

# Terrain Analysis and Hydrogeological Study Proposed Residential Development 1934 Stagecoach Road

Prepared for 7773226 Canada Inc.

Report PH3745-1 dated June 21, 2023

Ottawa, Ontario



# **Table of Contents**

1.0	Introduction	6
1.1	1. Terms of Reference	6
1.2	2. Background	7
2.0	Method of Study	7
2.1	1. Terrain Analysis	7
2.2	2. Test Well Installation	8
2.3	3. Test Well Construction	9
2.4	4. Aquifer Analysis	13
2.5	5. Topographical Survey	15
2.6	6. Laboratory Testing	15
2.7	7. Overburden Groundwater Assessment	15
2.8	Bedrock Aquifer Groundwater Assessment	17
3.0	Site Description	17
3.1	1. Surface Conditions	17
3.2	2. Surrounding Land Uses with 500 m	17
4.0	Geology	18
4.1	1. Surficial Geology	18
4.2	2. Bedrock Geology	19
5.0	Regional Hydrogeology	20
5.1	Water Well Construction and Aquifer Interception	20
5.2	2. Neighbouring Water Quality	22
6.0	Site Hydrogeology	22
7.0	Aquifer Analysis	24
7.1	1. Aquifer Characteristics	24
7.2	2. Groundwater Geochemistry Assessment	24
7.3	3. Aquifer Analysis Summary	29
8.0	Development Recommendations	32
8.1	1. Site Development	32
8.2	2. Lot Development Plan	32
8.3	3. Predictive Impact Assessment	33
8.4	4. Sewage System Design	36

# Terrain Analysis and Hydrogeological Study Proposed Residential Development 1934 Stagecoach Road, Ottawa



8.5	5. Long Term Safe Yield Calculation	37
8.6	6. Potential Well Interference	38
8.7	7. Future Water Well Design	40
8.8	8. Water Conditioning Considerations	41
8.8	9. Implementation of Best Management Practices	42
8.1	10. Subdivision Phasing Plan	42
9.0	Conclusions	45
10.0	Recommendations	46



# Tables

Table 1: Summary of water levels measured within the shallow overburden groundwater across the subject property
Table 2: Summary of background nitrate concentrations reported within the shallow overburden groundwater aquifer
Table 3: Summary of unique stratigraphic units encountered on subject property based on test pit excavations in study area
Table 4: Summary of aquifer characteristics resulting from analysis of pumping test data obtained from constant rate testing
Table 5: Summary of Health and Aesthetic/Operational Parameters for the Oxford Formation Water Supply Aquifer (TW1 and TW6)
Table 6: Summary of the General Chemistry Parameters for the Oxford Formation as defined by the Raw Water Quality obtained from TW1 and TW6
Table 7: Summary of Health and Aesthetic / Operational Parameters for the combined Oxford Formation and March Formation Water Supply Aquifers as defined by TW2, TW4, TW5, and TW8
Table 8: Summary of the General Chemistry Parameters for the combined Oxford Formation and March Formation Water Supply Aquifers as defined by TW2, TW4, TW5, and TW827
Table 9: Summary of the Health and Aesthetic / operational Parameters for the combined Oxford Formation, March Formation and Nepean Formation Water Supply Aquifers as Defined by TW3 and TW9
Table 10: Summary of the General Chemistry Parameters for the combined Oxford Formation, March Formation and Nepean Formation Water Supply Aquifers as Defined by TW3 and TW9
Table 11: Summary of Health and Aesthetic / Operational Parameters for TW7 for both Unsleeved and Sleeved Well Construction Conditions
Table 12: Summary of General Chemistry Parameters for TW7 for both Unsleeved and Sleeved Well Construction Conditions



# **Appendices**

Appendix 1 Soil Profile and Test Data Sheets

Symbols and Terms

Appendix 2 Published MECP Well Data for Test Wells

Local Well Records (Regional Hydrogeology)
MECP Provincial Offences order - Sleepy Cedars

Appendix 3 Soil Laboratory Test Results

Water Laboratory Test Results

Appendix 4 Aquifer Analysis Data

Graphical Summary of Field Water Quality Data for Test wells Figure - A4 - 1 - Potential Well Interference Model 1

(Cumulative Drawdown)

Figure - A4 - 2 - Potential Well Interference Model 2

(Individual Drawdown)

**Detailed Nitrate Impact Assessment Data** 

Appendix 5 PH4734 – 1 – Site Plan

PH4734 – 2 - MECP Water Well Location Plan

PH4734 – 3 - Surficial Geology Plan PH4734 – 4 - Bedrock Geology Plan PH4734 – 5 - Bedrock Aquifer Plan

PH0482 – 4 – Generalized Hydrogeological Cross section

PH0482 – 7 – Lot Development Plan



# 1.0 Introduction

# 1.1. Terms of Reference

Paterson Group (Paterson) was commissioned by Fotenn Consultants Inc. (Fotenn) in 2007 to conduct a Terrain Analysis and Hydrogeological Study for a proposed rural residential subdivision on a 63 ha parcel of land, hereafter denoted as subject property, located on Part of the Rear of Lot 12, Concession 3, Parts 1-9, Plan 4R-19474 and as Part of the East Half of Lot 12, Concession 3, Part 1, Plan 5R2820, former Township of Osgoode, now in the City of Ottawa (Refer to Paterson Drawing PH4734-1 - Site Plan, located in Appendix 5). The subject site currently has a municipal address of 1934 Stagecoach Road, in Ottawa.

Work began on this subdivision in 2006, with an original Terrain Analysis and Hydrogeological Study Report being prepared and issued in April 2007. Several rounds of comments were addressed by Paterson pertaining to the review of the report by the South Nation Conservation (SNC) by means of an addendum report and several correspondence letters. However, in January 2008, work ceased on the site pending a change in ownership of the subject property.

In November 2009, Paterson was re-engaged by the new owner, Velika Realty Corporation of Ottawa, Ontario, to address the remaining concerns of the SNC and finalize the Hydrogeological Study.

An updated Terrain Analysis and Hydrogeological Study was released on June 23, 2011 titled Paterson Report PH0482-REP.02 – Terrain Analysis and Hydrogeological Study – Dated April 2, 2007 and updated June 23, 2011.

A Draft Plan of Submission Application was submitted on August 5, 2022 to address the clearance of conditions for the application. City of Ottawa comments regarding the submission were received on October 7, 2022. The applicants company changed to 7773226 Canada Inc. at that time.

Paterson Group completed an updated Geotechnical Investigation titled Paterson Report PG6532-1- Geotechnical Investigation dated December 14, 2022. The results of the Geotechnical Investigation were used to update this Terrain Analysis and Hydrogeological Study Report.

Paterson Group completed a Hydrogeological Study & Water Budget Assessment titled Paterson Report PH4734 - Hydrogeological Study & Water Budget Assessment dated June 21, 2023. The results of this Study were used to update this Terrain Analysis and Hydrogeological Study Report.



The purpose of this study has been to ascertain and assess the specific terrain and hydrogeological conditions which currently exist beneath the subject property as they relate to the suitability of the site for residential development on private services with minimal impact on groundwater resources. This report summarizes all of the additional works carried out and summarizes all of the associated findings.

The following report has been prepared specifically and solely for the aforementioned project which is described herein. It contains our findings and recommendations pertaining to the private services for the subject development as it is understood at the time of writing this report.

Paterson has also completed a Phase I - Environmental Site Assessment (ESA) for the subject lands, the results of which are recorded under in Paterson Report PE0969-REP.01

# 1.2. Background

The subject property encompasses a total area of approximately 62.57 ha (GeoOttawa) and is proposed to be subdivided into 66 residential lots and one stormwater management pond having a minimum lot size of approximately 0.8 ha. It is proposed that the subdivision will be serviced by individual onsite wells and septic systems.

Paterson has conducted extensive hydrogeological investigations in the vicinity of the subject property in recent years, especially in the Greely Village area. Paterson has carried out hydrogeological studies for the South Village and Woodstream Subdivisions located to the north of the subject site (G8105) and for lands to the east of Hwy. 31 for a combination commercial and residential developments (Paterson Project No. PH0145). This local expertise has been incorporated into this study, where applicable.

# 2.0 Method of Study

# 2.1. Terrain Analysis

As part of this study, a series of test pits were put down on the subject property to delineate the subsurface soil conditions beneath the site. The initial field investigation was conducted on August 29, 2006. During this investigation a total of 13 test pits were put down in the area of the residential lots, by means of a backhoe. The test pit locations were selected by Paterson personnel to ensure adequate representation of the subsurface soil profile that was delineated across the site. The test pit locations were recorded and the subsurface conditions,



including the soil morphology and depth to the groundwater table (where encountered), were carefully observed and recorded by Paterson personnel as the test pits were advanced. Representative samples of the soils were recovered from the test pits. All samples were classified texturally in the field and sealed in proper containers for further review in our laboratory. The depths at which the soil samples were recovered from the test holes are shown as "G" on the Soil Profile and Test Data sheets provided in Appendix 1.

On September 26, 2006, an additional seven (7) hand auger holes were put down in the area located along the central to western quadrant of the site, due to access limitations encountered with the backhoe during the initial field investigation. The subsurface conditions observed at both the test pits and auger hole locations are shown on the Soil Profile and Test Data sheets, in Appendix 1 of this report, and the locations are referenced on the Drawing No. PH0482-7 – Lot Development Plan in Appendix 5.

On August 6, 2010, a series of additional test pits were put down on the subject property to augment the original terrain analysis fieldwork program with specific focus on determining the surficial soil profiles within the southern central and southeastern quadrants of the site. During this investigation a total of ten (10) additional test pits were put down. Reference should be made to Appendix 1 for the Soil Profile and Test Data sheets for each of these test pits and their locations can be reference on the Lot Development Plan Drawing No. PH0482 - 7 located in Appendix 5.

A permeameter testing investigation was conducted using a Pask (Constant Head) Permeameter between October and November 2022. An 83 mm diameter hole was excavated using a Riverside/Bucket auger to the desired testing depth. Permeameter testing was conducted at 12 locations across the subject site. Two tests were conducted at each location, one at the invert elevation of the drainage ditch and another 0.5 m below the invert elevation. The permeameter testing locations were placed to provide general coverage of the proposed drainage ditch system. Additional information regarding the Pask Permeameter testing can be found in Paterson Report PH4734 - Hydrogeological Study & Water Budget Assessment dated June 21, 2023.

### 2.2. Test Well Installation

A rigorous review of available Water Well Records for the immediate area, published by the Ontario Ministry of the Environment (MECP) was undertaken prior to the placement of the test wells. Overburden thickness, depth of casing, aquifer interception points and reported well yields were reviewed in detail in order to establish a conceptual hydrogeological model for the site. Based on Paterson's

Report: PH 3745-1 June 21, 2023



previous experience in the area, and combined with the available Water Well Records, a conceptual hydrogeological model was established. A comprehensive well construction protocol was subsequently established based on the conceptual model and field results.

The general well locations were chosen in order to ensure adequate coverage across the site, while, at the same time, endeavoring to maintain sufficient proximity such that responses could be measured in observation wells during the pumping tests. The test well installation program was carried out by Air Rock Drilling Company Ltd. between February 9 to February 22, 2007 for TW1 to TW4. TW7 was constructed on December 19, 2008. TW4 was deepened on August 31, 2010 and TW8 and TW9 were constructed on August 23, 2010 and August 31, 2010, respectively. An engineer from Paterson was present during the creation of the casing hole, installation of the casing and grouting of the annular space for each test well constructed at the site. The Ministry of the Environment, Conservation and Parks (MECP) Water Well Records (WWR) for each test well can be found in Appendix 2.

### 2.3. Test Well Construction

# TW 5 (Existing Well)

An existing, onsite well, hereafter referred to as TW5 for this study, is an existing drilled well which used to service a small residential dwelling, which was recently demolished, on the subject property. A water well record was obtained for this well (reference should be made to Appendix 2).

Based on the MECP WWR, the well was constructed in 1978 by Henry Mains Well Drilling. The well consisted of 30 m of casing set approximately 6.1 m into the March Formation, which was intercepted at a depth of approximately 24 m bgs. Cement grout was utilized to seal the annular space.

The aquifer intercept was reported to be located at a depth of approximately 51.5 m bgs. The reported well yield was upwards of 10 gallons per minute (gpm) (45.4 L/min), based on the one (1) hour pumping test.

# TW 6 (Existing Well)

An existing offsite well, hereafter referred to as TW6 and located at 1897 Stagecoach Road, was identified to be accessible for testing and was subjected to a pumping test. An MECP WWR was obtained for this well (refer to the published WWR located in Appendix 2) as a result of the comprehensive WWR background search.



Based on the information contained within the published MECP WWR, the well was constructed using a 150 mm diameter casing having a length of 17.7 m and set approximately 1.5 m into the underlying limestone bedrock. The open borehole was extended to a depth of 22.9 m bgs. The aquifer intercept was noted to be within the Oxford Formation limestone at a depth of 18.3 m bgs. A recommended pumping rate of 5 gpm was set for this well.

# TW1, TW2, and TW3 (New Wells)

With respect to the construction of TW1, TW2 and TW3, which took place in 2007, similar well construction methodology was utilized. First, a 228 mm diameter casing hole for each test well was advanced using a rotary tri-cone bit through the overburden, to the underlying limestone. The casing hole was advanced into the bedrock an additional 2.4 to 4.3 m to ensure that each casing was seated into competent bedrock.

Each casing hole was filled with a combination of neat cement and bentonite grout slurry having an observed consistency of at least 20% bentonite solids (by weight). A neat cement slurry was introduced into the lower 2 to 3 m of the casing hole through the tri-cone bit resting at the bottom of the casing hole. The tri-cone bit was raised 2.5 m off the bottom of the casing hole and the bentonite slurry was introduced down the drill stem and through the tri-cone bit and pumped upwards through the hole to the ground surface.

A new, 150 mm diameter steel casing, equipped with a drive shoe, was installed in the bentonite column. The density of the slurry in the casing hole was sufficient to prevent lateral movement of the casing as it was lowered into the hole, thereby ensuring proper casing alignment. The casing was seated into the bedrock and bentonite slurry. The inside of the casing was blown out prior to advancing the bit into the bedrock.

Once the water supply aquifer was encountered, the formation was repeatedly surged with air and allowed to clear. Preliminary well yield was estimated and the well was purged until the water was observed to be in a sand free state.

Following completion of the drilling and purging process, the static water level was allowed to stabilize. Air Rock, in accordance with Ontario Regulation 903, proceeded to chlorinate the well and complete the mandatory one hour constant rate pumping test. The rate chosen for the one (1) hour pumping test was based on the preliminary findings of the well contractor at the time of installation and are those which are reflected on the published MECP Water Well Records.



### **TW4**

TW4 was constructed in the same manner as that described above for TW1, TW2 and TW3. TW4 was completed at, or near the base of the Oxford Formation at a depth of approximately 18.3 m bgs when it was constructed in 2007.

TW4 was deepened by Air Rock on August 31, 2010 in order to delineate the depth of the Oxford Formation/March Formation in relation to the rest of the site and to ensure that the water supply located within the March Formation could be adequately intercepted in the northwest quadrant of the site.

Air Rock deepened the well by utilizing a 150 mm diameter button bit and slowly advancing the open borehole through the Oxford Formation and into the March Formation. The water supply aquifer located within the March Formation was intercepted at a depth of approximately 44.5 m bgs and the open hole was advanced to 48.8 m bgs to provide for an adequate water column for testing and development purposes. Reference should be made to the amended WWR for TW4 which is located in Appendix 2.

### **TW7**

TW7 was constructed by Air Rock on December 19, 2008. The construction methodology followed that of the other test wells, with the casing being installed upwards of 2.5 m into the Oxford Formation limestone. The open hole was extended through the Oxford Formation and intercepted a water supply aquifer contained within the March Formation.

During the original pumping test of TW7, it was noted that the water column could not be drawn down below the bottom of the casing. Furthermore, water quality results from the pumping test contained elevated concentrations of dissolved organic carbon, tannins and lignins, iron and colour.

Based on the apparent well yield, combined with the proximity of TW7 to the area of poor drainage containing peat and a high water table and the elevated parameters commonly associated with surface water interactions, a detailed investigation was undertaken in October 2009. Paterson undertook a detailed site investigation of TW7. The purpose of this investigation was to isolate the source of the surface water influx into the open borehole. The well was first purged using a high-capacity submersible pump in an attempt to draw the water column down and past the bottom of the casing so that a camera could be utilized to examine the casing shoe seating in the bedrock to look for evidence of surface water inflow. However, despite pumping at rates exceeding 120 L/min for upwards of four



(4) hours, the static water level of the water column in the well did not drop below the bottom of the casing.

Paterson then retained Air Rock to carry out a series of intrusive investigations of the existing well. Upon their initial arrival to the site, Air Rock proceeded to check that the casing was seated into the bedrock. The methodology of this work consisted of placing a hammer collar onto the existing well casing and attempt to move the casing using the 150 mm diameter button bit with moderate air pressure applied to hammer the casing. The casing stickup was measured before and after the casing evaluation. A difference of approximately 17 mm was noted upon completion of the casing evaluation. This indicated that the casing has moved 17 mm downward into the ground upon completion of the short duration of applied pressure.

Air Rock then proceeded to lower a surge block into the well. The surge block consisted of a series of rubber plates clamped together onto a drilling rod, thereby creating a thick rubber plug. The diameter of the block was measured to be approximately 160 mm in diameter which is generally sufficient to seal the block against the casing at is lowered down the well. The surge block was lowered down the existing well casing and the static water level was measured to be absent from the surge block after it had been lowered to a depth of approximately 6 m below the top of casing and let sit for upwards of 10 minutes. Next, the surge block was lowered to the bottom of the casing. As the surge block was pushed past the bottom of the casing, at a depth of approximately 9.7 m below the top of casing, a vacuum like suction sound was audibly detected from the hole. The surge block was retracted and a volume of black coloured, mal-odorous water was discharged from atop the block. Moreover, a gray and black silty clay was observed to be present on the top of the surge block upon visual inspection when it had been retracted.

The works carried out by Air Rock during the intrusive investigation, based on the findings presented above, confirmed that the surface water was entering into the well at the bottom of the casing. Moreover, based on the casing movement, it is likely that the casing was initially seated onto the bedrock and either the grout column did not adequately seal the annular space at that zone, or the bedrock became fractured as the open borehole was advanced after the casing was installed and the annular space had been grouted.

Air Rock then installed a 100 mm diameter Schedule 40 PVC sleeve into the well. Air Rock proceed to install the PVC sleeve to a depth of approximately 13 m, measured from the top of the casing (approximately 6 m below the bedrock surface and 4 m deeper than the original casing) and the annular space between the PVC and the existing well casing and bedrock face was sealed with a neat cement

Report: PH 3745-1 June 21, 2023



slurry. The slurry was introduced using a tremie pipe and was pumped to the top of the well casing. The method of installation and grouting appears consistent with the requirements of Ontario Regulation 903.

Upon the completion of the updated pumping test, Air Rock subsequently abandoned the well in accordance with Ontario Regulation 903 requirements. All attempts were made to remove the existing casing, however the steel casing could not be removed from the ground. In light of this, the casing and PVC sleeve were cut back a total of 1.5 m bgs during the abandonment. The abandonment record for TW7 is included in Appendix 2.

### TW8 and TW9

TW8, constructed on August 23, 2010 and August 31, 2010, respectively, were constructed utilizing the same general methodology as the other test wells.

During the construction of TW8, it was noted that the surface of the bedrock was much more fractured and less competent than in the other areas of the site. In order to ensure the casing was seated in competent bedrock and not subject to the same problems as had been experienced at TW7, the casing hole was extended until competent rock was encountered for a thickness of approximately 2 m. As such, the total length of casing is 11.5 m bgs. This compares to a length of PVC sleeve of 13 m in TW7.

Open borehole construction, surging and well development activities were carried out in conformity to the well construction program, as detailed in the construction of TW1. Each well was sufficiently chlorinated and subjected to a one hour constant rate pumping test by Air Rock, prior to Paterson carrying out any detailed testing.

# 2.4. Aquifer Analysis

Each of the nine (9) test wells were subjected to a constant rate pumping test set at the pumping rate recommended by Air Rock during their one hour constant rate pumping test. The duration for each test was specified to be the greater of the time in which steady state was achieved, or after six (6) hours of continuous pumping.

Each of the wells were pumped using a 1.5 horsepower (HP) electric submersible pump and portable generator package supplied by Air Rock. The pumping test configuration consisted of the submersible pump assembly discharging through a 10 m long discharge hose. The discharge hose was directed into a discharge piping system consisting of upwards of 20 m of 75 mm diameter solid bell and spigot PVC piping contiguously connected and laid over the ground surface to



direct the discharge water a sufficient distance away from the pumped well. In all cases, the discharge point for each pumping test was downgradient of the subject well at a sufficient distance to utilize the natural surface drainage features (i.e. roadside ditch, or sloping terrain). Given the locations of the discharge points, combined with the duration of pumping, the pumping test configuration is believed to have minimized the potential effects of recharge into the overburden aquifer.

For each of the test wells, the test rate was selected based on the drawdown observed and reported by Air Rock during the O.Reg 903 mandatory one hour pumping test. Based on the drawdown over the one hour period, a test rate was set with the expectation that the rate would stress the aquifer enough to result in a demonstrable reduction in potentiometric head (i.e. a lowering of the static water levels) within the observation wells intercepting the water supply aquifer being tested. In all cases, the design test rates were several times higher than the minimum volumes required by Section 4.3.2 of Procedure D-5-5 which provides for an increased factor of safety in interpretation of the anticipated well yield and potential well interference models presented and discussed in Section 7.0 of this report.

