductivity	<5 uS/cm	99	95-105
F	<0.10 mg/L	99	90-110
pH	5.65	100	90-110
Run No 255093 **Analysis Date** 2013-07-29 **Method** O CCME			
F1 (C6-C10)	<0.1 mg/L	90	80-120
Run No 255099 **Analysis Date** 2013-07-26 **Method** V 8260B			
1,1,1,2-tetrachloroethane	<0.5 ug/L	89	80-120
1,1,1-trichloroethane	<0.4 ug/L	103	80-120
1,1,2,2-tetrachloroethane	<0.5 ug/L	93	80-120
1,1,2-trichloroethane	<0.4 ug/L	93	80-120
1,1-dichloroethane	<0.4 ug/L	108	80-120

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QC Summary

Analyte	Blank	QC % Rec	QC Limits
1,1-dichloroethylene	<0.5 ug/L	102	80-120
1,2-dibromoethane	<0.2 ug/L	95	80-120
1,2-dichlorobenzene	<0.4 ug/L	119	80-120
1,2-dichloroethane	<0.2 ug/L	96	80-120
1,2-dichloroethane-d4	109 %	103	80-120
1,2-dichloropropane	<0.5 ug/L	103	80-120
1,3,5-trimethylbenzene	<0.3 ug/L	86	80-120
1,3-dichlorobenzene	<0.4 ug/L	93	80-120
1,4-dichlorobenzene	<0.4 ug/L	93	80-120
Benzene	<0.5 ug/L	101	80-120
Bromodichloromethane	<0.3 ug/L	104	80-120
Bromoform	<0.4 ug/L	95	80-120
Bromomethane	<0.5 ug/L	95	70-130
c-1,2-Dichloroethylene	<0.4 ug/L	104	80-120
c-1,3-Dichloropropylene	<0.2 ug/L	95	80-120
Carbon Tetrachloride	<0.2 ug/L	104	80-120
Chloroethane	<0.2 ug/L	94	70-130

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QC Summary

Analyte	Blank	QC % Rec	QC Limits
Chloroform	<0.5 ug/L	97	80-120
Chloromethane	<0.2 ug/L	82	70-130
Dibromochloromethane	<0.3 ug/L	99	80-120
Dichlorodifluoromethane	<0.5 ug/L	86	70-130
Dichloromethane	<4.0 ug/L	114	60-200
Ethylbenzene	<0.5 ug/L	93	80-120
m/p-xylene	<0.5 ug/L	94	80-120
Monochlorobenzene	<0.2 ug/L	88	80-120
o-xylene	<0.5 ug/L	93	80-120
Styrene	<0.5 ug/L	93	80-120
t-1,2-Dichloroethylene	<0.4 ug/L	99	80-120
t-1,3-Dichloropropylene	<0.2 ug/L	99	80-120
Tetrachloroethylene	<0.3 ug/L	92	80-120
Toluene	<0.5 ug/L	99	80-120
Toluene-d8	102 %	100	80-120
Trichloroethylene	<0.3 ug/L	105	80-120
Trichlorofluoromethane	<0.5 ug/L	111	80-120

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QC Summary

Analyte	Blank	QC % Rec	QC Limits
Vinyl Chloride	<0.2 ug/L	89	70-130
Run No 255107 **Analysis Date** 2013-07-29 **Method** C SM4500-NO3-F			
N-NO2	<0.10 mg/L	113	80-120
N-NO3	<0.10 mg/L	88	80-120
Run No 255136 **Analysis Date** 2013-07-29 **Method** C SM5550B			
Tannin & Lignin	<0.1 mg/L	102	80-120
Run No 255156 **Analysis Date** 2013-07-29 **Method** SM 4110C			
Cl	<1 mg/L	100	90-110
SO4	<3 mg/L	108	90-110
Run No 255158 **Analysis Date** 2013-07-30 **Method** C SM5530D			
Phenols	<0.001 mg/L	90	73-127
Run No 255181 **Analysis Date** 2013-07-29 **Method** C SM4500-S2-D			
S2-	<0.01 mg/L	107	
Run No 255185 **Analysis Date** 2013-07-30 **Method** P 8270			
1-methylnaphthalene	<0.1 ug/L	52	20-140
2-methylnaphthalene	<0.1 ug/L	50	20-140
Acenaphthene	<0.1 ug/L	58	20-140