During the pumping test, the pumping rate was constantly monitored using the timed-volume correlation method at 60 minute intervals in order to ensure that the rate of discharge of the pumped water did not vary by more than 5%. There were no variations of more than 5% measured for any of the pumping tests during the course of pumping of each test well.

A series of physical and geochemical analyses of the pumped water were carried out at the well head during each pumping test. The parameters tested at the well head included: turbidity, free chlorine residual, total dissolved solids, pH, temperature and electrical conductivity. The turbidity and free chlorine residuals were monitored utilizing a Hanna C114 turbidity meter and the remaining parameters were analysed using a Hach combination multimeter. The field water quality results are tabulated and graphically presented in Appendix 4.

Observation wells were closely monitored during each pumping test, in order to attempt to utilize the drawdown data in the observation wells to accurately estimate the aquifer storativity. The observation well data is tabulated in Appendix 4 associated with the pumping test of each test well.

Recovery data was collected for each of the test wells following the completion of pumping. Recovery times varied from well to well with all wells achieving at least 95% recovery within 24 hours after the completion of each pumping test.



Pumping test data was analyzed using Aquifer Test v. 2.5 aquifer analysis software package, by Waterloo Hydrogeologic. The following analytical methods were applied (where data was available):

Transmissivity Parameters: (Theis & Jacob Recovery ); and
Storativity Parameters: Cooper Jacob's Time-Drawdown and Theis (Curve
Matching).

These analytical models are well recognized to be applicable based on the aquifer system within the subject area. The results of the aquifer analysis are presented and discussed in Section 7 of this report.

# 2.5. Topographical Survey

A field survey was carried out of the subject property by J.D. Barnes. The ground surface elevations are referenced to a geodetic datum. The test pit elevations and well head elevations have been interpolated based on this survey data provided.

# 2.6. Laboratory Testing

### **Gradation of Soils**

The soil samples recovered from the test holes were returned to our laboratory and visually examined to review the results of the field logging. Four (4) representative samples were selected for grain size analyses in our laboratory. The results of the soil testing are provided on the Grain Size Distribution curves in Appendix 3.

### 2.7. Overburden Groundwater Assessment

At the time of the fieldwork, the groundwater levels were measured and are recorded as shown, where applicable, on the Soil Profile and Test Data sheets. Groundwater infiltration into the test holes varied across the site from 0.5 m to 2.2 m bgs at TP 1 and TP 9, respectively. Several of the test holes were reported to be dry upon completion (in the raised portion of the site).

Monitoring wells were installed in selected areas across the site in order to more accurately delineate the direction of flow within the overburden. The static water level measurements for the monitoring wells installed on the site, are summarized in Table 1, below.



SUMMARY OF WATER LEVELS MEASURED WITHIN THE SHALLOW OVERBURDEN GROUNDWATER AQUIFER ACROSS THE SUBJECT PROPERTY									
Manitoring Wall No		r Level Measurement (R		atum)					
Monitoring Well No.	2010-08-26	2010-09-07	2010-09-14	2010-09-22					
MW1-10	95.21	95.18	95.23	95.2					
MW2-10	95.92	95.91	95.94	95.91					
MW3-10	95.85	95.84	95.82	95.85					
MW4-10	95.32	95.33	95.31	95.31					
MW5-10	93.87	93.85	93.88	98.88					
MW6-10	95.22	95.23	95.23	95.21					

Table 1: Summary of water levels measured within the shallow overburden groundwater across the subject property

In addition to the quantitative and qualitative groundwater assessment in each test pit, groundwater samples were recovered from TP1-10, TP3-10, and TP13-10. Specifically, groundwater samples were recovered from each test pit while being excavated, under dry conditions. Each groundwater sample was extracted directly from the overburden groundwater and is considered to be directly indicative of the overburden groundwater in the sampled locations. The individual locations for sampling of the overburden groundwater were chosen in order to evaluate the background nitrate concentrations associated with areas where the existing sewage system is located (TP1-10) and in areas where there was the previous potential for agricultural uses (i.e. pasture land (TP1-10/TP3-10). In addition, TP13-10 was chosen as it reflects the central area of the subject property where existing drainage tends to focus the overburden groundwater.

These samples were submitted to Exova Accutest Laboratories, located in Ottawa, Ontario, for chemical analysis for relevant nitrogen species (i.e. nitrite and nitrate). The results of this analysis are summarized in Table 2, below and the laboratory report is provided in Appendix 3. The additional sampling carried out on the monitoring wells put down on the subject site, appear in Table 1, also.

SUMMARY OF BACKGROUND NITRATE CONCENTRATIONS REPORTED WITHIN THE SHALLOW OVERBURDEN									
GROUNDWATER AQUIFER									
Monitoring Well Location	TP1-10	TP3-10	TP13-10						
N-NO2 (Nitrite) (mg/L)	<0.10	<0.10	<0.10						
N-NO3 (Nitrate) (mg/L)	0.16	0.16	0.16						

Table 2: Summary of background nitrate concentrations reported within the shallow overburden groundwater aquifer

A detailed discussion on the results of the overburden groundwater assessment can be found in Section 8.3 of this report.



# 2.8. Bedrock Aquifer Groundwater Assessment

Raw water samples were collected from each of the nine (9) test wells during the pumping tests. Specifically, one (1) sample was collected after three (3) hours of pumping and one (1) sample was collected at the completion of pumping.

Prior to collection of the water samples, the free chlorine residual was verified to be non detectable using the Hanna C-114 handheld turbidity/free chlorine multimeter. After collection, the water samples were properly stored in a refrigerated cooler and transported to Exova Accutest Laboratories, located in Ottawa, Ontario. The samples were submitted for comprehensive testing of bacteriological, chemical and physical water quality parameters consistent with a standard "Subdivision Assessment Package". The results of the bedrock aquifer assessment are summarized in Section 7.0 of this report.

# 3.0 Site Description

### 3.1. Surface Conditions

At the time of the field investigations, the subject site was vacant and covered by shrubs and mature trees.

The site generally slopes from northeast to southwest with an undulating profile generally varying between 92 to 99 m asl with a localized high point located in the central to rear west quadrant of the property. From this high point, the land slopes off to areas of low topographical relief to the central quadrant of the subject property and westward towards a municipal drainage ditch located along the western property line. These low areas are heavily treed and have poor drainage characteristics.

# 3.2. Surrounding Land Uses with 500 m

The site, as previously mentioned is located in a rural setting. It is bordered to the east by Stagecoach Road followed by residential properties, and to the west by a municipal drain followed by recreational property. The neighbouring lands to the north and east consist of low-density residential dwellings. Undeveloped lands are present to the south.

One residence and accessory outbuildings is present on the subject site, situated approximately 100 to 150 m west of Stagecoach Road.



Based on the available information, there are no obvious indicators of potential groundwater contamination present on the surrounding lands within 500 m of the subject property, which may negatively impact the proposed development.

With respect to the recharge areas for the Oxford Formation Limestone aquifer, published information has accurately identified the location of the recharge area for the limestone aquifer(s) to be located west of Richmond, Ontario. Similarly, the March Formation limestone-sandstone composite, and Nepean Formation sandstone, both regional aquifers, have been previously documented by Paterson and others, to obtain recharge waters from Mississippi Lake and the eastern portions of Beckwith Township/western portions of Goulbourn Township, respectively.

A search of the MECP Permit to Take Water (PTTW) database provided no active PTTW within 500 m of the subject site. A search of the MECP Environmental Activity and Sector Registry (EASR) database provided no water taking permits within 500 m of the subject site.

In consideration of the identification of sources of potential contamination of the deep bedrock aquifers, the Phase 1-Environmental Site Assessment, completed by Paterson in 2007 (Paterson Report No. PE0969-REP.01) did not identify any potential contaminant sources. As the locations of the recharge areas for the bedrock aquifers are located a considerable distance away from the subject property, it is anticipated that no surficial impacts, at the time of preparation of the original report to the date of issuance of this report, are present within the immediate vicinity of the subject property which would impair or compromise the safety of the water supply aquifer in the long term.

# 4.0 Geology

# 4.1. Surficial Geology

A review of available surficial soils mapping for the area in the vicinity of the subject property indicates that the site is located in an area known to be covered with several different soil types ranging from peat to silty clay.

Based on surficial mapping prepared by the Ontario Geological Survey, the subject site is located in an area where surficial geology consists of sand, gravel, minor silt and clay, and till. Please refer to Drawing PH4734-3 – Surficial Geology Plan in Appendix 5 for additional details.

Based on the results of the test pit excavation program, surficial soil deposits which were encountered onsite coincide with the available surficial geological mapping.



Silty clay was encountered in the central quadrant of the site where the drainage is poor, and the area remains heavily treed. The western quadrant was noted to contain silty sand to sandy gravel deposits. Pockets of sand, glacial till, and organic peat soils were encountered in the eastern quadrant of the site, which is consistent with the available soils mapping.

Based on the test pit excavation program and onsite WWR's, overburden thickness across the site is in excess of 4 m. Using well recognized techniques for the field identification of soils, five (5) unique stratigraphic units were identified in the areas investigated. The soils were classified using the Unified Soil Classification System (USCS). The stratigraphic units are summarized in Table 3, and the grain size distribution curves are provided in Appendix 3. As detailed in this report, the area of peat and organic material is limited to the southeast quadrant of the site and is relatively shallow in nature. It is underlain by a coarse sand which, in turn, is underlain by silty clay and a localized perched groundwater table is present.

The test hole locations are presented on Drawing PH0482 – 7 – Lot Development Plan, included in Appendix 5. The test pit logs are provided in Appendix 1. The surficial soils encountered during the onsite investigations are generally consistent with the published mapping.

UMMARY OF UNIQUE STRATIGRAPHIC UNITS ENCOUNTERED ON SUBJECT PROPERTY BASED ON TEST PIT EXCAVATIONS* IN STUDY AREA									
Terrain Unit	USCS Classification	General Thickness (m)*							
1	SM - compact to dense silty sand	0.2 to 2.2							
2	SM-SC- compact to dense silty sand to sand-clay mixture	more than 3.0							
3	<b>GW-SM</b> - compact well graded gravelly sand to silty sand	0.8 to 2.2							
4	SC-CL- stiff silty clay to sandy clay	more than 2.4							
5	Organic- peat	0.9 to 1.5							
Maximum depth of test pit excavation of 4.2 m.	Organic deposit explored with hand auger equipment only.								

Table 3: Summary of unique stratigraphic units encountered on subject property based on test pit excavations in study area

### 4.2. Bedrock Geology

Published geological mapping (Refer to Paterson Drawing PH4734 – 4 - Bedrock Geology Plan located in Appendix 5) (OGS MRD219) reveals that the site and immediate surroundings are underlain by dolostone of the Oxford Formation. Based on available bedrock lithology data, the Oxford Formation is, historically,



underlain by a thin layer of March Formation limestone-sandstone, which, in turn, is underlain by Nepean Formation Sandstone.

Although the overall maximum thickness of the Oxford Formation ranges from 69 m to 70 m in the Ottawa area, the formation is somewhat thinner in the subject area, based on available MECP Water Well Records. Available information indicates that the Oxford formation has an onsite overall thickness of approximately 10 to 30 m.

The March Formation, based on published data, is believed to have an estimated thickness of between 8 and 9 m in much of the Ottawa area. The March Formation is comprised of thick beds of grey sandstone alternating with thick beds of sandy blue-grey dolomite. The contact with the Nepean formation is generally placed at the lowest dolomitic layer, however it is often difficult to differentiate the Nepean and March formations due to similarities in appearance.

The Nepean Formation, the oldest member of the Paleozoic strata, consists of a cream coloured, coarse-grained sandstone with a weathered grey and irregular brown stained appearance. Near the top of the formation, the cement is either calcareous or of iron oxide, and the overall thickness of the formation varies considerably beneath the Ottawa area.

The MECP Water Well records, detailing the construction of the test wells, confirm the presence of limestone which is underlain by sandstone. Published MECP Water Well records in close proximity to the site substantiate the published bedrock mapping for the subject property.

A cursory review of the published MECP Water Well Records also confirms that the significant majority of the wells drilled in the immediate area have been constructed into the limestone of the Oxford Formation, and a fewer number have been advanced to the March or Nepean Formations.

# 5.0 Regional Hydrogeology

# 5.1. Water Well Construction and Aquifer Interception

A search of the available MECP Water Well Records (WWRs) as undertaken as part of the background works in order to prepare a conceptual hydrogeological model for the subject property. The MECP WWR search was completed within a search area consisting of a radial search centred on the subject property and extending to a radial length of 1500 m. The search returned over 180 individual MECP WWRs. Analysis of the individual MECP WWRs resulted in approximately 30 individual WWR's which could be identified as being within the immediate



vicinity of the subject property. The majority of these WWRs were located in the adjacent subdivisions situated immediately to the north of the subject property. The WWR search did confirm the WWR's for the existing drilled wells at the site (one of which is TW5) as well as the WWR for 1897 Stagecoach Road (TW6).

Several WWR were noted to lack sufficient aquifer intercept information to be included in the regional analysis and a couple of WWR's were noted to be a WWR abandonment record. In total, 30 MECP WWR's were analysed for well construction characteristics and aquifer intercept depths within the underlying bedrock strata. These WWRs are included for reference purposes in Appendix 2.

Of the 30 MECP WWRs included in the analysis, 100% of the wells were noted to be drilled wells with the casings completed into bedrock. The choice of grouting compounds were identified to be either a neat cement, or sodium bentonite slurry.

With respect to the depth of aquifer interception, 10 of the WWRs reported intercepting a water supply aquifer within the shallow portion of the Oxford Formation at a depth of less than 23 m below the existing ground surface. Of these 10 WWRs, three (3) were noted to have also intercepted a lower water supply aquifer within the Oxford Formation limestone at depths of the order of 35 m to 39 m bgs. In all instances, the length of well casing reported on the WWRs indicated that the casings terminated into only the upper few metres of the bedrock surface.

Conversely, the remaining MECP WWRs were noted to intercept a combination of the lower Oxford Formation limestone and the limestone-sandstone interbeds associated with the March Formation. A total of 5 WWRs intercepted the lower Oxford Formation between 35 m and 45 m bgs and the March Formation water supply aquifer at a depth of between 52 and 70 m bgs. The remaining 26 WWR's intercepted only the March Formation at depths of between 52 and 70 m bgs and did not report encountering the Oxford Formation water supply aquifers. In all instances, the length of well casing reported on these WWRs indicated that the casings terminated into only the upper few metres of the bedrock surface.

With respect to well yields, all of the 49 WWRs reported yields in excess of 23 L/min (5 gpm).

# **Summary**

Although most of the available MECP WWRs within the adjacent developments are completed into the lower Oxford Formation limestone or the March Formation water supply aquifers, all of the WWR's reviewed indicated that the well casings terminated into only the first few metres of the surface of the bedrock. Moreover,



upwards of 5 of the 30 WWRs reviewed (10%) reported intercepted both the lower Oxford Formation and March Formation water supply aquifers.

# 5.2. Neighbouring Water Quality

The existing well located at 1897 Stagecoach Road (TW6) was the only well accessible and with a published water well record in which the construction methodology could be verified to be included in the study.

In addition to the residences located within the immediate vicinity of the site, Paterson approached the owners of the Sleepy Cedars Family Campground (Sleepy Cedars) located to the west of the subject property beyond the tributary of the Castor River. Sleepy Cedars, which is located at 1893 Manotick Station Road, Ottawa, Ontario, operates a seasonal campsite which utilizes a private well and onsite sewage system. Paterson has carried out analytical aquifer analysis and groundwater geochemistry testing, under J.D. Paterson & Associates Ltd. in 2001. The work was carried out in conjunction with a Provincial Order issued by the MECP and pertained to the existing water works at the site, in order to assess the applicability of Ontario Regulation 459/00.

The existing drilled well (refer to Appendix 2 for WWR) was constructed in 1978 to a depth of 50.3 m bgs. Based on the published information, the well intercepts the March Formation aquifer at a depth of approximately 48.8 m bgs. Well yield was reported to be of the order of 12 gpm.

Sleepy Cedars confirmed with Paterson that the original peak values of upwards of 10,000 L/day during summer periods remain valid for the purpose of carrying out well interference modelling. The maximum rate of supply of water, based on the configuration of the water system is only 34 L/min (48,960 L/day). As such, the well at this particular site acts as a single house well for the purposes of interference analysis.

The aquifer analysis carried out in 2001 utilized the data obtained from a 250 minute pumping test to fit a Cooper & Jacobs Time-Drawdown graphical analysis model. A transmissivity of 4.40 x 10-3 m²/minute was calculated. The graphical analysis and information contained within the original MECP Provincial Offences order is provided in Appendix 2.

# 6.0 Site Hydrogeology

As previously stated in this report, a total of seven (7) test wells were constructed at the subject site during the well construction program and two (2) existing wells were utilized as part of the aquifer analysis (refer to Drawing No. PH0482 - 1- Test



Hole Location Plan in Appendix 5 for well locations). Hydrogeological details of the construction of each test well, based on the MECP Water Well Records, and engineering site notes, are graphically presented in the Generalized Hydrogeological Cross Section of the Subject Property- Drawing No. PH0482 - 4 in Appendix 5.

A review of Drawing No. PH0482 - 4 reveals that the hydrogeology of the test well construction is consistent with the other wells constructed in the immediate vicinity of the site. The water supply aquifer located within the Oxford Formation limestone appears, based on the finding of the pumping test program which are discussed in detail in Section 7.0, to be intermittent throughout the site and immediate area. Conversely, the March Formation was consistently intercepted by eight (8) of the nine (9) test wells at the site. TW6 (1897 Stagecoach Road) was not advanced to the March Formation as it intercepted a water supply aquifer present in the lower section of the Oxford Formation. The available water well records for wells located to the immediate vicinity of the site, including the well for Sleepy Cedars Campground to the West (refer to Section 5.2 for more information) of the subject property indicated that many of the surrounding wells have been advanced to the March Formation also.

The confining pressure and aquifer response of TW8 and TW9 to the pumping test, suggest that the preferred water supply aquifer system is behaving as a confined aquifer present between two (2) aquitards. By definition, "...the term aguitard has been coined to describe the less-permeable beds in a stratigraphic sequence." (Freeze & Cherry, 1979). The lower Oxford Formation, and underlying March/Nepean interface, if acting as aquitards, would explain the confining pressure measured in the wells and the corresponding Theis-like response to pumping. Analysis of the available MECP Water Well Records within a 500 m radius of the site indicate significant thicknesses of limestone are present between the surface of the ground and the depth of the water supply aguifer on most, if not all of the drilled wells. This fact, combined with the absence of nitrates in the preferred water supply aquifer zone (Lower Oxford and March Formations) further suggest the preferred water supply aquifer is hydraulically isolated from surficial impacts. However, the scope of this Hydrogeological Study did not include a detailed analysis of the preferred aguifer system focussed on demonstrating hydraulic isolation. As such, the information presented in this section adds a degree of security to the natural protection of the preferred aquifer system and only infers the system is hydraulically isolated, but does not corroborate this.

Report: PH 3745-1 June 21, 2023



# Direction of Groundwater Flow within the Combined Oxford and March Aquifer System

Typically, the static water levels in at least three (3) wells intercepting the same water supply aquifer is utilized to provide an interpolated direction of groundwater flow. In this instance, a total of seven (7) test wells (TW3 and TW6 omitted) were utilized to interpolate the direction of groundwater flow within the March Formation beneath the site. Based on an analysis of the static water levels found within these wells, the interpolated direction of groundwater flow within the water supply aquifer located in the March Formation, is in a south-southwest direction beneath the site.

# 7.0 Aquifer Analysis

The results of the pumping tests performed on the test wells are presented in the following sections.

# 7.1. Aquifer Characteristics

The aquifer characteristics determined from the compilations of the pumping tests for the nine (9) test wells are summarized below:

Parameter	Test Well Number										
Faranietei	TW1	TW2	TW3	TW4	TW5	TW6	TW7	TW8	TW9		
Transmissivity* (m2/d)	4.1	2.4	684	56.7	118	66	0.8	13.3	485		
Storativity**	n/a	n/a	n/a	1.0 x 10-4	4.0 x 10-5	3.9 x 10-4	1.0 x 10-4	6.8 x 10-4	1.1 x 10-4		
Pumping Rate (L/min)	24	36	114	75.7	42	44	22.8	45.4	75.6		
Available Drawdown (m)	27.15	47.7	65.04	48.8	49	22.5	44.7	48.8	71.3		
Maximum Drawdown (m)	5.28	10.46	0.34	0.67	0.49	1	19.8	13.8	0.47		
% Drawdown	8.4	21.9	0.5	1.4	1	4.5	44.3	28.3	0.7		
Specific Capacity (L/min/m dd)	4	3	228	113	86	43.8	0.7	3	161		
20 Year Safe Yield (m3/day)	479	78	30251	1882	3932	1010	24	441	23416		

<sup>\*</sup> Transmissivity values calculated from numerical averages of values derived from the Theis & Jacobs Recovery method of analysis. In the case of TW3, transmissivity was calculated as the numerical average of the three (3) analytical results through the use of observation well data.

\*\* Storativity values calculated based on the numerical averages of all storativity values obtained from both Theis and Cooper & Jacobs Time-Drawdown analytical methods.

Table 4: Summary of aquifer characteristics resulting from analysis of pumping test data obtained from constant rate testing

# 7.2. Groundwater Geochemistry Assessment

As three (3) distinct water supply aquifers/aquifer combinations were encountered within the bedrock beneath the subject property, and the well construction program resulted in at least one (1) well intercepting each formation in isolation, the water quality data for each of the water supply aquifers is presented in tabular formation in each subsection, summarized below.

Data obtained from active well head water quality monitoring during the pumping tests is summarized, graphically, in Appendix 4.

Report: PH 3745-1 Page: 24

June 21, 2023



# **Oxford Formation**

Table 5 and Table 6, presented in this section, summarize the overall laboratory geochemistry of the Oxford Formation water supply aquifer located beneath the subject property. The water quality of this aquifer is presented based on the analysis of raw water recovered from TW1 and TW6.

	Units	TW1		TW6		Ontario Drinking Wate Standards*	
		3 Hour	6 Hour	3 Hour	6 Hour	Type	Limit
robiological Parameters**							
Escherichia Coli	ct/100 mL	0	0	0	0	MAC	0
Faecal Coliforms	ct/100 mL	0	0	0	0	-	-
Faecal Strep.	ct/100 mL	0	0	0	0	-	-
HPC	ct/1 mL	0	0	0	1	-	-
Total Coliforms	ct/100 mL	0	0	0	0	MAC	0
mical Parameters (Health Related)							
Fluoride	mg/L	0.36	0.39	0.32	0.32	MAC	2.4
Nitrite	mg/L	<0.10	<0.10	<0.10	<0.10	MAC	1
Nitrate	mg/L	<0.10	<0.10	<0.10	<0.10	MAC	10
mical Parameters with Aesthetic Objective	s/ Operational G	uidelines					
Alkalinity	mg/L	242	243	227	226	OG	500
Chloride	mg/L	7	8	7	7	AO	250
Colour	TCU	2	<2	3	3	AO	5
DOC	mg/L	1.7	1.5	2	2.1	AO	5
Hydrogen Sulfide	mg/L	0.01	<0.01	0.01	<0.01	AO	0.05
pH		8.13	8.13	8.11	8.14	AO	6.5-8.
Sulphate	mg/L	34	33	24	24	AO	500
Hardness	mg/L	232	211	222	229	OG	100
Sodium	mg/L	22	25	6	7	AO	20(20
Iron	mg/L	0.86	0.47	0.17	0.18	AO	0.3
Manganese	mg/L	0.02	0.02	0.01	0.01	AO	0.05
TDS	mg/L	343	343	310	309	AO	500
Turbidity (laboratory)	NTU	12	4.6	1	1	AO/MAC	5/1
Turbidity (field)	NTU	9.15	0.92	0.09	0.06	AO/MAC	5/1

Table 5: Summary of Health and Aesthetic/Operational Parameters for the Oxford Formation Water Supply Aquifer (TW1 and TW6)

SUMMARY OF GENERAL CHEMISTRY PARAMETERS FOR THE OXFORD FORMATION AS DEFINED BY THE RAW WATER QUALITY OBTAINED FROM TW1 AND TW6										
D	11-11-	T	W1	TV	W6					
Parameter	Units	3 Hour	6 Hour	3 Hour	6 Hour					
General Parameters										
Conductivity	uS/cm	527	527	477	476					
N-NH3 (Ammonia)	mg/L	0.1	0.09	0.15	0.15					
Phenols	mg/L	<0.001	<0.001	<0.001	<0.001					
Tannin & Lignin	mg/L	0.2	0.2	0.2	0.2					
Total Kjeldahl Nitrogen	mg/L	0.15	0.15	n/a	n/a					
Ion Balance	Unitless	0.99	0.94	0.9	0.95					
Calcium	mg/L	50	45	46	47					
Magnesium	mg/L	26	24	26	27					
Potassium	mg/L	5	4	3	3					

Table 6: Summary of the General Chemistry Parameters for the Oxford Formation as defined by the Raw Water Quality obtained from TW1 and TW6.

Report: PH 3745-1 Page: 25 June 21, 2023



### Combined Oxford/March Formation

Table 7 and Table 8, presented in this section, summarize the overall laboratory geochemistry of the raw water resulting from the mixing of the upper Oxford Formation and the lower March Formation water supply aquifers located beneath the subject property. The water quality of this aquifer is presented based on the analysis of raw water recovered from TW2, TW4, TW5, and TW8. TW7, in which the water quality was suspected to be impacted by a short-circuiting of overburden groundwater into the water well through the base of the casing (refer to Section 2.3), was not included in the evaluation of the water quality from the Oxford/March Formation. The water quality summary for TW7 appears in Tables 11 and 12 and is included to demonstrate the degree of impact of the overburden groundwater on the combined water quality from the bedrock aquifers.

In addition to the reported water quality analysis for these wells, TW8 was sampled for heavy metals and select herbicides/pesticides during the 24th hour of the test. The results are provided for reference purposes in Appendix 3 for the TW8 data set. Analysis of the chemical analysis reveals an absence of both heavy metals and herbicides/pesticides in the combined Oxford/March Formation aquifer system.

SUMMARY OF HEALTH AND AESTHETI	C/ OPERATION/	L PARAMETER:	S FOR THE CO	MBINED OXFOR	RD FORMATION	AND MARCH	FORMATION W	ATER SUPPLY	AQUIFERS AS D	EFINED BY TW2	, TW4, TW5, AI	ID TW8
		Т	W2	TW4		TW5		TW8			ODWS	
Parameter	Units	3 Hour	6 Hour	3 Hour	6 Hour	3 Hour	6 Hour	12 Hour	24 Hour	12h Repump	Туре	Limit
Microbiological Parameters												
Escherichia Coli	ct/100 mL	0	0	0	0	0	0	0	0	0	MAC	0
Faecal Coliforms	ct/100 mL	0	0	0	0	0	0	0	0	0	-	-
Faecal Strep.	ct/100 mL	0	0	0	0	0	0	0	0	0	-	-
HPC	ct/1 mL	>500	185	82	58/0	17	21	88	85	0	-	-
Total Coliforms	ct/100 mL	0	0	0G	OG/0	0	0	2	1	0	MAC	0
Chemical Parameters (Health Related)									•			
Fluoride	mg/L	0.43	0.42	0.34	0.33	0.71	0.71	0.36	0.48	0.36	MAC	2.4
Nitrite	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	MAC	1
Nitrate	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	MAC	10
Chemical Parameters with Aesthetic Objectives,	/ Operational G	uidelines										
Alkalinity	mg/L	193	199	195	195	178	178	294	286	207	OG	500
Chloride	mg/L	6	6	45	44	4	4	13	13	59	AO	250
Colour	TCU	<2	<2	<2	2	<2	3	13	12	<2	AO	5
DOC	mg/L	2.8	2.4	1.4	1.5	1.7	1.7	5	4.9	1.7	AO	5
Hydrogen Sulfide	mg/L	0.02	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	AO	0.05
pH		8.29	8.33	8.18	8.21	8.19	8.2	8.16	8.18	8.07	AO	6.5-8.5
Sulphate	mg/L	20	20	34	36	15	15	76	70	47	AO	500
Hardness	mg/L	204	213	217	215	121	127	248	233	254	0G	100
Sodium	mg/L	12	11	36	34	31	31	51	46	40	AO	20(200)
Iron	mg/L	1.47	0.33	0.26	0.12	0.05	0.05	0.41	0.41	0.21	AO	0.3
Manganese	mg/L	0.03	0.02	0.04	0.02	<0.01	<0.01	0.03	0.03	0.02	AO	0.05
TDS	mg/L	269	272	376	375	244	244	462	450	433	AO	500
Turbidity (laboratory)	NTU	23.4	15.6	0.6	0.4	0.3	0.6	0.9	0.7	1.1	AO/MAC	5/1
Turbidity (field)	NTU	17.7	0.94	0	0	0.09	0.06	0.1	0	0	AO/MAC	5/1

Table 7: Summary of Health and Aesthetic / Operational Parameters for the combined Oxford Formation and March Formation Water Supply Aguifers as defined by TW2, TW4, TW5, and TW8.



SUMMARY OF THE GENERAL CHEMISTRY PARAMETERS FOR THE COMBINED OXFORD FORMATION AND MARCH FORMATION WATER SUPPLY AQUIFERS DEFINED BY TW2, TW4, TW5, AND TW8											
		T\	V2	T\	N4	T\	V5	TW8			
Parameter	Units	3 Hour	6 Hour	3 Hour	6 Hour	3 Hour	6 Hour	12 Hour	24 Hour	12H Repump	
General Parameters											
Conductivity	uS/cm	414	419	527	527	376	376	711	693	666	
N-NH3 (Ammonia)	mg/L	0.23	0.23	0.1	0.09	0.14	0.14	0.21	0.21	0.07	
Phenols	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Tannin & Lignin	mg/L	0.2	0.1	0.2	0.2	0.1	0.1	0.2	0.2	<0.01	
Total Kjeldahl Nitrogen	mg/L	0.29	0.2	0.15	0.15	0.17	0.17	0.53	0.73	<0.10	
Ion Balance	Unitless	1.06	1.06	0.99	0.94	0.96	1	0.94	0.9	1.02	
Calcium	mg/L	37	39	50	45	22	23	50	47	54	
Magnesium	mg/L	27	28	26	24	16	17	30	28	29	
Potassium	mg/L	5	4	5	4	4	4	6	5	5	

Table 8: Summary of the General Chemistry Parameters for the combined Oxford Formation and March Formation Water Supply Aquifers as defined by TW2, TW4, TW5, and TW8

# **Combined Oxford/March/Nepean Formations**

Table 9 and Table 10, presented in this section, summarize the overall laboratory groundwater geochemistry of the raw water resulting from the mixing of the upper Oxford Formation, the March Formation and the lower Nepean Formation water supply aquifers. The water quality of this aquifer is presented based on the analysis of raw water recovered from TW3 and TW9.

			TW3 and 1	rw9				
Parameter	Units	TW3		TW9			ODWS*	
Taraneter	Onits	3 Hour	6 Hour	3 Hour	6 Hour	6 Hour Repump	Type	Limit
crobiological Parameters**								
Escherichia Coli	ct/100 mL	0	0	0	0	0	MAC	0
Faecal Coliforms	ct/100 mL	0	0	0	0	0	-	-
Faecal Strep.	ct/100 mL	0	0	0	0	0	-	-
HPC	ct/1 mL	0	0	107	46	6	-	-
Total Coliforms	ct/100 mL	0	0	89	68	0	MAC	0
emical Parameters (Health Related)								
Fluoride	mg/L	0.3	0.3	0.37	0.37	0.36	MAC	2.4
Nitrite	mg/L	< 0.10	<0.10	< 0.10	< 0.10	0	MAC	1
Nitrate	mg/L	< 0.10	< 0.10	< 0.10	< 0.10	0	MAC	10
emical Parameters with Aesthetic Objecti	ves/ Operational Guideline	es	•			•		
Alkalinity	mg/L	212	212	201	204	202	OG	500
Chloride	mg/L	44	44	56	50	59	AO	250
Colour	TCU	2	<2	<2	<2	2	AO	5
DOC	mg/L	1.6	1.5	1.5	1.7	1.4	AO	5
Hydrogen Sulfide	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	<0.01	AO	0.05
pH		7.97	8	8.04	8.12	8.02	AO	6.5-8.5
Sulphate	mg/L	48	48	54	50	48	AO	500
Hardness	mg/L	252	261	231	229	227	OG	100
Sodium	mg/L	32	32	34	34	35	AO	20(200
Iron	mg/L	0.25	0.26	0.47	0.13	0.16	AO	0.3
Manganese	mg/L	0.02	0.02	0.03	0.02	0.02	AO	0.05
TDS	mg/L	401	402	430	427	417	AO	500
Turbidity (laboratory)	NTU	2.3	1.9	13.1	2.5	1.2	AO/MAC	5/1
Turbidity (field)	NTU	0.7	0.3	5.1	0	0	AO/MAC	5/1

Table 9: Summary of the Health and Aesthetic / operational Parameters for the combined Oxford Formation, March Formation and Nepean Formation Water Supply Aquifers as defined by TW3 and TW9.

Report: PH 3745-1 Page: 27 June 21, 2023



SUMMARY OF GENERAL CHEMISTRY PARAMETERS FOR THE COMBINED OXFORD FORMATION, MARCH FORMATION, AND NEPEAN FORMATION WATER SUPPLY AQUIFERS AS DEFINED BY TW3 and TW9								
Parameter	Units	TV	W3	TW9				
Parameter		3 Hour	6 Hour	3 Hour	6 Hour			
General Parameters								
Conductivity	uS/cm	527	527	477	476			
N-NH3 (Ammonia)	mg/L	0.1	0.09	0.15	0.15			
Phenols	mg/L	<0.001	<0.001	<0.001	<0.001			
Tannin & Lignin	mg/L	0.2	0.2	0.2	0.2			
Total Kjeldahl Nitrogen	mg/L	0.15	0.15	n/a	n/a			
Ion Balance	Unitless	0.99	0.94	0.9	0.95			
Calcium	mg/L	50	45	46	47			
Magnesium	mg/L	26	24	26	27			
Potassium	mg/L	5	4	3	3			

Table 10: Summary of the General Chemistry Parameters for the combined Oxford Formation, March Formation and Nepean Formation Water Supply Aquifers as defined by TW3 and TW9.

Parameter	Units	TW7 (NO SLEEVE)		TW7 (SLEEVED)			ODWS*	
Parameter	Units	3 Hour	6 Hour	3 Hour	6 Hour	24 H Repump	Type	Limit
crobiological Parameters**								
Escherichia Coli	ct/100 mL	0	0	0	0	0	MAC	0
Faecal Coliforms	ct/100 mL	0	0	0	0	0	-	-
Faecal Strep.	ct/100 mL	0	0	0	0	0	-	-
HPC	ct/1 mL	0	0	1	3	5		-
Total Coliforms	ct/100 mL	0	0	0	0	0	MAC	0
emical Parameters (Health Related)			•	•	•	•		•
Fluoride	mg/L	< 0.10	<0.10	0.14	0.14	0.22	MAC	2.4
Nitrite	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	MAC	1
Nitrate	mg/L	< 0.10	<0.10	<0.10	<0.10	<0.10	MAC	10
emical Parameters with Aesthetic Objecti	ives/ Operational Guideline	es		•	•	•		
Alkalinity	mg/L	398	399	382	384	337	OG	500
Chloride	mg/L	20	20	16	16	15	AO	250
Colour	TCU	26	26	19	21	18	AO	5
DOC	mg/L	14.8	13.2	10.8	12.4	7.8	AO	5
Hydrogen Sulfide	mg/L	0.01	0.01	<0.01	< 0.01	< 0.01	AO	0.05
рН		7.95	7.95	7.96	7.97	7.85	AO	6.5-8.5
Sulphate	mg/L	202	200	122	130	112	AO	500
Hardness	mg/L	635	649	482	484	372	OG	100
Sodium	mg/L	13	13	14	15	27	AO	20(200)
Iron	mg/L	4.78	4.73	3.39	3.33	1.7	AO	0.3
Manganese	mg/L	0.3	0.3	0.2	0.2	0.1	AO	0.05
TDS	mg/L	708	708	610	612	534	AO	500
Turbidity (laboratory)	NTU	26.5	25.6	21	19	7	AO/MAC	5/1
Turbidity (field)	NTU	N/A	5.2	3.33	1.49	0	AO/MAC	5/1

Table 11: Summary of Health and Aesthetic / Operational Parameters for TW7 for both Unsleeved and Sleeved Well Construction Conditions

р .	11.25	TW7 (NO SLEEVE)		TW7 (SLEEVED)			
Parameter	Units	3 Hour	6 Hour	3 Hour	6 Hour	24 H Repump	
ieneral Parameters							
Conductivity	uS/cm	1090	1090	938	941	821	
N-NH3 (Ammonia)	mg/L	0.77	0.76	0.65	0.65	0.54	
Phenols	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	
Tannin & Lignin	mg/L	1	1.1	0.8	0.8	0.5	
Total Kjeldahl Nitrogen	mg/L	1.29	1.23	0.72	0.64	0.56	
Ion Balance	Unitless	1.05	1.07	0.97	0.96	0.92	
Calcium	mg/L	175	179	127	128	93	
Magnesium	mg/L	48	49	40	40	34	
Potassium	mg/L	2	2	2	2	3	

Table 12: Summary of General Chemistry Parameters for TW7 for both Unsleeved and Sleeved Well Construction Conditions

Report: PH 3745-1 Page: 28 June 21, 2023



# 7.3. Aquifer Analysis Summary

# **Water Quantity Assessment**

Using the procedure summarized in the document entitled, "Procedure D-5-5 Technical Guideline for Private Wells: Water Supply Assessment", prepared by the Ontario Ministry of the Environment, last revised August 2006, an analysis of the suitability of the aquifer to supply the proposed development can be completed. Using the values contained within Procedure D-5-5, the per-person water requirement is set at 450 L/day. The peak demand, which occurs over a 120 minute period each day, equates to a peak demand rate of 3.75 L/min per person. Procedure D-5-5 suggests the utilization of the number of bedrooms plus one, to determine the minimum number of people per house. As the proposed development will likely contain four-bedroom single family homes, using the Procedure D-5-5 methodology, the number of persons would be five (5) and the total peak demand rate is calculated to be 18.75 L/min. This estimated total peak demand is well below the well yields demonstrated for the preferred water supply aquifer.

Analysis of Table 4 in Section 7.1, reveals that the pumping rates chosen for each of the pumping wells are above this minimum pumping rate. Furthermore, all of the test wells were reported to have utilized less than 75 % of the available drawdown during the pumping tests. This information, combined with the calculated 20 year long term safe yield values, suggests that the specified well yields are representative of the yields which residents of the development are likely to obtain from future wells put down on the site. Long term offsite impacts on wells intercepting the March Formation are not anticipated, considering the drawdown experienced in TW8 from the 24 hour pumping test, the spacing of the wells on the site, and the intermittent nature of the water use.

# Water Quality

### Oxford Formation

A review of the water quality analysis data from Table 5 and Table 6, which represents the water supply aquifer located within the limestone in the upper portion of the Oxford Formation, reveals that the raw water meets all health related parameters of the Ontario Drinking Water Standards (ODWS).

The well head water quality monitoring, carried out on each of the two (2) test wells during the constant rate pumping test, indicated that the raw water had generally stabilized within three (3) to four (4) hours following the commencement of pumping.



With respect to aesthetic objectives and operational guidelines, the water contains modestly elevated concentrations of sodium, hardness, and iron.

Sodium (Na) concentrations in TW1 were noted to be present above a concentration of 20 mg/L (22 mg/L to 25 mg/L reported). The sodium concentrations do vary between the two (2) test wells, with TW6 reporting lower concentrations (6 mg/L to 7 mg/L). This may be a result of the active use of TW6 as a water supply well for a neighbouring residence and may indicate that the sodium concentrations within this formation may fall with continued well development.

Although sodium is not toxic and no maximum acceptable concentration has been set, concentrations above 20 mg/L require that the Medical Officer of Health be notified so that this information may be passed on to local physicians for use in treatment of those requiring a sodium-restricted diet.

Hardness, an operational guideline, does not appear in the ODWS. Rather it appears in the Technical Support Documents for Drinking Water Standards, Objectives and Guidelines (Technical Support Documents) as a parameter with an operational guideline of 100 mg/L. At the measured concentrations, the water is considered to be hard to very hard. TW1 and TW6 had reported hardness concentrations below the reasonable treatable limit of 500 mg/L specified in Table 3 of the guidance document, entitled, "Procedure D-5-5: Technical Guideline for Private Wells: Water Supply Assessment", published by the MECP in 1995.

Iron (Fe), an aesthetic water quality parameter, has an aesthetic objective set at 0.30 mg/L. This objective is set by appearance effects. Excessive iron concentrations in drinking water may impart a brownish colour to laundered goods and plumbing fixtures. The colour of the water may also be affected by excessive iron concentrations and the raw water can produce a bitter, astringent taste which may affect beverages.

### **Combined Oxford and March Formations**

Analysis of Table 7 and Table 8, which reflect the general groundwater geochemistry associated with the combined Oxford Formation and March Formation water supply aquifers, reveals that the raw water meets all of the critical health related parameters of the Ontario Drinking Water Quality Standards (ODWS).

With respect to aesthetic water quality parameters, the raw water originating from this combined aquifer system shows similarly elevated concentrations of sodium, hardness and iron as was noted in the water quality summary for the Oxford Formation water supply aquifer, above.



It should be noted that, with respect to TW8, the 24 hour pumping test resulted in significant reductions to the iron and colour concentrations. Due to its proximity to TW7, which allowed overburden water into the combined aquifer system, it was necessary to pump for an additional period of time in order to remove the remaining aesthetic parameter exceedances by stabilizing the pH within the raw water. The stabilized pH, as noted in Table 7, is approaching the range of values summarized in Table 9. Table 9 reflects the water quality from the Oxford, March and Nepean Formations, however most of the influence on the water quality from those wells is believed to be from the March and Nepean Formations.

Turbidity was elevated in TW2 during the original pumping tests. Similarly, iron was also elevated. Additional well development through the pumping of future wells at a low flow rate, intended on drawing water from the formation(s) in a more laminar fashion, will reduce the turbidity to the desired values of less than 5 NTU. This is evidenced by the 2010 pumping tests carried out on TW4, TW8 and TW9.