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QC Summary

Analyte	Blank	QC % Rec	QC Limits
Acenaphthylene	<0.1 ug/L	54	20-140
Anthracene	<0.1 ug/L	72	20-140
Benzo(a)anthracene	<0.1 ug/L	84	20-140
Benzo(a)pyrene	<0.01 ug/L	81	20-140
Benzo(b)fluoranthene	<0.05 ug/L	81	20-140
Benzo(g,h,i)perylene	<0.1 ug/L	92	20-140
Benzo(k)fluoranthene	<0.05 ug/L	83	20-140
Chrysene	<0.05 ug/L	81	20-140
Dibenzo(a,h)anthracene	<0.1 ug/L	90	20-140
Fluoranthene	<0.1 ug/L	84	20-140
Fluorene	<0.1 ug/L	62	20-140
Indeno(1,2,3-c,d)pyrene	<0.1 ug/L	96	20-140
Naphthalene	<0.1 ug/L	48	20-140
Phenanthrene	<0.1 ug/L	72	20-140
Pyrene	<0.1 ug/L	84	20-140
Run No 255206 **Analysis Date** 2013-07-30 **Method** O CCME			
F2 (C10-C16)	<0.1 mg/L	100	50-120

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QC Summary

Analyte	Blank	QC % Rec	QC Limits
F3 (C16-C34)	<0.2 mg/L	100	50-120
F4 (C34-C50)	<0.2 mg/L	100	50-120
Run No 255240 **Analysis Date** 2013-07-31 **Method** C SM4500-Norg-C			
Total Kjeldahl Nitrogen	<0.10 mg/L	106	77-123
Run No 255242 **Analysis Date** 2013-07-31 **Method** C SM4500-NH3D			
N-NH3	<0.02 mg/L	99	85-115

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Sample Comment Summary

Sample ID: 1045651 TW1-4Hr S2 MRL elevated due to sample turbidity.

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ATTACHMENT F

EXOVA ACCUTEST LABORATORY CERTIFICATE OF ANALYSIS
ADDITIONAL BACTERIOLOGICAL TESTING

AUGUST 2, 2013

EXOVA OTTAWA

Certificate of Analysis

Exova

Client: Houle Chevrier Engineering
180 Wescar Lane, R.R. #2
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Attention: Mr. James McEwen
PO#:
Invoice to: Houle Chevrier Engineering

Report Number: 1316630
Date Submitted: 2013-08-02
Date Reported: 2013-08-04
Project: 13 - 106
COC #: 34064

Dear James McEwen:

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 2013.08.04 18:17:42 -04'00'

Dragana Dzeletovic
Microbiology Laboratory Team Lead

EXOVA OTTAWA

Certificate of Analysis

EXOVA

Client: Houle Chevrier Engineering
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Attention: Mr. James McEwen
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Report Number: 1316630
Date Submitted: 2013-08-02
Date Reported: 2013-08-04
Project: 13 - 106
COC #: 34064

Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1047683 Water Composite 2013-08-02 TW1 - R1	1047684 Water Composite 2013-08-02 TW1 - R2
Microbiology	Escherichia Coli	0	ct/100mL	MAC-0		0	0
	Faecal Coliforms	0	ct/100mL			0	0
	Faecal Streptococcus	0	ct/100mL			0	0
	Heterotrophic Plate Count	0	ct/1mL			97	15
	Total Coliforms	0	ct/100mL	MAC-0		0	0

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ATTACHMENT G

LANGELIER INDEX CALCULATION

Langelier Index calculator (online calculator)

This calculator helps you determine the scaling potential of the water by using the Langelier Saturation Index

Give the values of your water analysis. All the fields with * are required.

Water Temperature (Fahrenheit or Celcius)	11.2	○ °F ◉ °C
pH	8.05	
TDS (mg/L):	889	
Ca (mg/L):	116	○ $CaCO_3$ ◉ Ca^{2+}
Alkalinity (mg/L as CaCO3):	221	
Langelier Index:	+0.8	Calculate Now! Reset

Saturation Index	Description	General Recommendation
-5	Severe Corrosion	Treatment Recommended
-3	Moderate Corrosion	Treatment Recommended
-2	Moderate Corrosion	Treatment May Be Needed
-1	Mild Corrosion	Treatment May Be Needed
-0.5	None- Mild Corrosion	Probably No Treatment
0	Near Balanced	No Treatment
0.5	Some Faint Coating	Probably No Treatment
1	Mild Scale Coating	Treatment May Be Needed
2	Mild to Moderate Coatings	Treatment May Be Needed
3	Moderate Scale Forming	Treatment Recommended
4	Severe Scale Forming	Treatment Recommended

Click here to get code

Please Note- SI Index is not a reliable means of evaluating corrosion potential, but it can be used as a guide.

Technical Resources

Calculators for Water Treatment
- Chlorine Metering Pump Calculator: CC 's per minute
- Chlorine Metering Pump Sizing
- Fixture Counts
- How to determine pump flow rate on systems with pressure tanks
- **Langelier Index**
- Metric Conversions
- Ozone Demand
- Rainfall
- Multi-Media Sand Filters
- Filter System Flow Rates (English)
- Filter System Flow Rates (Metric)

Diagrams & Schematics
Factory Manuals
Frequently Asked Questions
Glossary of Water Terms
How-To-Guides
Installation Guides
System Selector Form
Water Sources