# Combined Oxford, March and Nepean Formation

The summarized raw water quality for TW3 and TW9, the wells which were confirmed to penetrate into the Nepean Formation, appears in Table 9 and Table 10. Analysis of the tabulated data, which reflect the general groundwater geochemistry associated with the combined Oxford Formation, March Formation, and Nepean Formation water supply aquifers, reveals that the raw water meets all of the critical health related parameters of the Ontario Drinking Water Quality Standards (ODWS).

With respect to aesthetic water quality parameters, the raw water originating from this combined aquifer system shows similarly elevated concentrations of sodium, hardness and, to a much lesser extent, iron, as was noted in the water quality summary for the Oxford Formation and Combined Oxford and March Formation aquifer systems, above. The noted iron concentrations, with the exception of the initial three (3) hour concentration measured for TW9, all fell below the 0.30 mg/L threshold. Additional discussions on this phenomenon are discussed in the water conditioning considerations in Section 8.8 of this report.

It should be noted that the initial development of future water wells will likely require a period of well development of a similar duration as the six (6) hour pumping tests carried out on these test wells in order to reduce initial turbidity levels and iron concentrations which will likely be elevated. This is evidenced by all of the pumping tests carried out on the test wells at this site.



# 8.0 Development Recommendations

The following sections outline the recommendations for development which have been formulated from the data collected in this study.

# 8.1. Site Development

Based on the results of our study, this site is considered to be suitable for the development of more than 66 lots as described in Section 1.0 of this report. The on-site sewage disposal needs can be accommodated with standard Class 4 sewage systems consisting of a septic tank and fully raised leaching bed, as per Part 8 of the Ontario Building Code. Furthermore, an adequate water supply aquifer of sufficient quality and quantity is located beneath the subject property and can be intercepted by private wells drilled in accordance with Ontario Regulation 903.

# 8.2. Lot Development Plan

One objective of the Hydrogeological Study is to enhance development and minimize the effects of sewage systems on the surrounding environment. This is achieved through prevention of the accumulation of surface water near sewage systems, by ensuring the proper construction of water supply wells and sewage systems, and by coordinating the overall positioning of the services to maximize separations. A minimum separation of 18 m for fully-raised systems is required between a well and a Class 4 sewage system. Clearance distances also apply to wells and septic systems located on neighbouring lots.

The proposed Lot Development Plan (Drawing No. PH0482-7) in Appendix 5 shows the proposed lot development plan for the site. The purpose of this drawing is to show that a typical home and private services will fit onto the proposed lot, and can meet all pertinent regulations without causing environmental constraints. The houses shown in this drawing covers a plan area of 510 m², assuming a four (4) bedroom, two-storey 300 m² home, and including a garage of 70 m² with a driveway area of 140 m² (7 m wide by 20 m long (on average)). This impervious area is considered to be moderately conservative, but is representative of the larger homes being constructed elsewhere in the Greely area. Each residence is serviced by a sewage system with the capacity of 3,000 L/day. In actuality, the daily sewage flows will likely be significantly lower than this value.

In all instances, careful, site specific analysis of the soil morphology in the area of each proposed leaching bed is required during the design stages of the leaching bed in order to determine if sufficient soil exists to facilitate the use of native soil



for subgrade preparation. Detailed soil morphology should only be determined by a qualified geotechnical specialist.

It is not the intent of the Lot Development Plan (Drawing No. PH0482-7) to restrict placement of a dwelling on each lot. While the actual configuration and position of the home may change, the relative position of the home, sewage system and well should be maintained. In all cases, the separation criteria for the immediate and neighbouring lots should be followed.

The required separation distance from a fully raised leaching bed to a surface water body or drilled well is 18 m. Furthermore, in accordance with Ontario Regulation 903, all drilled wells, in addition to the prescribed separation distances to the sewage system, must also be located a minimum of 15 m from a potential source of contamination. (i.e. fuel oil tanks, Regional Roads, etc.)

# 8.3. Predictive Impact Assessment

# **Hydrogeological Sensitivity**

In accordance with Section 5.0 of the MECP publication, entitled, "Procedure D-5-4 Technical Guidelines for Individual On-site Sewage Systems: Water Quality Impact Risk Assessment", the groundwater impacts from on-site sewage systems must be addressed in a step-wise manner. In order to establish the initial step, it is essential to demonstrate whether or not the site is considered hydrogeologically sensitive.

Hydrogeological Sensitivity as defined by the City of Ottawa refers to bedrock within 2.0 m of the ground surface. Available drift thickness mapping shows an onsite drift thickness between 5 to 15 m. Bedrock was not encountered onsite in any of the test pits, with the exception of TP 5 which notes a inferred bedrock surface at 1.3 m bgs. As TP12-10 was completed adjacent to TP 5, and extended to 3.2 m bgs, it is inferred that the refusal encountered in TP 5 was refusal on till. Furthermore, the soil description on the soil profile for TP12-10 notes sand with boulders, which is the likely cause of refusal. TW4 was also completed near TP5, and notes an overburden thickness of 4.0 m on the WWR. This is further corroborated by the WWR's for the onsite Test Wells which demonstrate that bedrock was encountered between 3.7 and 17.7 m bgs on the subject site.

As such, the subject site is not considered to be hydrogeologically sensitive based on the overburden thickness being greater than 2.0 m across the subject site.



# **Isolation of Supply Aquifer**

As established in Section 6.0 of this report, the confining pressure and aquifer analyses suggest that the preferred water supply aquifer system, as defined by TW9, exhibits an aquifer response indicative of a confined aquifer present between two (2) aquitards. However, the scope of this Hydrogeological Study did not include a detailed analysis of the preferred aquifer system and focussed on demonstrating hydraulic isolation. As such, the information presented in this section adds a degree of security to the natural protection of the preferred aquifer system and only infers the system is hydraulically isolated, but does not corroborate this.

# **Predictive Impact Assessment for Nitrate**

Nitrate is considered to be a critical parameter of concern when assessing impacts to groundwater quality downgradient of an onsite sewage system. MECP Procedure D-5-4 applies for the proposed development. For the purpose of this guideline, the Ontario Drinking Water Objective of 10 mg/L of nitrate is the maximum allowable concentration detectable in the groundwater prior to the property line.

Guideline D-5-4 indicates that where the average lot size is 1.0 ha or larger, a detailed assessment is typically not required since it is considered be a low-risk development and that adequate surplus water is available in the soils to appropriately dilute the nitrate output on the property. The proposed severed lots have an average size of less than 1.0 ha and, as such, a detailed impact assessment has been completed.

In order to demonstrate that private services would adequately support the proposed residential subdivision, a predictive nitrate impact assessment for the subject site is shown below. The values shown in the Predictive Nitrate Impact Assessment attached to this report are summarized below:

Site area	62.6 ha
Impervious area % (Although impervious area calculations result in home, a garage of 70 m2, a driveway area of 14 of 22,000 m²) the Stormwater Managements De Project Ref # P584-06 dated May 11, 2022 not impervious area of 20% was used to demonstr work for the subdivision using a conservative approximate the subdivision and a conservati	0 m2 and a subdivision road lengthesign Brief completed by JFSA with es a impervious area of 20%. The eate that the NIA calculation would
Daily sewage flow	66,000 l/day
(Rased on Ontario Guideline D-5-4)	(66 Lats)

Report: PH 3745-1 June 21, 2023



	Concentration of nitrate in effluent (Value based on typical effluent concentration)	40 mg/L
0	Surplus Water (The surplus water value was estimated based on Envir Office values with a soil type comprised of clay loam (Urb Crops) and anthropogenic sources, which can be found is a significant amount of sand across the subject site, the used in order to be conservative)	an Lawn/Shallow Rooted attached. Although there
	Combined infiltration factor based on:	0.45
	<ul> <li>Topography infiltration factor</li> </ul>	0.15
	<ul> <li>Soil texture infiltration factor</li> </ul>	0.20
	<ul> <li>Cover infiltration factor</li> </ul>	0.10

The topography infiltration factor of 0.15 is based upon a average of rolling land with a average slope of 2.8 to 2.8 m/km and hilly land with an average slope of 28 m to 47 m/km for the proposed development.

The soil texture infiltration factor was based on a medium combination of clay and loam with a value of 0.2 which is a reasonable generalization based upon the geotechnical field investigation, available geological mapping and surrounding WWR's. Although there is a significant amount of sand across the subject site, the value for clay loam was used in order to be conservative.

The vegetative cover infiltration factor was calculated as 0.1 based the value for cultivated land (0.1).

Based on Ontario Guideline D-5-4 Individual On-Site Sewage Systems: Water Quality Impact Risk Assessment, the predictive nitrate impact assessment reviewed the potential impacts using a value of 1,000 L/day per lot. The calculation for a standard septic system results in a predicted nitrate concentration of 9.14 mg/L nitrate concentration for the subject sites, using a value of 40 mg/L nitrate concentration within the effluent.

Background nitrate concentrations of 0.16 mg/L from the background nitrogen family results were detected in the overburden groundwater across the subject site, and as such, were included in the Nitrate Impact Assessment Calculation.

Based on the results of the predicted nitrate impact assessment, it is our opinion that the proposed residential subdivision can adequately support the proposed single family dwellings without having an adverse impact on the underlying bedrock aquifer.



The groundwater within the bedrock aquifers will be protected from sewage system effluent by the considerable overburden thickness combined with the massive layer of Oxford Formation limestone above the shallowest point of groundwater interception. The general overburden groundwater flow direction will be controlled by the undulating topography on the site, due to the relative impervious nature of the overburden soils. However, the flow would tend to be contained onsite through the construction of a series of roadside ditches.

With respect to the utilization of stormwater runoff in the calculations, the drainage at the site is proposed to consist of a series of grassed ditches and subdrains. As such, most of the stormwater runoff can be justified to be utilized for the purposes of the predictive impact assessment as the distance of travel across the individual lots and into the drainage network is sufficiently long. In order to simplify the predictive impact assessment, however, stormwater runoff has not been included in the available dilution water calculations. Attention should be made to the discussion on best management practices for promoting the infiltration of surface water into the shallow overburden and for the reuse of the greywater, etc., to reduce long term demands of the preferred water supply aquifer.

# 8.4. Sewage System Design

Sewage systems must be designed according to Part 8 of the Ontario Building Code (OBC). The OBC sets out minimum design and construction standards for all approved classes of sewage systems. It is proposed that this site be serviced with traditional Class 4 sewage systems consisting of a septic tank and separate leaching bed.

OBC requirements state that the there must be a minimum of 900 mm of suitable soil or leaching bed fill present between the base of the absorption trenches and the high groundwater table, bedrock or soil with a percolation rate greater than 50 min/cm. Some lots are located in areas with permeable cover which may permit either in-ground or partially raised leaching beds. Where lots are located in areas with moderately low permeable silty clayey sand and silty sand within the overburden soils, combined with the flat topography, most Class 4 absorption trench style leaching beds are expected to be fully raised above the existing ground surface. An imported sand mantle having a minimum thickness of 250 mm and extending a minimum of 15 m beyond the absorption trenches in the direction of effluent flow would also be required.

Based on OBC design sewage flow tables, a 4 bedroom residence with a finished floor area of 300 m<sup>2</sup> may produce in the order of 3,000 L/day of sewage effluent per day. Based on the quality of the sand deposits available in the local pits, imported sand is anticipated to have a percolation rate (a.k.a. T-time) of between



6 and 8 min/cm. Considering the design flows and percolation rate of the available imported sand, a tile length of 140 metres is required. The Lot Development Plan (PH0482-7) illustrates the size of such tile beds, complete with minor alternative configurations due to irregular lot shapes and other constraints.

The sewage system layouts detailed in Drawing No. PH0482-7 are shown to be fully raised leaching beds with a 15 m imported sand mantle. With due consideration to the more permeable terrain unit which dominates the subject property, the Lot Development Plan (Drawing No. PH0482-7) has been prepared to illustrate that the maximum foreseeable size of leaching bed utilized on any given lot, can be easily accommodated. Moreover, the purpose of the drawing is to illustrate that adequate space exists on each lot to accommodate such a sewage system. The end, or toe, of the mantles will be required to be unobstructed and free draining; the existing topsoil layer is likely to receive the polished effluent from the toe.

With respect to the presence of peat and a perched water table located within the southeastern quadrant of the site, specialized construction will be required. In order to prevent uneven settlement of both the building foundations and sewage systems, the peat and all other organic materials will be required to be excavated within the footprint of the building and within the limits of the distribution piping for the leaching beds proposed in this quadrant. It is also prudent for the peat to be removed from the mantle area(s) also, to minimize overall differential settlement within/near the leaching bed area.

The leaching beds will be fully raised within the southeast quadrant also. As such, it will be required to place imported sand fill into the excavation resulting from the excavation and removal of the peat within the specified limits of the leaching bed areas.

### 8.5. Long Term Safe Yield Calculation

The twenty-year safe well yield calculation is used to estimate the long-term safe pumping rate for a well and can be calculated using the following equation (Farvolden 1959):

 $Q_{20} = 0.683*T*H_{A}*S_{f}$  Where:  $Q_{20} = 20 \text{ year safe pumping rate for the well } (m^{3}/d)$   $T = Transmissivity (m^{2}/day)$   $H_{A} = Available Head (m)$   $S_{f} = Safety Factor = 0.7 \text{ (no units)}$ 



The most conservative transmissivity value from the pumping tests completed on the onsite test wells was used to complete this calculation (i.e  $T = 2.4 \text{ m}^2/\text{day}$ ). The safe yield was calculated to be 54.5 m³/day or 37.8 L/min constantly during a day. This value is more than twice the anticipated peak draw of 18.75 L/min that would be expected for 2 hours per day or more than 18 times the average water demand per day (3,000 L/day).

#### 8.6. Potential Well Interference

It is anticipated that a series of individual water supply wells, in addition to the existing test wells, will be constructed at the subject property in order to provide individual water supplies for each lot. As these wells are anticipated to intercept aquifers located in the March Formation, and considering the inherent intermittent nature of pumping, potential well interference with offsite uses is anticipated to be negligible. This is further corroborated by the 20 year safe yield estimates established earlier in this report.

As the pumping is anticipated to be intermittent with several wells in operation at any given time, a potential well interference model was created to reflect a hypothetical worst case scenario for drawdown at the site. The essence of the predictive model assimilates a total of 66 individual pumping wells and simulates the drawdown from a single centrally located imaginary pumping well set at a pumping rate of 3,000 L/day/lot (i.e. 198,000 L/day). Figure A4-1, located in Appendix 4, summarizes the prediction of drawdown versus time for a constant pumping rate of 198,000 L/day.

The recovery data was utilized in the Theis & Jacob Recovery analysis which specifies a transmissivity of the order of 13.3 m²/day. The value for storativity (6.8 x 10-4) was calculated based on the Cooper & Jacob's Time-Drawdown analysis of the observation well data for TW8. The chosen transmissivity value is considered to be conservative in that it reflects a lower transmissivity value for the preferred water supply aquifer. The storativity value is considered to be consistent and representative of a confined limestone aquifer.

It is prudent to note that this model is considered to be very conservative as the governing assumption of a single well pumping at the combined rates of the individuals, does not consider the separation distances of the individual wells. As such, the model will inherently over estimate the drawdown at both the location of pumping, and in the vicinity of the highest density of the proposed development. As the distance from the centre of the development increases, the model should provide a better prediction of offsite well interference.



In the long-term model, the maximum anticipated drawdown predicted at the imaginary pumping well, based on 66 lots continuously pumping for 9,125 days, or approximately 25 years, is of the order of 10.42 m. As the available drawdown in the future well in the site are upwards of 48 m, this corresponds to a reduction in available drawdown of approximately 22 %. Considering the very conservative nature of the model, this predicted loss of available storage in wells near the center of the proposed development is considered to be satisfactory.

#### Offsite Potential Well Interference

Figure A4-2, in Appendix 4, presents a prediction of drawdown versus time for an imaginary production well pumping at a constant rate of 50,000 L/day. The nearest offsite wells are located approximately 250 m away from the centre of the site, where the imaginary well is located. A conservative radius of impact of 100 m was used to support this assessment. Based on this radial distance, the closest offsite wells would experience a drawdown of 0.48 m at 1 day of pumping and approximately 3.2 m at 9,125 days (25 years) of continuous pumping. As the available drawdown in the offsite wells, located in the immediate vicinity of the site, are of the order of 48 m, based on the published water well records, this corresponds to a loss of available storage of approximately 5% at 365 days (1 year) and 7% after 9,125 days (25 years) of pumping. Based on the available water well records, the Sleepy Cedars Campground, which has a static water level of approximately 5 m below top of casing and a depth of approximately 53 m, the long term pumping would reduce the static water level from 5 to approximately 8 m after 9,125 days (25 years) of continuous pumping. This would leave 45 m of available drawdown in that well. The same analysis can be extended to the other neighbouring wells located to the immediate north and east of the site which intercept and draw water from the combined Oxford, March, and Nepean Formations. The available well records suggest that the houses to the immediate east of the site, as evidenced by TW6 in the aquifer analysis program, are completed in the Upper Oxford Formation and are not expected to exhibit any well interference from the future wells at this site, if constructed in accordance with the recommendations for the well construction presented in Section 8.7 below.

Given the very conservative nature of the model presented above, it is opined that the potential well interference between wells, and beyond the property limits is acceptable in the worst case scenario model. Considering the intermittent pumping, rapid recovery values and significant 20 year safe yield estimates, actual drawdown in offsite wells is anticipated to be negligible.



#### 8.7. Future Water Well Design

Drilled wells, completed in the bedrock aquifer, should be used for the water supply in this development. The wells should be drilled by a licensed well contractor experienced in the study area and should be completed in accordance with Ontario Regulation 903, as amended.

A minimum well yield of 5 gpm is recommended for an average residence and is considered to be readily obtainable on this site. As it is desirable to drill the future wells to achieve the highest quality water, the proposed well construction methodology should endeavor to extend the casing hole through the overburden and should be advanced a minimum of 18 to 24 m bgs or at least 6 m into competent bedrock. Based on a casing length of 24 m bgs, this should result in a casing penetration of sufficient depth to ensure the casings are set into sound bedrock.

The casing should then be installed and grouted in place utilizing either a neat cement grout or sodium bentonite grout slurry introduced from the bottom of the annular space to the surface of the ground in accordance with Ontario Regulation 903 (wells). The creation of the casing hole, the installation of the casing and the grouting of the annular space should be inspected by a qualified Professional Engineer.

With respect to the presence of peat in the southeast quadrant and it's impact on well construction, the thickness of the peat, as determined by the field investigation suggests the maximum thickness of the peat to be less than 3 m. As such, it is recommended that the peat be removed within a minimum of 3 m radius around the proposed location of the well, prior to constructing the well at the site. The peat can be replaced with uncontaminated imported fill, or select, site excavated, nonorganic material.

The well should be developed by surging or pumping until the water is developed to a sand free state at the time of construction in accordance with Ontario Regulation 903. If the water is observed to be cloudy at the completion of the prescribed well development, extended well development should be performed until all visible turbidity is removed.

Chlorine should be introduced at the completion of well development in sufficient quantity to produce a free chlorine residual of at least 50 mg/L (ppm). The chlorine should be mixed with the standing water in the casing using a procedure that will result in the thorough vertical mixing of the chlorine over the entire depth of the well. The chlorine should then be left for 24 hours and purged out of the well until it can be determined that a free chlorine residual of 0 mg/L is present.



The well should be completed with a submersible pump, pitless adaptor and vermin proof well cap. All such mechanical work connected to the well is to be completed by a qualified well contractor possessing a valid Class 4 pump installer's license. After completion of the mechanical work in the well, the well should be disinfected as described above.

The grading around the well casing should be slightly elevated to direct surface runoff away from the well. The casing should project approximately 400 mm above the mounded soil within 3 m in all directions form the casing.

With respect to the existing test wells, all of the wells completed on the site, with the exception of TW7 which was previously abandoned, are considered to be acceptable for reuse as future wells as they meet the intent of the well construction specifications presented above. The use of the existing wells for the future servicing of proposed lots, is subject to the finalized lot fabric and road alignment. Should any of the wells be ultimately located in a location which they will not be utilized for private servicing, they must be abandoned in strict conformity with Ontario regulation 903.

#### 8.8. Water Conditioning Considerations

As the water within the preferred zone of aquifer interception contains elevated hardness and, to a lesser extent, iron, the raw water can be suitably conditioned to remove these two aesthetic parameters. A standard residential grade water softener can be installed to remove both the hardness and iron concentrations in the raw water. Regeneration rates may be slightly higher given the concentration of iron in a few of the test wells, however the iron concentrations are not anticipated to substantially contribute to a reduction in resin capacity.

As the water is considered to be hard, it is strongly recommended that should a water softener be selected for installation, that consideration be made to installing a separate tap for drinking water which bypasses the softener. This will minimize the consumption of an increased sodium concentration resulting from the ion exchange process.

Additional well development should be undertaken upon completion of the construction of future water wells at this site. The wells should be subjected to a period of well development of at least six (6) hours at a rate of approximately 23 L/min (5 gpm) in order to stabilize the raw water within the aquifer system in the immediate vicinity of the constructed well. Water samples, for verification of raw water quality in anticipation of water conditioning, should not be collected until the pH measured at the wellhead does not vary by more than 20% during a 30-minute interval during pumping.



With respect to the slightly increased turbidity in both the field and laboratory samples, as there is no need for water treatment to control bacteriological parameters, the turbidity values are considered to be within the acceptable range of values contained within Procedure D-5-5. It is anticipated that extended well development, at a rate of not more than 5 L/min for at least 24 hours, will be sufficient to remove any residual turbidity resulting from well construction for each newly constructed well at the site.

#### 8.9. Implementation of Best Management Practices

The surficial soils present throughout most of the site are conducive to the implementation of rainwater infiltration and retention technologies, including, but not limited, to infiltration trenches and shallow rear yard swales complete with subdrains.

Backwash water from water softeners is suitable for discharge into infiltration galleries located a minimum of 5 m from the leaching bed area and should be set on sufficient in situ or imported sand fill to be incorporated into proposed lot drainage patterns. Backwash water from a water softener, based on the anticipated regeneration cycle, can be directed to the sewage system, provided the sewage system components are sized and designed accordingly. As a minimum, the backwash cycle should be assumed to be once per day at a volume of upwards of 150 L. The septic tank, if conventional sewage treatment technologies are employed, should be fitted with a high quality plate/tube style effluent filter in order to minimize suspended solids migration. With respect to the efficient and effective utilization of the effective building areas on each of the proposed lots, it will be advantageous to consider the selection of advanced wastewater treatment systems in place of the more traditional fill based Class 4 sewage systems. The reduction in height and area will have a beneficial impact on preserving existing forested areas.

With respect to residential water use, it is recommended that individual homeowners utilize water conserving plumbing fixtures and follow lawn irrigation strategies created by the City of Ottawa. Irrigation systems for lawn irrigation are discouraged from use in this development.

#### 8.10. Subdivision Phasing Plan

The City of Ottawa's Official Plan related to phased subdivision development requires the submission and acceptance of a Servicing Review Study for each phase of rural development. The intent of this study is to review the sewage system



and well construction being carried out in the first/previous phase(s) in order to evaluate if, and how, the subsequent phases should proceed.

The lot fabric of the proposed subdivision consists of a total of 40 lots in Phase 1, and the balance of the lots (26) reserved for Phase 2. The proposed layout for lots in Phase 1 is such that most of the lots are situated along the upgradient end of the southerly flow of overburden groundwater beneath the site. As such, the following methodology should be employed to complete the Servicing Review Study.

☐ The existing test wells in both Phase 1 and Phase 2 should be purged and sampled for a comprehensive suite of groundwater parameters consistent with the original Hydrogeological Study report. This update water quality should be compared against the original baseline data to determine the presence/extent of surficial impacts, if any, and to confirm the baseline water quality as it related to recommendations for water conditioning, etc. ☐ The water well records for the constructed wells should be reviewed in order to confirm that the wells are intercepting the preferred water supply aquifer. if the wells are intercepting the preferred water supply aguifer the sampling regime should focus on the health-related parameters within the newly constructed homes with a representative cross section of the wells being sampled for the comprehensive suite of groundwater parameters carried out for the test wells. If the wells constructed in Phase 1 do not intercept the preferred water supply aquifer, these wells should be sampled for the comprehensive suite of groundwater parameters included in the original baseline water quality plan for the Hydrogeological Study. ☐ Collect representative samples of the overburden groundwater located downgradient of the sewage system installations at the upgradient limits of Phase 1/Phase 2 development line, and at the downgradient property limits beyond Phase 2. The water samples should be analysed for the full nitrogen species, sodium, chloride, total coliforms, faecal coliforms, and E.coli. ☐ The sewage system design, construction and operation should be reviewed for each of the systems installed and approved with the Ottawa Septic System Office.

It has been generally accepted by the City of Ottawa, historically, that the Servicing Review study should be initiated when a minimum of 20% of the lots in each phase (i.e 8 lots of 40 possible lots) have been occupied for a minimum of three (3) seasons. This condition, in our opinion, should be considered to be the minimum trigger point to initiate the Servicing Review Study. Notwithstanding the above, the City of Ottawa, in March 2011, approved a series of standard draft conditions for the subdivision development. In this approved conditions, the City of Ottawa has provided clear direction regarding the trigger point at which a Servicing Review



Study should be initiated for a subdivision utilizing private services. Specifically, the draft conditions read as follows:

"The registration of this subdivision shall be phased. Each phase of registration is to contain not more than 40 lots. Prior to the registration of each phase other than the first phase, the Owner shall submit a performance review of the operation of wells and private sewage disposal systems in the previous phase(s) of the development. Such review shall demonstrate that the previous phase(s) are operating satisfactorily. A Professional Engineer, with experience in hydrogeology, or a professional geoscientist shall prepare the performance review. The final number of lots required for analysis must be supported in the performance review, but in any case the performance review shall only be prepared and submitted for review when a minimum of 50% of the lots in the previous phase have been built and occupied for not less than three seasons, and, when requesting the registration of any phase beyond the second phase, a representative number of lots, to the satisfaction of the General Manger, Planning and growth Management, in the older phases must also be analysed. Further, the Owner agrees that prior to the registration of each phase, lots in that phase or any subsequent phase will not be offered for sale."

Given that this above noted draft condition is endorsed by City Council, it appears prudent to start the Phase 1 review at the stage where 20 lots have been built in Phase 1 and occupied for a minimum of three (3) seasons. It remains that the recommended minimum number of lots that should be used in the analysis be set at no less than eight (8), however, the location of the lots used in the study should be reflective of site conditions and their logical downgradient impacts on Phase 2 development. Obviously, in the even that impacts are measured, or discrepancies noted, for the cross section of lots used in the study, the scope of the study should be increased to provide the necessary information.

Page: 44 Report: PH 3745-1



### 9.0 Conclusions

Based on the information contained within the body of this report, the following conclusions can be drawn:

- The subject property is situated in an area noted to be generally flat with good to poor surficial drainage patterns. The site can be divided into two (2) distinct drainage areas resulting from a topographical high point located along the southwestern quadrant and extending several hundred metres northward.
- 2. The surficial soils coverage on the subject property are conducive to the subsurface dispersion of sewage system effluent and are not considered to be hydrogeologically sensitive.
- 3. Surrounding land uses are consistent with the intended residential use for this property. Offsite impacts on the subject property have been assessed and are considered to be negligible.
- 4. The surficial geology of the subject property generally consists of a mixture of silty clayey sand to sandy till deposits overlying bedrock, at depth, across the subject area. The soils types and areal delineation are consistent with available soils mapping with some noted exceptions.
- 5. The bedrock geology directly beneath the site consists of limestone of the Oxford Formation. The Oxford Formation is underlain by the March Formation, followed by the Nepean Formation. The preferred water supply aquifers are located within the Oxford and March Formations, creating a combined aquifer system for future water wells.
- 6. The construction of the test wells on the subject property appear to have intercepted at least two (2) individual water supply aquifers of suitable quantity: the Oxford Formation and the March Formation. The quality of the March Formation water supply aquifer is such that it is the preferred aquifer for future wells. An additional water supply aquifer is located within the shallowest portion of the Nepean Formation.
- 7. The most consistent zones of aquifer intercept within the combined Oxford and March Formation aquifer system as reported in the test wells and neighbouring wells is between 28 m and 56 m bgs.
- 8. Significant confining pressures are present on the water supply aquifer at the interception points. An adequate quantity of water is present in all of the encountered aquifers and free flowing artesian conditions are not anticipated.
- Water quality of the Oxford, March and Nepean Formations is considered to be sufficient for domestic use. Domestic water conditioning equipment may be utilized to reduce hardness and iron levels for aesthetic requirements only.



- 10. Potential well interference with neighbouring, offsite wells, is considered to be minimal and, based on the aquifer parameters determined by this study, the anticipated water demand from this subdivision will have minimal impact on the safe yield of the water supply aquifers.
- 11. Sewage systems, containing fully raised leaching beds, are easily accommodated on each of the proposed lots. The proposed development may be serviced using sewage systems which are either in-ground or partially raised. Site specific soil morphology analysis, carried out by a qualified geotechnical engineer, should be completed for each individual sewage system design.
- 12. The subject property is suitable for development as a residential subdivision at the proposed density. Impacts to the neighbouring low density residential development area are expected to be minimal.

### 10.0 Recommendations

Based on the information presented in the body of this report, the following recommendations can be made:

- In accordance with the intent of Procedure D-5-5, the Medical Officer of Health must be notified where sodium concentrations in the new wells exceed 20 mg/L. This requirement is specified in order for the information to be disseminated to local physicians in order to treat persons with sodium reduced dietary needs.
- 2. The raw water found in the preferred water supply aquifer system is considered to be hard to very hard and may contain iron levels which may result in the visible iron staining to plumbing fixtures and clothing. A residential grade water softener is recommended where these aesthetic parameters are deemed unsuitable to the future homeowner. If the use of water softeners are considered by the future homeowner, it is recommended that a separate water supply tap be installed. This tap should bypass the water softener to prevent the increased sodium concentration which will result by softening the water with sodium chloride. In all cases, the raw water should be sampled and submitted for comprehensive chemical analysis for the same parameters tested in this study only after the well and distribution system have been properly flushed and the well has been in use for an extended period.
- 3. It is recommended, in keeping with the intent of the Osgoode Bylaw, that the casing hole extend a minimum of 6 m into the underlying bedrock to ensure the casing extends into sound bedrock. Given the test well construction methodology employed on the site, a casing length of between 18 m and 24 m will be required in order to achieve the necessary bedrock penetration. The well contractor should review the proposed well



- construction methodology specified in this report prior to proceeding with any site works.
- 4. The preferred zone of aquifer interception for future wells should be set at approximately 28 m to 56 m measured below the ground surface. Wells should be constructed with a rotary air drilling rig.
- 5. The recommended minimum range of well yields is set at 23 L/min.
- 6. The creation of the casing hole, installation of the casing, and grouting of the annular space, should be inspected by a qualified Professional Engineer or Professional Geoscientist of Ontario. Furthermore, it is recommended that a qualified Professional Engineer or Professional Geoscientist of Ontario oversee the construction of the open borehole in order to ensure well depths do not exceed those recommended in this study. All well construction must be carried out by a qualified and experienced well technician.
- 7. Wells should be developed to a sand free state in order to ensure that the residual turbidity created by the well drilling activities is completely purged from the well. Additional well development, prior to placing the well into use, is strongly recommended in order to provide adequate development of the formation and remove extraneous rock debris from the aquifer pathways. It is likely that future wells at this site will require additional well development. The wells should be subjected to a period of well development of at least six (6) hours at a rate of approximately 23 L/min (5 gpm) in order to stabilize the raw water within the aquifer system in the immediate vicinity of the constructed well. Water samples, for verification of raw water quality in anticipation of water conditioning, should not be collected until the pH measured at the wellhead does not vary by more than 20% during a 30 minute interval during pumping.
- 8. All future water wells should be completed such that the top of well casing is a minimum of 400 mm above the finished grade within a 3 m radius of the wellhead. Moreover, the grade should slope away from the wellhead for a distance of at least 3 m. It is recommended that the homeowner consult the comprehensive reference document entitled, "Water Supply Wells Requirements and Best Management Practices (December 2009)", prepared by the Ontario Ministry of the Environment and familiarize themselves on their legal obligations to maintain and protect their well.
- 9. Individual future well owner(s) should carry out semi annual verification of potability of the raw water supply. Moreover, the well owner should ensure that they maintain the wellhead and immediate area in accordance with the requirements of Ontario Regulation 903.
- 10. Irrigation systems for cosmetic watering which utilize water from the preferred water supply aquifer are not recommended for use at this site.



11. The Servicing Review Study Report, required to be completed and approved prior to releasing Phase 2 of the development, cannot be initiated until at least 20 homes are built and occupied for three (3) seasons. The minimum number of lots used in the analysis for the Study should be set at eight (8).

In summary, it is our professional opinion that this site is suitable for development as a residential subdivision at the proposed lot density. The hydrogeological recommendations contained within this report, if followed, will ensure that the development takes place in an effective manner, with a minimal impact on the natural environment.

We trust that the current submission satisfies your immediate requirements.

Best Regards,

Paterson Group Inc.

Erik Ardley, P.Geo

Michael S. Killam, P.Eng



ERIK ARDLEY PRACTISING MEMBER . 3667 .

NTAR



### **APPENDIX 1**

Soil Profile and Test Data Sheets

Symbols and Terms



### **SOIL PROFILE & TEST DATA**

1934 Stagecoach Road Ottawa, Ontario

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

**Geotechnical Investigation** 

FILE NO. **DATUM** PH0482 REMARKS HOLE NO. TP 1 **DATE 29 AUG 06** BORINGS BY Backhoe Pen. Resist. Blows/0.3m **SAMPLE** Piezometer Construction PLOT DEPTH ELEV. • 50 mm Dia. Cone SOIL DESCRIPTION (m) (m)RECOVERY N VALUE or RQD NUMBER STRATA Water Content % 80 60 40 20 **GROUND SURFACE** 0-**TOPSOIL** 0.15 Loose, red-brown medium SAND with cobbles G 1 \_\_\_\_1.00 1 Grey-brown SILTY fine  $\underline{\nabla}$ SAND with cobbles and 2 G boulders 2-2.20 GLACIAL TILL: Dense, grey 2.40 clavey silt with sand, gravel and cobbles End of Test Pit TP terminated in dense till @ 2.60m depth (Water infiltration @ 1.6m depth) 100 80 60 40 Shear Strength (kPa) ▲ Undisturbed △ Remoulded

### **SOIL PROFILE & TEST DATA**

1934 Stagecoach Road Ottawa, Ontario

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

**Geotechnical Investigation** 

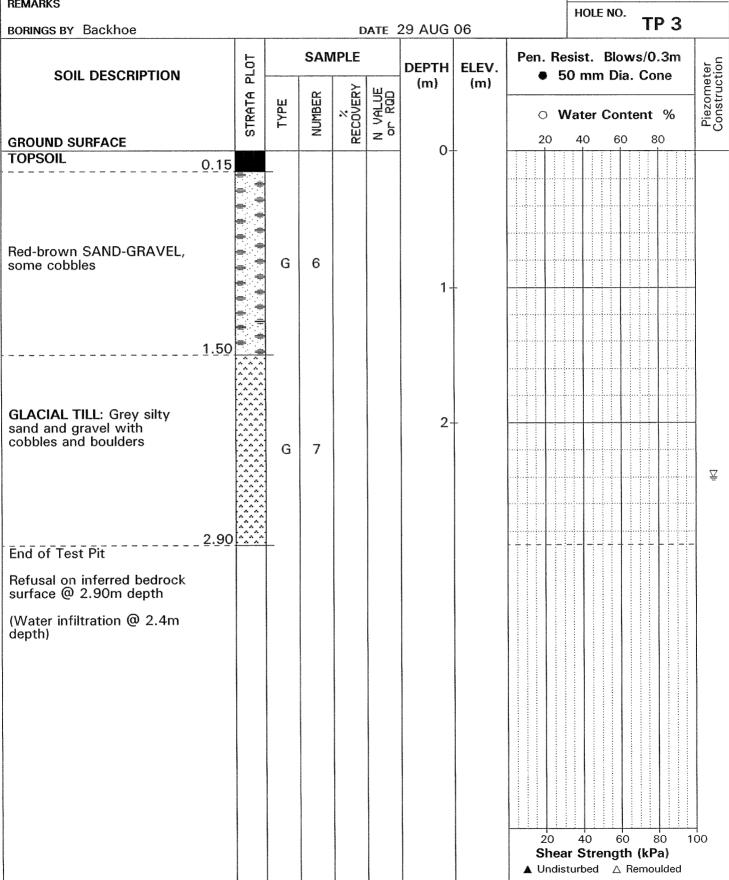
DATUM FILE NO. PH0482 REMARKS HOLE NO. TP 2 BORINGS BY Backhoe **DATE 29 AUG 06** Piezometer Construction Pen. Resist. Blows/0.3m PLOT **SAMPLE** DEPTH ELEV. • 50 mm Dia. Cone SOIL DESCRIPTION (m)(m)N VALUE or ROD RECOVERY STRATA NUMBER O Water Content % 80 40 60 20 **GROUND SURFACE** 0 **TOPSOIL** Dense, yellowish brown G 3 SAND-GRAVEL 0.60 1 Compact to dense, grey SILTY FINE SAND G 4 2 2.10 Very stiff, grey CLAYEY 3-SILŤ G 5  $\underline{\mathbb{Z}}$ 4.00 4 Dense GLACIAL TILL 4.10 End of Test Pit (Water infiltration @ 3.9m depth) 40 60 100 Shear Strength (kPa) ▲ Undisturbed △ Remoulded

### **SOIL PROFILE & TEST DATA**

**Geotechnical Investigation** 1934 Stagecoach Road Ottawa, Ontario

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

FILE NO. **DATUM** PH0482 REMARKS HOLE NO.



28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

**SOIL PROFILE & TEST DATA** 

**Geotechnical Investigation** 1934 Stagecoach Road Ottawa, Ontario

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28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

### **SOIL PROFILE & TEST DATA**

**Geotechnical Investigation** 1934 Stagecoach Road Ottawa, Ontario

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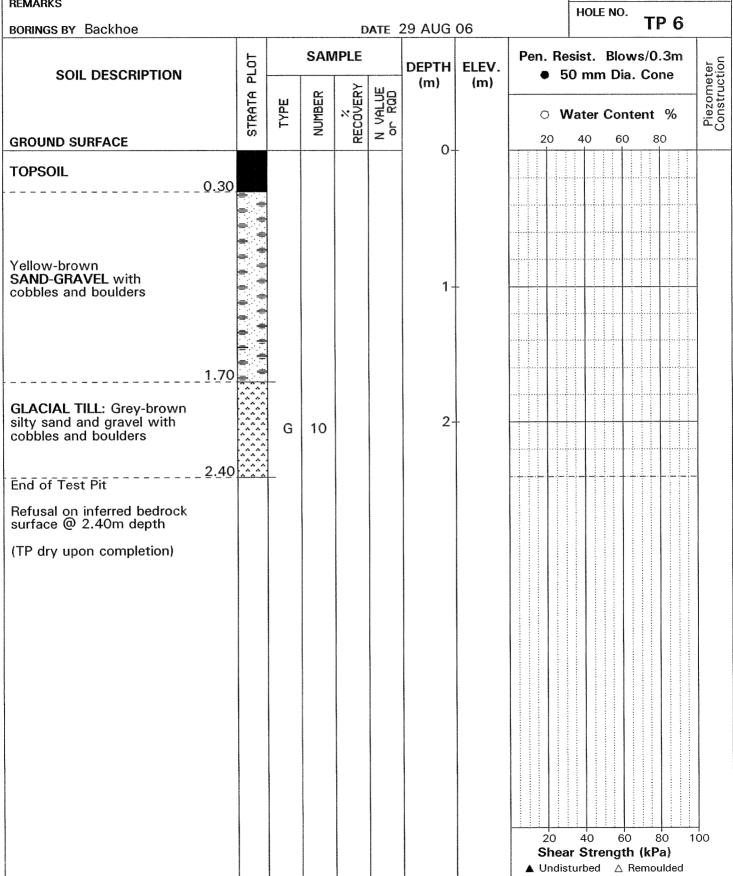
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28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

**SOIL PROFILE & TEST DATA** 

Geotechnical Investigation 1934 Stagecoach Road Ottawa, Ontario

DATUM FILE NO. PH0482 REMARKS HOLE NO.



**SOIL PROFILE & TEST DATA** 

**Geotechnical Investigation** 1934 Stagecoach Road Ottawa, Ontario

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7 DATUM FILE NO. PH0482 REMARKS

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### patersongroup Consulting Engineers **SOIL PROFILE & TEST DATA Geotechnical Investigation** 1934 Stagecoach Road 28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7 Ottawa, Ontario DATUM FILE NO. PH0482 REMARKS HOLE NO. **TP 8** BORINGS BY Backhoe **DATE 29 AUG 06** PLOT **SAMPLE** Pen. Resist. Blows/0.3m DEPTH ELEV. SOIL DESCRIPTION 50 mm Dia. Cone (m)(m)% RECOVERY N VALUE or ROD NUMBER STRATA O Water Content % **GROUND SURFACE** 20 40 60 80 0 **TOPSOIL** Brown SAND with gravel 0.40 and cobbles 1 Grey-brown SANDY SILT with cobbles G 11 2 $\underline{\underline{\nabla}}$ 3.00 3. End of Test Pit (Water infiltration @ 2.6m depth)

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Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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### **SOIL PROFILE & TEST DATA**

**Geotechnical Investigation** 1934 Stagecoach Road

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

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### **SOIL PROFILE & TEST DATA** patersongroup Consulting Engineers **Geotechnical Investigation** 1934 Stagecoach Road 28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7 Ottawa, Ontario **DATUM** FILE NO. PH0482 REMARKS HOLE NO. **TP10** BORINGS BY Backhoe **DATE 29 AUG 06 SAMPLE** PLOT Pen. Resist. Blows/0.3m DEPTH ELEV. SOIL DESCRIPTION • 50 mm Dia. Cone » RECOVERY (m)(m) N VALUE STRATA NUMBER TYPE O Water Content % **GROUND SURFACE** 40 60 0-TOPSOIL GLACIAL TILL: Grey-brown silty sand with gravel, cobbles and boulders G 12 1 1.50 (2.2.2) End of Test Pit Practical refusal to excavation in dense till or bedrock surface (TP dry upon completion)

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Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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100

**SOIL PROFILE & TEST DATA** 

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Shear Strength (kPa) ▲ Undisturbed △ Remoulded

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Geotechnical Investigation

1934 Stagecoach Road 28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7 Ottawa, Ontario DATUM FILE NO. PH0482 REMARKS HOLE NO. **TP11** BORINGS BY Backhoe **DATE 29 AUG 06** PLOT **SAMPLE** Pen. Resist. Blows/0.3m DEPTH ELEV. SOIL DESCRIPTION • 50 mm Dia. Cone (m) (m) ». RECOVERY N VALUE STRATA NUMBER TYPE Water Content % **GROUND SURFACE** 40 80 20 60 0 TOPSOIL. 0.20  $\underline{\nabla}$ Grey coarse SAND G 13 1 1.50 End of Test Pit (Water infiltration @ 0.5m depth)

**SOIL PROFILE & TEST DATA** 

▲ Undisturbed △ Remoulded

**Geotechnical Investigation** 1934 Stagecoach Road

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7 Ottawa, Ontario **DATUM** FILE NO. PH0482 REMARKS HOLE NO. **TP12** BORINGS BY Backhoe **DATE 29 AUG 06 SAMPLE** Pen. Resist. Blows/0.3m PLOT DEPTH ELEV. **SOIL DESCRIPTION** • 50 mm Dia. Cone (m) (m) % RECOVERY N VALUE or ROD NUMBER STRATA TYPE Water Content % 20 40 60 80 **GROUND SURFACE** 0-FILL: Silty sand and gravel with cobbles and topsoil, some asphalt and cement 1 pieces G 14 2 2.30 Grey coarse SAND 2.70 End of Test Pit (Water infiltration @ 2.3m depth) 40 100 60 Shear Strength (kPa)

**SOIL PROFILE & TEST DATA** 

▲ Undisturbed △ Remoulded

**Geotechnical Investigation** 

1934 Stagecoach Road 28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7 Ottawa, Ontario **DATUM** FILE NO. PH0482 **REMARKS** HOLE NO. **TP13** BORINGS BY Backhoe **DATE 29 AUG 06 SAMPLE** Pen. Resist. Blows/0.3m PLOT DEPTH ELEV. SOIL DESCRIPTION 50 mm Dia, Cone (m) (m)» RECOVERY N VALUE or ROD STRATA NUMBER TYPE O Water Content % 40 80 20 60 **GROUND SURFACE** 0 FILL: Silty sand with gravel, cobbles and topsoil, some wood pieces 7 \_\_\_\_\_1.10  $\underline{\nabla}$ Grey coarse SAND 2.00 2 End of Test Pit (Water infiltration @ 1.3m depth) 100 20 40 60 Shear Strength (kPa)

**SOIL PROFILE & TEST DATA** 

**Geotechnical Investigation** 1934 Stagecoach Road

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7 Ottawa, Ontario **DATUM** FILE NO. PH0482 REMARKS HOLE NO. **AH 1** BORINGS BY Hand Auger **DATE 26 SEP 06** PLOT **SAMPLE** Pen. Resist. Blows/0.3m DEPTH ELEV. SOIL DESCRIPTION • 50 mm Dia, Cone (m)(m) ≈ RECOVERY N VALUE or RQD STRATA NUMBER TYPE Water Content % **GROUND SURFACE** 40 60 0 **TOPSOIL** \_ \_ \_ \_ 0.20 Brown SILTY SAND \_\_\_\_0.40 Stiff, grey SILTY CLAY to CLAYEY SLIT Ÿ G 1 1. \_\_\_\_1.35 SILTY fine SAND, trace gravel 1.60 End of Auger Hole Refusal on inferred glacial till @ 1.60m depth (Water infiltration at 0.90m depth) 100 Shear Strength (kPa) ▲ Undisturbed △ Remoulded

# patersongroup

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

Consulting Engineers

### **SOIL PROFILE & TEST DATA**

Geotechnical Investigation 1934 Stagecoach Road Ottawa, Ontario

**DATUM** FILE NO. PH0482 **REMARKS** HOLE NO. AH 2 BORINGS BY Hand Auger **DATE 26 SEP 06 SAMPLE** PLOT Pen. Resist. Blows/0.3m DEPTH ELEV. SOIL DESCRIPTION • 50 mm Dia. Cone (m) (m) » RECOVERY N VALUE or RQD STRATA NUMBER Water Content % **GROUND SURFACE** 20 40 60 80 0 **TOPSOIL** 0.60 G 2 Stiff, grey-brown SANDY CLAY \_\_\_\_\_1.00 1 Grey CLAYEY SILT, trace G 3 fine sand 1.25 Grey SILTY CLAY to CLAYEY SILT, trace fine sand  $\underline{\underline{\nabla}}$ AH terminated in soft silty clay @ 1.60m dead clay @ 1.60m depth 40 100 Shear Strength (kPa) ▲ Undisturbed △ Remoulded

# patersongroup

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

Consulting Engineers

### **SOIL PROFILE & TEST DATA**

Geotechnical Investigation 1934 Stagecoach Road Ottawa, Ontario

DATUM FILE NO. PH0482 REMARKS HOLE NO. **AH 3** BORINGS BY Hand Auger **DATE 26 SEP 06** PLOT **SAMPLE** Pen. Resist. Blows/0.3m DEPTH ELEV. SOIL DESCRIPTION 50 mm Dia, Cone (m) (m) \* RECOVERY N VALUE or ROD STRATA NUMBER TYPE O Water Content % **GROUND SURFACE** 20 40 60 80 0 **TOPSOIL** \_\_\_\_\_0.40 SANDY SILT to SANDY CLAY (medium density) 1.00 1 **Grey SILTY CLAY** AH terminated in silty clay @ 1.80m depth (Water infiltration at 1.60m depth) 100 40 60 80 Shear Strength (kPa) ▲ Undisturbed △ Remoulded

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

### **SOIL PROFILE & TEST DATA**

Geotechnical Investigation 1934 Stagecoach Road Ottawa, Ontario

**DATUM** FILE NO. PH0482 **REMARKS** HOLE NO. **AH 4** BORINGS BY Hand Auger **DATE 26 SEP 06 SAMPLE** PLOT Pen. Resist. Blows/0.3m Piezometer Construction DEPTH ELEV. SOIL DESCRIPTION • 50 mm Dia, Cone (m) (m) % RECOVERY STRATA NUMBER Water Content % **GROUND SURFACE** 60 0 **TOPSOIL** \_\_\_\_\_0.40 **Brown SILTY SAND** \_ \_ \_ \_ \_ \_ \_ 0.60 SAND, some gravel 1 Refusal on inferred Glacial 100 Shear Strength (kPa) ▲ Undisturbed △ Remoulded

## patersongroup

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

Consulting Engineers

### **SOIL PROFILE & TEST DATA**

Geotechnical Investigation 1934 Stagecoach Road Ottawa, Ontario

DATUM FILE NO. PH0482 REMARKS HOLE NO. AH 5 BORINGS BY Hand Auger **DATE 26 SEP 06** SAMPLE Pen. Resist. Blows/0.3m PLOT Piezometer Construction DEPTH ELEV. SOIL DESCRIPTION • 50 mm Dia. Cone (m)(m) RECOVERY N VALUE or RQD STRATA NUMBER O Water Content % **GROUND SURFACE** 40 60 80 0 **TOPSOIL** \_\_\_\_\_0.20 **Grey SILTY CLAY** \_\_\_\_\_0.40 SANDY SILT, trace clay (medium density) \_\_\_\_1.00 1 **PEAT** 1.20 Soft to stiff, grey SILTY CLAY 1.60 Soft to stiff, grey SILTY CLAY to SANDY CLAY, trace fine sand \_ \_ \_ \_ 1.80 End of Auger Hole Auger hole terminated in silty clay to sand clay at 1.80m depth (Water infiltration at 1.60m depth) 40 60 80 100 Shear Strength (kPa) ▲ Undisturbed △ Remoulded

**Geotechnical Investigation** 

**SOIL PROFILE & TEST DATA** 

1934 Stagecoach Road 28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7 Ottawa, Ontario **DATUM** FILE NO. PH0482 REMARKS HOLE NO. AH 6 BORINGS BY Hand Auger **DATE 26 SEP 06** PLOT **SAMPLE** Pen. Resist. Blows/0.3m DEPTH ELEV. SOIL DESCRIPTION • 50 mm Dia. Cone (m) (m) » RECOVERY STRATA NUMBER Water Content % **GROUND SURFACE** 60 80 0 **TOPSOIL** 0.15 **Brown SILTY SAND**  $\frac{\nabla}{2}$ 1 \_\_\_\_1.10 Stiff SILTY CLAY to **CLAYEY SILT** AH terminated in stiff silty clay to clayer silt © clay to clayey silt @ 1.50m depth 60 80 100 Shear Strength (kPa) ▲ Undisturbed △ Remoulded

**SOIL PROFILE & TEST DATA** 

**Geotechnical Investigation** 1934 Stagecoach Road

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7 Ottawa, Ontario **DATUM** FILE NO. PH0482 REMARKS HOLE NO. **AH 7** BORINGS BY Hand Auger **DATE 26 SEP 06 SAMPLE** Pen. Resist. Blows/0.3m PL<sub>0</sub>T Piezometer Construction DEPTH ELEV. **SOIL DESCRIPTION** • 50 mm Dia. Cone (m) (m) : RECOVERY N VALUE or RQD STRATA NUMBER Water Content % **GROUND SURFACE** 20 40 60 0-**TOPSOIL** \_\_\_\_\_0.10 CLAYEY SAND, trace silt \_\_\_\_0.30 **Grey SILTY SAND** 1 AH terminated in silty sand @ 1.20 m depth (Water infiltration at 0.20m depth) 20 40 60 80 100 Shear Strength (kPa) ▲ Undisturbed △ Remoulded

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### **SOIL PROFILE AND TEST DATA**

Proposed Residential Subdivision 1934 Stagecoach Road

28 Concourse Gate, Unit 1, Ottawa, ON					Ot	tawa, O			,	<del></del>	
DATUM Ground surface elevations	interp	olated	from	topo	surve	y plan.	_		FILE NO.	PH0482	
REMARKS									HOLE NO.	TP1/MV	V1-1
BORINGS BY Backhoe				ם							
SOIL DESCRIPTION	PLOT	SAMPLE				DEPTH (m)	ELEV. (m)		ws/0.3m Cone	Piezometer Construction	
	STRATA	TYPE	NUMBER	% RECOVERY	N VALUE OF ROD	(117	(111)	0 V	Water Cont	tent %	ezon
	STR	TX	MOM	SECO	N A			20	40 60		a.ပ
GROUND SURFACE						0-	_				
TOPSOIL 0.30											
											N <sup>*</sup>
						1-					
SAND with marl		G	1			'					
			İ								
				•							
<u>2.0</u> 0		}				2	+				
SILTY CLAY		G	2								
2.50											
End of Test Pit		T									
(GWL @ 0.7m depth)											
·											
											1
					ļ						
								20 She	40 66 ear Strengt		100
								▲ Undi		Remoulded	

SOIL PROFILE AND TEST DATA

Shear Strength (kPa)

△ Remoulded

▲ Undisturbed

Proposed Residential Subdivision 1934 Stagecoach Road

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

Ottawa, Ontario

Ground surface elevations interpolated from topo survey plan. FILE NO. DATUM PH0482 REMARKS HOLE NO. TP 2-10 DATE 6 August 2010 BORINGS BY Backhoe Pen. Resist, Blows/0.3m SAMPLE PLOT **DEPTH** ELEV. • 50 mm Dia. Cone SOIL DESCRIPTION (m) (m) N VALUE of RQD RECOVERY STRATA NUMBER TYDE O Water Content % **GROUND SURFACE** 0 TOPSOIL Ā G 3 SAND with gravel 2 SILTY CLAY G 4 End of Test Pit (GWL @ 0.7m depth) 100 60

SOIL PROFILE AND TEST DATA

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

Proposed Residential Subdivision 1934 Stagecoach Road Ottawa, Ontario

DATUM Ground surface elevations	interp	olated	from	topo	surve	y plan.			FILE	NO.	PH0482	
REMARKS									HOL	E NO.		VO 4
BORINGS BY Backhoe		,		D	ATE (	August	2010	<u> </u>			TP3/MV	VZ-1
SOIL DESCRIPTION	PLOT	SAMPLE				DEPTH (m)	ELEV. (m)		ws/0.3m Cone	neter uction		
	STRATA	TYPE	NUMBER	& RECOVERY	N VALUE of ROD			0 V	Vater	Cont	ent %	Piezometer Construction
GROUND SURFACE	Š		Z	2	≱ °	0-	_	20	40	60	80	era e e e
TOPSOIL	7	_										
FILL: Silty sand with cobbles	6	G	5									
			c		***	1.						⊽
Coarse SAND		G	6			2			· · · · · · · · · · · · · · · · · · ·			
26	i0			74.								
SILTY CLAY	00					3						
End of Test Pit (GWL @ 1.5m depth)								20	40	6	0 80	100
								She	40 ear S1 isturbe	trengt	0 80 t <b>h (kPa)</b> Remoulded	.00

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### SOIL PROFILE AND TEST DATA

28 Concourse Gate, Unit 1, Ottawa, ON	K2E	777			19 Of	34 Stage tawa, Or	coacn K ntario		
DATUM Ground surface elevations	interp	olated	from	topo					FILE NO. PH0482
REMARKS									HOLE NO. TP 4-10
BORINGS BY Backhoe	T		<del></del>	D	ATE (	6 August :	2010	T _ =	
SOIL DESCRIPTION	PLOT		SAN	IPLE		DEPTH (m)	ELEV. (m)	1	esist. Blows/0.3m 0 mm Dia. Cone
	STRATA 1	TYPE	NUMBER	% RECOVERY	N VALUE	(111)	(111)	0 V	O mm Dia. Cone Vater Content %
GROUND SURFACE	02			R	Z	0-	_	20	40 60 80
TOPSOIL 0.23									
Coarse SAND		G	7			1-			▼
SILTY CLAY  2.70 End of Test Pit  (GWL @ 0.4m depth)		G	8					20	40 60 80 100
								20 She	ear Strength (kPa)

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### **SOIL PROFILE AND TEST DATA**

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

Proposed Residential Subdivision 1934 Stagecoach Road Ottawa, Ontario

Ground surface elevations interpolated from topo survey plan. FILE NO. DATUM PH0482 REMARKS HOLE NO. TP 5-10 PATE 6 August 2010 BORINGS BY Backhoe Pen. Resist. Blows/0.3m SAMPLE PLOT Piezometer Construction DEPTH ELEV. 50 mm Dia. Cone SOIL DESCRIPTION (m) (m) RECOVERY N VALUE of RQD STRATA NUMBER O Water Content % **GROUND SURFACE** 0 TOPSOIL 0.18 FILL: Sandy silt with gravel and cobbles G 9 1 SANDY SILT with marl G 10 2.00 2-G 11 SILTY CLAY End of Test Pit (TP dry upon completion) 80 60 40 Shear Strength (kPa) △ Remoulded ▲ Undisturbed

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SOIL PROFILE AND TEST DATA

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

Proposed Residential Subdivision 1934 Stagecoach Road Ottawa, Ontario

Ground surface elevations interpolated from topo survey plan. FILE NO. DATUM PH0482 REMARKS HOLE NO. TP6/MW4-1( DATE 6 August 2010 BORINGS BY Backhoe Pen. Resist. Blows/0.3m SAMPLE Piezometer Construction STRATA PLOT ELEV. DEPTH ■ 50 mm Dia. Cone **SOIL DESCRIPTION** (m) (m) N VALUE of ROD RECOVERY NUMBER O Water Content % 20 **GROUND SURFACE** 0 TOPSOIL 0.15 SAND with marl 12 G 1 1.40 2 SILTY SAND with boulders G 13 3 End of Test Pit (GWL @ 0.1m depth) 60 Shear Strength (kPa) ▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

Proposed Residential Subdivision 1934 Stagecoach Road Ottawa, Ontario

Ground surface elevations interpolated from topo survey plan. FILE NO. **DATUM** PH0482 REMARKS HOLE NO. TP7/MW3-1( DATE 6 August 2010 BORINGS BY Backhoe Pen. Resist. Blows/0.3m SAMPLE Piezometer Construction PLOT DEPTH ELEV. 50 mm Dia. Cone SOIL DESCRIPTION (m) (m) RECOVERY N VALUE of ROD STRATA NUMBER TYPE O Water Content % **GROUND SURFACE** 0 TOPSOIL 0.14 G 14 SILTY SAND - with clay by 0.4m depth G 15 SAND with marl G 16 2-SILTY CLAY G 17 3 End of Test Pit (GWL @ 0.1m depth) 60 80 40 Shear Strength (kPa) △ Remoulded ▲ Undisturbed

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### SOIL PROFILE AND TEST DATA

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

Proposed Residential Subdivision 1934 Stagecoach Road Ottawa, Ontario

DATUM Ground surface eleva	tions i	interp	olated	from	topo	surve	y plan.	<u>-,</u>		FILE	NO. PH	10482	
REMARKS										HOLE	NO. TI	P 8-10	<u> </u>
BORINGS BY Backhoe	1		<del>_</del>		D	ATE (	August	2010					
SOIL DESCRIPTION		PLOT		SAN	PLE		DEPTH (m)	ELEV. (m)	)		Blows/0		meter uction
		STRATA	TYPE	NUMBER	8 RECOVERY	N VALUE OF ROD	, ,		0 V	/ater	Content	%	Piezometer Construction
GROUND SURFACE		ζ.		<b>5</b>	RE	z °	0-	_	20	40	60 	80	
TOPSOIL	0.20												
SAND	<u>0.25</u>		G	18				·					
							1-	-					
SILT			G	19			2						
- with boulders by 3.1m depth	_3. <u>50</u>						3						
End of Test Pit (TP dry upon completion)									20 She ▲ Undis		60 rength (k △ Rem	(Pa)	190

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**SOIL PROFILE AND TEST DATA** 

**Proposed Residential Subdivision** 1934 Stagecoach Road

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7 Ottawa, Ontario Ground surface elevations interpolated from topo survey plan. FILE NO. DATUM PH0482 REMARKS HOLE NO. TP 9-10 DATE 6 August 2010 BORINGS BY Backhoe Pen. Resist. Blows/0.3m SAMPLE PLOT DEPTH ELEV. 50 mm Dia, Cone SOIL DESCRIPTION (m) (m) RECOVERY N VALUE of ROD STRATA NUMBER TYPE O Water Content % **GROUND SURFACE** 0-TOPSOIL 20 G SAND 0.80 1 SILT 2 G 21 3 End of Test Pit (TP dry upon completion) 40 60 80 Shear Strength (kPa) ▲ Undisturbed △ Remoulded

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### SOIL PROFILE AND TEST DATA

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

1934 Stagecoach Road

28 Concodise date, onit i, ottairs,						nawa, Or	Itario		T		—
DATUM Ground surface elevation	ns inter	polate	d from	topo	surve	y plan.			FILE NO.	PH0482	
REMARKS									HOLE NO	TP10/N	110/5
BORINGS BY Backhoe		<del>-  </del>		D	ATE (	6 August	2010	<u> </u>		17 10/14	1440
SOIL DESCRIPTION	PLOT		SAN	IPLE	ļ —	DEPTH (m)	ELEV. (m)		esist. Bl	ows/0.3m a. Cone	Piezometer Construction
	STRATA	TYPE	NUMBER	% RECOVERY	N VALUE or ROD	(,	(,	0 V	Vater Cor	ntent %	iezor
GROUND SURFACE	STS	E	NO.	RECO	N N	0+	_	20		0 80	EO.
TOPSOIL	00	-									
SILTY SAND with boulders	.50	G	22			1-					
SILTY CLAY with gravel and boulders		G	23			2-	- -				- · · · · · · · · · · · · · · · · · · ·
End of Test Pit  Practical refusal to excavation on inferred boulders @ 2.60m depth  (GWL. @ 2.5m depth)	2.60							20	40		100
								She	ear Stren		-

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### SOIL PROFILE AND TEST DATA

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

Proposed Residential Subdivision 1934 Stagecoach Road Ottawa, Ontario

DATUM Ground surface eleva	tions i	nterp	olated	l from	topo:	surve	y plan.			FILE NO.	PH0482	7
REMARKS										HOLE NO.	TP11-1	0
BORINGS BY Backhoe	7	<del></del> -	<u></u> .			ATE (	3 August	2010		•		
SOIL DESCRIPTION		PLOT	1	_	IPLE 성	E	DEPTH (m)	ELEV. (m)		esist. Blov 0 mm Dia.		Piezometer Construction
	;	STRATA	TYPE	NUMBER	* RECOVERY	N VALUE of RQD				Vater Conte		Piezo
GROUND SURFACE					124		0-	-	20	40 60	80	
TOPSOIL	<u>0.35</u>											
SAND with silt	<u>0.63</u>		G	24								
SILTY SAND with boulders	0.00		G	25			1-					₹
End of Test Pit  Practical refusal to excavation on inferred boulders @ 2.00m depth  (GWL @ 1.3m depth)	2.00						2		20	40 60	80 (I/Pa)	190
									20 She ▲ Undi	40 60 ear Strengtl sturbed △	80 n (kPa) Remoulded	100

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SOIL PROFILE AND TEST DATA

Proposed Residential Subdivision 1934 Stagecoach Road

28 Concourse Gate, Unit 1, Ottawa, ON				_		tawa, Or	ntario	<u>.</u>	· · · · · · · · · · · · · · · · · · ·	<u></u>	
DATUM Ground surface elevations	interp	olated	from	topo :	surve	y plan.			FILE NO.	PH0482	
REMARKS									HOLE NO.	TP12-1	0
BORINGS BY Backhoe	· I			D.	ATE 6	August	2010			<del> </del>	
SOIL DESCRIPTION	PLOT	<u> </u>	SAN	IPLE		DEPTH (m)	ELEV. (m)		esist. Blo 0 mm Dia.	1	Piezometer Construction
	STRATA	TYPE	NUMBER	% RECOVERY	N VALUE of ROD			0 <b>V</b>	Vater Conf		Piezo Constr
GROUND SURFACE	<u>"</u>			22	, Z, J	0-		20	40 60	80	
TOPSOIL											
SILTY SAND with boulders		G	26			2-					
3.2    End of Test Pit		+				}	•				1
Practical refusal to excavation on inferred boulders @ 3.20m depeth  (TP dry upon completion)		.,									
									40 6 ar Strengt	th (kPa)	100
	1	1	1	1	l	1	1	▲ Undis	sturbed $\Delta$	Remoulded	

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### SOIL PROFILE AND TEST DATA

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

Proposed Residential Subdivision 1934 Stagecoach Road Ottawa, Ontario

28 Concourse Gate, Unit 1, Uttawa, U						tawa, Or	<u>itario</u>					
DATUM Ground surface elevations	interp	olated	d from	topo	surve	y plan.			FILE	<sup>{O.</sup> F	PH0482	
REMARKS									HOLE	NO.	TP13/N	1W6-
BORINGS BY Backhoe	<del></del>			D	ATE (	S August 2	2010		<u>L</u> .			
SOIL DESCRIPTION	PLOT	, ,	SAN	IPLE		DEPTH (m)	ELEV. (m)	Pen. R ● 5	esist. 0 mm			Piezometer Construction
	STRATA	TYPE	NUMBER	% RECOVERY	N VALUE or ROD	(,	()	0 V	Vater C	onter	nt %	Piezor
GROUND SURFACE	SI	В	N.	REC	× 6	0-	Ļ	20	40	60	80	
TOPSOIL 0.2	2											
SAND0.2		G	27	i								
						1-						
		G	28									
SILTY CLAY						2.						
							i					
3.4	ın					3						
End of Test Pit												
Practical refusal to excavation on inferred boulders @ 3.40m depth  (GWL @ 3.1m depth)			E									
												400
				ļ				20 She ▲ Undi	40 ar Stro sturbed	60 ength △ Re	80 (kPa) emoulded	100

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#### **SOIL PROFILE AND TEST DATA**

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

Proposed Residential Subdivision 1934 Stagecoach Road Ottawa, Ontario

DATUM Ground surface elevations	interp	olated	l from	topo	surve	y plan.				F	ILE	NO.	F	Н	)48:	2
REMARKS										Н	OLE	. NO	٠.	 ΔΗ	l 1-	10
BORINGS BY Hand Shovel/Hand Auger	· [ ]			D	ATE '	15 Octobe	er 2010			1_						1
SOIL DESCRIPTION	PLOT		SAN	IPLE		DEPTH (m)	ELEV. (m)	P	en. F							Piezometer Construction
	STRATA	TYPE	NUMBER	% RECOVERY	N VALUE of RQD		(		0 '	Wat	er (	Con	iter	nt 9	<b>/</b> 6	Piezor Constri
GROUND SURFACE	v.		- ž	E. E.	× ö	0-	-96,60		20	4	10	6	0	80 <del> </del>	 0	<u>.                                    </u>
PEAT																
FINE SAND	# G P					1-	95.60									
End of Auger Hole  (GWL @ ground surface)			į													
									20 Sh	ear		eng	50 Jth	(kP	30 a)	100

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### SOIL PROFILE AND TEST DATA

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

Proposed Residential Subdivision 1934 Stagecoach Road Ottawa, Ontario

Ground surface elevations interpolated from topo survey plan. FILE NO. DATUM PH0482 REMARKS HOLE NO. AH 2-10 DATE 15 October 2010 BORINGS BY Hand Shovel/Hand Auger Pen. Resist. Blows/0.3m SAMPLE PLOT DEPTH ELEV. ■ 50 mm Dia. Cone SOIL DESCRIPTION (m) (m) N VALUE of ROD RECOVERY STRATA NUMBER O Water Content % **GROUND SURFACE** 0+96.30**PEAT** 1 + 95.30**FINE SAND** 1.40 End of Auger Hole (GWL @ ground surface) 60 40 Shear Strength (kPa) ▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

Proposed Residential Subdivision 1934 Stagecoach Road Ottawa, Ontario

DATUM Ground surface elevations	interp	olate	from	topo	surve	y plan.			FILE NO.	PH0482	
REMARKS									HOLE NO	AH 3-1	0
BORINGS BY Hand Shovel/Hand Auger	<u> </u>				ATE_	15 Octobe	er 2010				
SOIL DESCRIPTION	TOIG		SAN	IPLE		DEPTH (m)	ELEV. (m)		esist. Blo 0 mm Dia		Piezometer Construction
	STRATA	TYPE	NUMBER	* RECOVERY	N VALUE			0 <b>v</b>	Vater Con		Piezo Consti
GROUND SURFACE			7	뛾	Z O	0-	-96.60	20	40 60	80	⊽
PEAT											
FINE SAND  End of Auger Hole  (GWL @ ground surface)						1	95.60				
									ar Streng		100

#### **SYMBOLS AND TERMS**

#### **SOIL DESCRIPTION**

Behavioural properties, such as structure and strength, take precedence over particle gradation in describing soils. Terminology describing soil structure are as follows:

Desiccated	-	having visible signs of weathering by oxidation of clay minerals, shrinkage cracks, etc.
Fissured	-	having cracks, and hence a blocky structure.
Varved	-	composed of regular alternating layers of silt and clay.
Stratified	-	composed of alternating layers of different soil types, e.g. silt and sand or silt and clay.
Well-Graded	-	Having wide range in grain sizes and substantial amounts of all intermediate particle sizes (see Grain Size Distribution).
Uniformly-Graded	-	Predominantly of one grain size (see Grain Size Distribution).

The standard terminology to describe the strength of cohesionless soils is the relative density, usually inferred from the results of the Standard Penetration Test (SPT) 'N' value. The SPT N value is the number of blows of a 63.5 kg hammer, falling 760 mm, required to drive a 51 mm O.D. split spoon sampler 300 mm into the soil after an initial penetration of 150 mm.

Relative Density	'N' Value	Relative Density %
Very Loose	<4	<15
Loose	4-10	15-35
Compact	10-30	35-65
Dense	30-50	65-85
Very Dense	>50	>85

The standard terminology to describe the strength of cohesive soils is the consistency, which is based on the undisturbed undrained shear strength as measured by the in situ or laboratory vane tests, penetrometer tests, unconfined compression tests, or occasionally by Standard Penetration Tests.

Consistency	Undrained Shear Strength (kPa)	'N' Value
Very Soft	<12	<2
Soft	12-25	2-4
Firm	25-50	4-8
Stiff	50-100	8-15
Very Stiff	100-200	15-30
Hard	>200	>30

#### **SYMBOLS AND TERMS (continued)**

#### **SOIL DESCRIPTION (continued)**

Cohesive soils can also be classified according to their "sensitivity". The sensitivity is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil.

Terminology used for describing soil strata based upon texture, or the proportion of individual particle sizes present is provided on the Textural Soil Classification Chart at the end of this information package.

#### **ROCK DESCRIPTION**

The structural description of the bedrock mass is based on the Rock Quality Designation (RQD).

The RQD classification is based on a modified core recovery percentage in which all pieces of sound core over 100 mm long are counted as recovery. The smaller pieces are considered to be a result of closely-spaced discontinuities (resulting from shearing, jointing, faulting, or weathering) in the rock mass and are not counted. RQD is ideally determined from NXL size core. However, it can be used on smaller core sizes, such as BX, if the bulk of the fractures caused by drilling stresses (called "mechanical breaks") are easily distinguishable from the normal in situ fractures.

RQD %	ROCK QUALITY
90-100	Excellent, intact, very sound
75-90	Good, massive, moderately jointed or sound
50-75	Fair, blocky and seamy, fractured
25-50	Poor, shattered and very seamy or blocky, severely fractured
0-25	Very poor, crushed, very severely fractured

#### SAMPLE TYPES

SS	-	Split spoon sample (obtained in conjunction with the performing of the Standard Penetration Test (SPT))
TW	-	Thin wall tube or Shelby tube
PS	-	Piston sample
AU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size AXT, BXL, etc.). Rock core samples are obtained with the use of standard diamond drilling bits.

#### SYMBOLS AND TERMS (continued)

#### **GRAIN SIZE DISTRIBUTION**

MC% - Natural moisture content or water content of sample, %

Liquid Limit, % (water content above which soil behaves as a liquid)
 PL - Plastic limit, % (water content above which soil behaves plastically)

PI - Plasticity index, % (difference between LL and PL)

Dxx - Grain size which xx% of the soil, by weight, is of finer grain sizes

These grain size descriptions are not used below 0.075 mm grain size

D10 - Grain size at which 10% of the soil is finer (effective grain size)

D60 - Grain size at which 60% of the soil is finer

Cc - Concavity coefficient =  $(D30)^2 / (D10 \times D60)$ 

Cu - Uniformity coefficient = D60 / D10

Cc and Cu are used to assess the grading of sands and gravels:

Well-graded gravels have: 1 < Cc < 3 and Cu > 4 Well-graded sands have: 1 < Cc < 3 and Cu > 6

Sands and gravels not meeting the above requirements are poorly-graded or uniformly-graded.

Cc and Cu are not applicable for the description of soils with more than 10% silt and clay

(more than 10% finer than 0.075 mm or the #200 sieve)

#### **CONSOLIDATION TEST**

p'<sub>0</sub> - Present effective overburden pressure at sample depth

p'c - Preconsolidation pressure of (maximum past pressure on) sample

Ccr - Recompression index (in effect at pressures below p'c)
Cc - Compression index (in effect at pressures above p'c)

OC Ratio Overconsolidaton ratio =  $p'_c/p'_o$ 

Void Ratio Initial sample void ratio = volume of voids / volume of solids

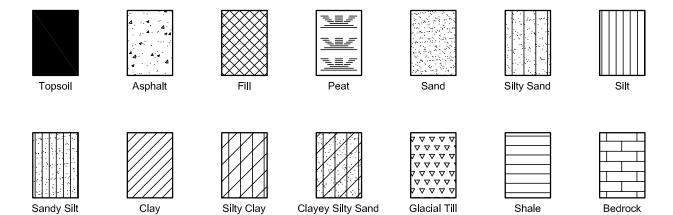
Wo - Initial water content (at start of consolidation test)

#### PERMEABILITY TEST

Coefficient of permeability or hydraulic conductivity is a measure of the ability of water to flow through the sample. The value of k is measured at a specified unit weight for (remoulded) cohesionless soil samples, because its value will vary with the unit weight or density of the sample during the test.

#### SYMBOLS AND TERMS (continued)

#### STRATA PLOT



#### MONITORING WELL AND PIEZOMETER CONSTRUCTION





### **APPENDIX 2**

Published MECP Well Data for Test Wells

Local Well Records (Regional Hydrogeology)

MECP Provincial Offences order - Sleepy Cedars



Ontario

instructions for Completing Form

Ministry of the Environment

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Ministry of the Environment

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Well Record
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Well Record Regulation 903 Ontario Water Resources Act

Instructions for Completing Form

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16138383277 AIR ROCK DRILLING PAGE (ম্ব) Ontario Ministry of Woll To mbre balow) A 952467 Well Record the Environment Regulation 903 Ontario Water Resources Act 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 Help Dask (Toll Free) at 1-886-396-9355.

All metric measurements shall be reported to 1/10% of a metric. Please print clearly in blue or black ink only. Miniatry Use Only Well Owner's Information and Location of Woll Information MUN CON LOT Lest Negre Fingol Concorplor Hunce County/District/Munkripality oworklo (City/Town/V) Province Telephone Numbel (include rice pode) Ontario Concossion Sho/Comannmen/Block/Tracticle. 5467884 Mode of Operation: Undillarentiated [813] Difformitated, apacit Log of Overburden and Bodrock Ma terials (see instructions Coneral Colour Most common malarial Other Malorials General Description 办 ی کدیسو 4 6,10 13.72 ïo 1372 Hole Dlameter Construction Record Test of Well Ylold () de() Motres Diamplar Pumping tent method Wall Draw Down Depin Motres Recovery Continuon Matorial From Τq thickness cardmanas diam Time Water Levi (8,79) Votor Level IF N From Τø min Motico Turio Int 3 3 1 Casing nval 5.5 ETSANI TENANDANO **4**% 671 Companie Companie  $\bigcirc$ Water Record Outsition of purpoing 150 Walne lound / Kind of Water .bro ≁.**C**)\_ mi Steel | Phragina Frash | Sulphu Plaatie | Concrete | | Early | month ∭ **Ġ**o≵mnized From Hulphon Becommy April " | Stock | | | Hameline Plantic Coperate Calundzed ማጣ<u>ሜ.</u> Piocentary out out of the country of | Freeh | Sulphur | Sally | Minaral Screen J mi 10 1,70 GM Direc \_ . Outomo \$ 277 ∫ Since | }Fillengines Slot No. diam Trans Congrete After tout of well yield, water was 20 J تک (Blue Dimira) <u>ک ک</u> ک [GalvanDas 30 \$ 30 40 33 40 80 5 33 50 60 5 50 II purning discord 145 ON THE PERSON No Casing or Screen (B,F) Ciyloquesed Follow 0 Plugging and Scaling Record Nanular space Abondonmon Location of Well In diagram balaw show stataness of wall from road, for line, and hullding Matrix [Material and type (battlering alterny, neet coment alterny) atc. Volume Placed (a mic motime) Mast Come Bests Mathod of Construction (finbary (nir) Cable Tool □ Diamond Dieging Botery (odovanilane) Notes porcuesion Offise T. Jamion C Bollon Bolary (rovarso) ☐ Driving Water Uso Slark Industrial Public Supply ☐ Otther Columnical 1w#4 Not usered ] jujčatjou Sauck ]Musicipai Capting & air conditioning Finel Status of Wall

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Print only in spaces provided. Mark correct box with a checkmark, where applicable. t1 1529623 Two Township/Borough/City/Town/Village County or District Con block tract survey, etc. Lot Ottava Carleton Osgoode. Date 1897 Stagecouch Rd. Greely Ontario R4P 16TP 21 نا لنعاا الآ نيسبسيا LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions) Other materials General description Ren Sand Brown 0 8 Sand Gray Gray Clay 50. Sand & Gravel Gray. 50 52 I (mestone Gray 75 ِ اللَّهُ اللَّهُ اللَّهُ المُنْ المُنْ المُنْ المُنْ المُنْ المُنْ المُنْ المُنْ المُنْ المُنْ المُنْ المُنْ ا CASING & OPEN HOLE RECORD WATER RECORD Sizes of operating (Silot No.) Water four Depth - test Kind of water · □ Fresh · □ Sulphur • □ Selty · □ Minerals • □ Ges Metrial and type C. Steel <sup>1</sup>
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The Ontario Water Resources Act

### WATER WELL RECORD

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(A)	Ministry of the
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# The Ontario Waler Resources Act WATER WELL RECORD

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# The Ontario Water Resources Act WATER WELL RECORD

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MINISTRY	OF THE ENVIRON					FOR	M NO 0506 (11/2	

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<u> </u>	UNTY OR DISTRICT	Tod	TOWNSHIP, HOROUGH, CITY, TOWN, Y	ILLAGE	··	COV., BLOCK, TRACT, SUR	VEY, ETC.	<del>व कें</del> ग्रे
0	NEW (SURBANE FO	28-17	OSG ODE		A 117		DAY 3/ NO. /2	62
	21 )	1088 EASTERS EASTERS (4.5141.)	50.08.1.20	<b>15</b>	<u>017</u> (4) 31 /14	PC BYSIN CORE		
A.		- 10	G OF OVERBURDEN AND	BÉDROÇI	MATERIAL	LS (SEE INSTRUCTIONS)		
. [	GENERAL COLOUR	COMMON MATERIAL	OTHER NATERIALS		<u> </u>	GENERAL DESCRIPTION	FEOM FEOM	TO TO
-	<del> </del>	CLAY	0 0				- 2	38
	GRE1/	GRAVEL	BOULDERS	<b>.</b>	<del> </del>	HARD	28	<u> </u>
-								
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Č	31) 1000	a boti Li laga	allulua il boosalanat	البلد	1111			الا ببا
	32		51 CASING & OPEN		ecoen	Z SLOT NO. >	\$5 51-33	78 90 (EKETH) 31-345)
	WATER JOURN AT FEET	ER RECORD	MANA HATERIAL THICKING INCHES	0EP	TH - FEE	MATERIAL AND TYPE	DEFTH TO TOP OF SCREEN	4-22 FE
1 0	242 !	FRESH 3   SULPHUR 14     SALTY 4   MIMERAL	OG 2 GALVANIZED		0029	W .		<u> </u>
		□ FRESH 3 □ SULPHUR 17 □ SALTY 4 □ MINERAL	3 CONCRETE / 8	دع الآ	25 F	DEPTH SET AT - FEET		ECORD EMENT SINTAL PAQUENT, ETC.)
}	2	GRESH 1 SULPHUN SALTY 4 HIMERAL	OG 2 GALVANIZED 1 CONLARTE 4 APP OPEN HOLE	29	0053	FROM TO 14-17		0 <i>0</i> 7
;	2	SALTY 4 NIMERAL  SALTY 4 NIMERAL  FRESH 3 SULPHUR 31	ZA-ZO I O STEEL ZE	į	27-50	18-21 22-29 26-2h 30-39	NI	
:		SALTY 4 MIRERAL	4 OPEN HOLE	<u> </u>		LOCATION	OF WELL	
!(	/ J. PUHP	ESTABLES DO	04 cru 01 15-14 31				CES OF WELL FROM HOAD ARE	,
	STATIC LEVEL	END OF WATE	EN LEVELS DURING 2 RECOVE	ET		Life, Myreac Bernie av		
	V =	- 017 ser 013 M		<u>a</u>	-	1		Ì
	Z STE RATE	CPN.	EO AS-AS ACCOMMENDED	44-45	ر ا	₩ .	` '	
}	2 PSHALU	(Fi) We	030 PETT GATE 0004	4 679	BE	d		,
!	FINAL	54 WATER SUPPLY	5 AMANDONED, INSUFFICIENT	supput,		· · · · · · · · · · · · · · · · · · ·	11/	
1	STATUS OF WELL		7 🔲 UNTINISHED	· ·	3	9	9	<del> </del>
	WATER	1 DOMESTIC 2 STOCK	5 COMMERCIAL 5 NUMICIPAL 7 PUBLIC SUPPLY		1 7	12- 4	76 Mi	<del>- }</del>
	ŲSE	O/ 4 - INDUSTRIAL - OTHER	S COOLING ON AIR CONDITIONIN	16		[]		Toni.
	METHO		6 ☐ BORING ENTIONAL) 7 ☐ DIAMOND		MA	d		¥
	OF DRILLING	3 ROTARY (REVER A ROTARY (AIR) (37) AIR PERSUSAHO	9 ☐ DHMHG	- {	DRILLERS REMA	IRIS:	<u> </u>	
{	HAME OF WE	IL CONTRACTOR	ERSUPPLU 33	26	SQUECE	14 3504	O T O O	63-44 NO
}	ADDRESS	LEAN WHI	AVE ATTIME	2 7	DATE OF BE			<del>-</del>
	M HAHE OF OR	ILLER OR BORER	LUCERCE N	Na Les	S SERVER			-
	SIGNATURE	CONTRACTOR	SUBMISHER BATE	7	OFFICE	·	oran Arab <b>Q</b>	
Ī		C COPY						

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WATER RESOURCES
DIVISION NO
JUN 1 6 1965

( 5 R 10 0 8 0 2 10 N Ontario Water R

Elev/bath BISICIS WATER WEI	i RF	CO CO	RORE	ONTARIO WATES	
128th t + 6 listrice Landle (on	Counship Ville	T.		1	1/2
Con. 1V Lot 13	Date completed	age, 100	F	May	1965
Owner (print in block letters)	Address / ?	(d 2 3		month // 0 77	zwa.
Casing and Screen Record	<del></del>		Pumpii	ng Test	
Inside diameter of casing 6 14"	Static level			3/	
Total length of casing 52					G,P.M.
Type of screen	Pumping le				* · · · · · · · · · · · · · · · · · · ·
Length of screen	Duration of	test pur	nping	140	
Depth to top of screen				test Cle	
Diameter of finished hole 6 1/4"	Recommen	ded pur	nping rate	15-	G.P.M.
	with pump	setting o	of. 3	eet belo	w ground surface
Well Log				Water	r Record
Overburden and Bedrock Record	From ft.		To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
sand	0		48		
gravel	4/8	<del>-</del>	572	52	Fresh
For what purpose(s) is the water to be used?			Location	of Well	·
house hold	In di	iagram t		distances of wel	l from
Is well on upland, in valley, or on hillside? upland	road	and lo	t line. In	dicate north by	arrow.
Drilling or Boring Firm	į.		11		
Mchean Water Supply UT			18.		
Mchean Water Supply LT. Address 1532 Raven Ave					
OTTawa 3					
Licence Number /486			30	:102	
Name of Driller or Borer H. Sally	<		- <del>1</del>	<del>(10</del>	<b>⇒</b> ø \
Address		Co	nc IV		Λ' 1 <sub>2</sub>
Date May 5, 1965					
(Signature of Licensed Drilling or Boring Contractor)	F		Conc I	11.°	·•·
Form 7 15M-60-4138		~ (o	יייץ גמ	~/	2
W RC COPY	H			Cario	a light

## WATER WELL RECORD

UNITY OR DISTRICT		SON WHERE APPLICABLE TOWNSHIP, BOROUGH, CITY, TO	OMN' AITTYRE N	15106	CON., BLOCK, TRACT	SURVEY, ETC.	<u> </u>	
Calle	on	ADDRESS	ma (	<u> </u>	<u> 25 4</u>	Y TOATE COM	PLETEO +	159
ZOMI	EASTING	ЯОПТНЯКО	<del></del>	ELEVATION		.22	<u>,01</u>	m.7
<u> </u>	8 4550		يَّتِياً الْإِلَّا	व्युग्रस्				بىتىا
<u> </u>		OF OVERBURDEN A	ND BEDROO	K MATERIA	LS (SEE INSTAUCTION	5)		
ERERAL COLOUR COM	MOST MATERIAL	OTHER MATERI	ALS		GENERAL DESCRIPTI	ON	FROM	- FEET
gray				day	d Pa	72	1	25
Black				10	savel		35	41
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				<u> </u>		· ·	<del>                                     </del>	
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علالينا	عبيا ليلنا	كربيا ليبيل		<u></u>	غلانتها ليلت		<u> </u>	نيب
41 WATER R	ECORD	STCASING & OF			Z (SLOT BO.)	A1-33 MAII	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	LEBOTH 3
	OF WATER	OTAL MATERIAL 1	THORNESS PRO		HATEBIAL AND TYP	E	PETTE TO TOP OF SCHOOL	2)-44
3 8 SALTY	3 C SULPHUN 14	STEEL 12	1/4 0	2970	<u>×</u>			FOET
2 SALTY	# D SULPHUM TO	4 OPEN HOLE	14 0	7 -76	DEFIN SET AT - PEET		, p. 4	EGORD
1 ☐ FAESH 2 ☐ SALTY	3 C SULPHUR **	2 ☐ GALYARIZED 3 ☐ CORCRETE	ŀ		FROM TO	.17		PACKER, ETC.
s (☐ 2mril	3   SULTHUR 29	4 ☐ OPEN HOLE  24-24 1 ☐ STEEL 26  2 ☐ GALYAMIZEO		37-30	14-24 22	-15		
. 30-33   ☐ FRESH Z ☐ SALTE	3 SULPHUR SALAC 4 MINERAL	3 D CONCRETE 4 D OPEN HOLE			2649 30	-31 60		
71 PUM ING TEST METHOD	10 PUNPING RATE	11-14 (04MA))ON OF PUMP	200 17:10		LOCATIO	N OF WE	LL	
<b>−</b>   \$161 €   €	LEVEL 25	PU PU	IMPING CCOVERY	IM C	MAGRAM BELOW SHOW DI UNE. INDICATE ROWTH I	STANCES OF HIS LE	NOW ORK SEE	
19-21	23-24 16 MADES 26-30	30 MIRATES of MINUTES 32-24	SO MINUTES				11/	
y riceas	78-41 Palme HATERE ST	P30 RETUSO RES	TEST 41	1	- 1		znecr's	
Z SINE PATE  S. RECOMMENDED PURP TIPE	GFB.	PRET 1 CLEAR 43-43 PECONNEUTRO	2☐ CLOUDY			<u> </u>	Zitu .	
50-50 00/2 0		FEET BATE 12	671	ر بر خو	1	è.		
<u> </u>	WATER SUPPLY	S ARANDONEO, INSUFFI			7 5		a 27.	-4
STATUS	☐ deservation weu ☐ test hole				/ 3	•		
33-54	DOMESTIC	5 COMMERCIAL				( )		
WATER	TOCK I RRIGATION	F ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING ON AIR CONDIT	nonine /	te	- /3	<b>、</b> /		
USE O/	OTHER	9 ☐ #07 £		-13	ं सई			٠
	CABLE TOOL		!	1	, w.	`		•
METHOD :	C		-	Days. 852 acres	, Z			
OF DRILLING	O ROTARY (REVERSE) O ROTARY (AIR) O AIR PERCUSSION	9 CRMRS		DRILLERS REMAI				
METHOD OF DRILLING	ROTARY (AIR)			I DUTA	SE CONTRACTOR	51-48 CATE RECE	<u> </u>	Λ 65-6
METHOD OF DRILLING	ROTARY (AIR)		377	DATE OF INSA	/ SO CONTRACTOR / 15/	59-49 CATE RECE 7 2 SPECTOR	3077	0
METHOD OF DRILLING  MAME OF WELL CONTRA  ADDRESS	ROTARY (AIR)	Cayer 7	SIZE MUMBER	DATA BOURCE  DATE OF IMSA	/ SO CONTRACTOR / 15/		3077	0
METHOD OF DRILLING	ROTARY (AIR)	Cayer 7	517	DATE OF INSA	/ SO CONTRACTOR / 15/		3077	0

Ministry of Well Tag No. A U/ YJDD Ontario: Well Record Regulation 903 Ontario Water Resources Act ) #Zotalo \* -Tamponis Page \_\_ \_ 54 Well Owner's information Well Location Address of V/el Charles School & Charles School & Celly serle-tom-Ртинск Pestai Code Ontario Office S MA COS Plan and Sublat Number 84532125009081 Overburden and Bedrock Materials Abandonment Senting Record uses instructions on the part of this terms CHIDESS COURS One Malerin s Depth (177ff) General Character 15 5 15' 351 Limestone 35 208 Grey Limes tone towhite Sandstone 208 260 Results of Well Yield Testing Amuler Space Sect Section of round Systems User Yalune हैं बेर्स्स्ट्रे Draw Down Tune Water Lord Time Water Lord 435335 Reat Cement Slury 6.24 i sweet. State ( 1.88 Bentonik Sturme 16.9 Method of Construction Wall Use Choe Inc 10sumore Lysich in Darsing Commercia Sol west C Remaind S Jawypak d Pot reser Doradion of pulpaying has - in A Correction ZRLEBBY <Component sab [] Montage 5 10.3 Responsible . 2312 h THAT HOPE . Pakis .. Street Short PERSONAL PROPERTY. Cooking & Ar Conditioning 124 ∐ изжылы  $\mathcal{A}$ 8 Ofer port 15 QS.5 Construction Record · Casing 20/26.3 20/8.1 Status of Well Dage and Cipted Hose (93 Marie a (Gatest only Foreigner, Consult Peaks She Wohr Juney 372 2. 8 38 B. 26 Responsement seen "क्ष्म सहस्र 435 E Reduce Wel 30 27,4 30 1.10 গ্ৰন্থ কৰ্মকট মুখ 28 4() Hopenhole 435 80 Owerston sett u தைது, 5 க Montorng 1904: 80 260 Car steamons Automodenen Traditionen Supply Map of Well Location Construction Record - Screen Abansanes, Poxs Water Quardy Abanda et dine Secreta Deer Meadow La Other succey Hole Diameter Water Details Dunb (m#r ful lower at Death Root of Water What can underson a 80' OMeter found at Dool or high this account L೧೬೯೬**ಥ**. ength this Other size to etuner found in Doods King of Warre .... Freight Other, sex 14 Well Contractor and Well Technician Information ATRIBUX DRILLING CO LTD. Hicknow Cut KOBZRO Ministry Use Only igativēces implyada implyada Sudn 190. Z 94761 MATERIAL PROPERTY CATHATIES FOR NAME . 200812 61373 2110 JAN 2 3 2809 COLUMNS FREELY CLIPENS 2001 Ministry's Copy

	Ministry of the Environment	· <b></b> · · · · · · · · · · · · · · · · ·			ne Ontario Wa WATER	ater Resour WELL RE	
hint only in space fark correct box w		cable. 11	15	31424	Municipality [15,009]	<b>ÇÖN</b>	<u> </u>
County or District	· · · · · · · · · · · · · · · · · · ·	Township/Borough/City	//Town/Village	<del></del>	Con blook tract	survey, etc. Lo	1 787
Ottawa Car	rleton	Osgoode			3		9
Owner's surpame	First Nem	Address			Date	beted	# 57
<u></u>	Zone	6346 Deermes	MOUN DE	Creely Ont	Basin Code	<u>, 13494 O u</u>	ougDQ=st
21	لـــاــّ		ليٍ ليــــ	a Marri i	<u> </u>	بتبات	Lu,
		OF OVERBURDEN AND BED	ROCK MATE	PIALS (see instructi	onsi	Dont	
General colour	Most common material	Other materials		General	description	Fran	- feet To
Brown	Sand					\ o	12
Grav	Sand					12	20
. 7	Sand Gravel	Boulders		Dank	.a	20	
Gray		- BOMOEZE		Pack			
Gray	Limestone	<del></del>		Bard		30	140
Gray & Whi	<u>ite Sandstone</u>			Yery	<u>Bard</u>	140	175
						-	
		<u> </u>		<del></del>			ļ
				<del></del>	<del></del>		<u> </u>
3†    32    1	<u> </u>			<del></del>	<u> </u>		البلي
19 14 1	RECORD 51	CÁSING & OPEN HOLE	TI LITT		opening 31-23 Dr	proder 3-36 Lung	<u> </u>
Vater found	l/ind at	de Wali	Omph-1			inches	jui ino
1 - leet	Front 1 G Sulphur 19 G 41	nes Inches	From	To Natorial SAT No.	and type	Depth at top	
171	Saley Gas	74 190 Steal 12 .188	0	34   18			item
	Front 4 G Minerale Saity 6 G Gas	4 □ Opén hole 6 □ Plastic		61	PLUGGING & SE	ALING RECORD	)
20-12 II	Presh 7 [] Suphur 34	7 18 1 □ Statel 2 □ Gar/renized		Clepth set	Arrivlar space	☐ Abendenri	
	Sany s G Gas	3 ☐ Corcrete 4 Œ Open trole 5 ☐ Plantic	34	175 From	To Materici and	type (Cement grout, be	enternia, elc.
li D		1-75 1 () Stool 25 2 () Gulyanizad	<del>                                     </del>	27-20 33	O Groute	d <u>– Henton</u>	ite (f
	Fresh 4 C Manager	2 Congrete		75-29	30-30 Pa	Cement	(1)
], 0	Sety + D Ges	5 Plastic	.lL	لـــــــــــــــــــــــــــــــــ		<u></u>	<del></del>
71 Pumping leat me		Ourstion of pumping 17-18 GPM 1 Hours Mins	7	ro	CATION OF WELL		
State level Wa	ater level Water levels during	¹∰ Pumping † [] Recomy		in diagram below sho indicate north by arro		from road and k	it line.
ON 1931 Property of the control of t	22-74 15 minutes 30 min						
21,24	75 be 170 em 12	5 ther 100 had 75 had				ļ	
I flowing give nat	to Pump Intalko set X	Witter at end of past	ر ۱	<del></del>			
Recommended pu		4345 Recommended 454	$\mathbf{d} \mid \mathbf{f}$	i	<u> </u>	<u> </u>	
· · · · ·	Deep purp sating 100	fact pump rate 5 GPs		<b>+</b> _	125"/\\A	ا <sup>لا</sup> مًّا	
অচ			<b>:</b>	i		i	
FINAL STATUS  Whiter stupp  D Observation			11 1	ı		i	
3 🚺 Test hole	? 🗀 Abandoned (Other)		11 1	1	•		
			_	1		i	
WATER USE 1 1/21 Connectic 2 1 Stock	55-68 5 🖸 Çommandal	1 ☐ Not use	11	1 1	rot # 40	'	
3 🛄 Indgallióñ	● □ Municipal  ○ □ Public supply  ■ □ Continue & nicessed	10 Ditter	' <b>                                    </b>				
4 🕒 Industriel	P 🗀 Cooling & air scand		_	>			1
METHOD OF C	CONSTRUCTION 57  5	9 Dictring	_	المراوين المراوية	ch se	,	
2 □ Rotary (co	onventional) 6 () Boring	10 Diaging		16000	rc [2]	000	1 000
3   Plotory free		_	11	-4. V. V.	17	22U	928
Polary (ne	A Jetting	_ <u></u>					
Rolary (set	o Sand   Jetting	Well Contractor's Uctanon N		SA Comment	390	Date received	61-46
Rolary (set	o Sand   Jetting	Well Contractor's Ucesca N	NO Tarie		558	Date received	2000
Name of Well Contra  Capital I	actor  Nater Supply Ltd.	1558 Ontario <b>R2</b> S 186	USE ONLY	Maspecitan .	558	Date received	61-46
Name of Well Contra  Activities  P.O. Book  Name of Well Contra  Capital B  Activities  P.O. Book  Name of Well Technique	Asper Supply Ltd.  490 Stittsville		USE ONLY	Maspecitan .	558	OCT 18	2000
Name of Well Contra  Activities  P.O. Book  Name of Well Contra  Capital B  Activities  P.O. Book  Name of Well Technique	Aster Supply Ltd.	1558 Ontario <b>R2</b> S 186	USE ONLY	Maspecitan .	558	Date received	2000

Well Tag No. (Place Sticker and the Print Reload)

Well Record

A076884 AN768RA Ton 903 Ontario Water Resources Act

ORCHIA ANA		metric []	Maring Art - 22			70/0			Page_		_ of
WOII OW	neris information 2	AND THE	<b>BOOK</b>					能談		W.	
											4
7											<u> </u>
Total Spherical Control											
Well Loc	ation Well Location (Street Nu					MINISTER STATE	A MARKET PROPERTY.	學學		经验	
1700 R	eindeer Way	mber/ <b>Nam</b> e)	ŀ	7	ownship		La		Concession		
	Strict/Municipality				Osgoode ity/Town/Village	<del></del>	9	Provin	3	Dacta	Code
	Carleton			1	Greely			Ont		rosta I	I I I I
	inales Zone Easting		orthing		unicipal Plan and Subl	of Number		Other		Щ_	<u> </u>
NAD	8 3 1 8 45827		289800	A STATE OF THE STA	C) - CMARIA VALVA						
General C	en and Secrock Mater	nou Matewal star¥balbido	sumetal see	niug/Kécoi	m;(sea histrations co)the er Materials	ouch of this form			學的解釋。	e Carlo	Mary Control
			<del>' </del>	- Out	er reaterials		General Description			from	plh (m/k) 10
Brown	Sandy S	oil		Stor	ies					0_	3,65
<u>Gray</u>	Clay			Stor	nes					3 <u>.</u> 65	10.05
Gray	Limesto	oe							10	0.05	22,24
			1								
	* +		-						<del>-</del> }-		1-
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						ļ					
ALE ALE ALE		N	<u> </u>								<u> </u>
Darth S	et at (m/fi)	Annula Type of Se		LANGUA	Volume Placed	AN-	Kesültsjöf Vy	(1)Y(e)	d:Testing:		
From	Ta	(Material at			volume Placed (m³/ft²)	Clear and	l ylekt, water was: send free	Time	aw Down Water Level		Vator Level
13,10	0 Grouted	Benton	ite Slu	TTV	.734m <sup>3</sup>	Citizer, spe	eify	(mln)	(ITVN)	(min)	(m/m)
						If pumping disc	onthrued, give reason:	Static	2.22		
								1	3.26	1	3.55
	<del>  -  </del>					Pump intake s		2	_	2	
	<u> </u>					15.		3	3.40	-	3,46
	nod of Construction €			Well Us	<b>,如此的神经</b> 地	Pumping rate 54		$\vdash$	3.48	3	3.40
Cable To	ool Diamono Coaventional) Dietting			Comme		Duration of pu		4	3.55	4	3.36
	Reverse) M(1.1 Chiving			☐ Municipa ☐ Test Ho)		_1_ hrs +_	min	5	3.62	5	3.33
☐ Boring	C Digging			Cooling	& Air Conditioning		end of purrying (mit)	10	3.78	10	3.23
Air perce			lusviel har, specify _			4.		15		$\vdash$	
	Construction R	acord CC	sing Water		Status of Well 8	i in nowing dive :	ale (Inda/GPM)	<b> </b> -	_3,86	15	3.17
Unside		Wall		(m/ft)	X Water Supply	Recommende	d pump depth (m/ft)	20	3.93	20	3.11
Diameter (cm/m)	Open Hole OR Meterial (Galvenized, Fibreglass, Concrete, Plastic, Steel)	Thickness (cm/n)	From	То	Replacement Well	15.3	23	25	3.99	25	3.07
15.86	Stee1	.48	+.45	13.10	☐ Test Hole ☐ Recharge Well	Recommender	t pump rate	30	4.04	30	3.04
			1.40	25,10	Dawaissing Weil	45.5	5	40		40	
		:			☐ Observation and/or Monitoring Hole	Well production	n (Vmin / GPM)	<b> -</b>	4.11	╌	2.99
					Alteration (Construction)	Distrifected?		50	4.14	50	
	•				☐ Abandoned,	X Yes	No	60	4.18	60	2.92
	Construction R	ecord Sch			Insufficient Supply  Abandoned, Poor	(2)3536.074.0	MANUAL MAPONW	ěli Lő	atloness.	THE C	0.75 S.Y.S.Y.Y.
Outside Diameter	Material	Slot No.	Depth	(m/ft)	Water Quality		gniwalizi weise gem e				
(cnuln)	(Plastic, Galvanized, Steel)		From	To	Abandoned, other, specify	}	K/			۱ -	
					]		. M			4	
					☐ Other, specify	sj				1	·
SASS ASSESSMENT	CZYSTOWA WATER DE			26556349 r	5120 120 120 120 120 120 120 120 120 120						6
Water four	nd at Depth Kind of Wete	c: Fresh		Dept	ti (m/it) Diameter	.8				3	1700
19.81	n/ft) □Ges □Other, spe	ecify		Firem	To (constr)	3			1		
Water four	nd at Depth Kind of Wats	r. Fresh	belaetnU 🗌	0	13.10 15.86	}			/		
	n/īt) ☐ Gas ☐ Other, spa nd at Depta Kund of Wate			13,10	22.24 15.25	W.	- ZELNINEER	لالساع	AI		
	nd at Depth Kind of Wate n/ft) ☐ Gas ☐ Other, so	_	The contraction			\d					
	Well Contract		Nachiilia	n informat	ion research	'Y					
Business N	Isme of Well Contractor	*	* + A-A I M ( Bring)		Contractor's Ucence No.	/					
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## The Ontario Water Resources Act WATER WELL RECORD

0906 (07/00) From Form 9

Print only in spaces provided. 1532052 Mark correct box with a checkmark, where applicable. 11 15009 CON 103 County or District Township/Borough/City/Town/Village Corr block tract survey, etc. La Oegoode 7/8 Ottawa Carleton 3 First Name Date 19 06 month 01 6346 Deermandows Dr., Greely CN. K4P 1M9 completed Basin Code 21 عبيبا لبأي ليستسيا لحيا لا لتحييا لا LOG OF OVERBURDEN AND REDROCK MATERIALS (see instructions) Depth - feet General description General colour Most common material Other materials To dry 0 6 Brown sand wet 6 12 Grey sand 12 20 Grey clay stones stickey 20 125 limestone med hard Grey Casing was left 1 ft. above ground level at time of drilling. 31 الماليك الماليك الماليك الماليك المنطب المنط المنط المنطب المنطب المنطب المنطب المنطب المنطب المنطب المنط المنطب المنطب المنطب المنطب المنطب المنطب المنطب المنطب المنط المنط المنط المنط المنط المنط المنط المنط المنط المنط المنط المنط CASING & OPEN HOLE RECORD Skeet of opening (Slot No.) NA Level WATER RECORD 51 Depin - Seet SCREEN Water found fraide dem Wall thickness Kind of water at - faat To .168 Note-Fels Calchur 2 D Suty | D Sus 55 <sup>10-13</sup> 25\*\* 6 3/4 1 Cjištel 2 C Galvenized 3 C Concrete 4 C Open hole 5 C Plastic ō NO COLOR DE SUPPLY 110" PLUGGING & SEALING RECORD 1 (1) Stani 2 (1) Galvanized 3 (1) Concrete 4 (1) Open hote 6 (1) Plastic Acres space ☐ Abendonment Fresh 2 D Sulphur 2 D Sally 6 D Gas Depth sel = Material and type (Commit grout, bentonin, etc.) 6 1/8 25 125 Fron Τά 1 | Fresh 2 | Sulphur 2 | Sally 6 | Gas 25 ď Grouted-cement(3) □ Fresh LOCATION OF WELL 71 Pumping for the con-Allina. In diagram below show distances of well from road and lot line.

In diagram below show distances of well from road and lot line.

Decrmed down Static level Water level and of pumping Water levels during 30 minutes 23-31 10:21 15 minutes 120 45 minutes 7'8" 100 100 **75** 75 V Howing give rate (**X** Cloudy Clear **GPM** Becommended out to No. Recomment pump rate purio saling 110 ☐ Shallow (\$ Deep 50 53 FINAL STATUS OF WELL S Abardoned, immificient eupply 4 (1) Unlinished
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Minietry of the Environment

## The Ontario Water Resources Act WATER WELL RECORD

Print only in spaces provided.

Mark correct box with a checkmark, where applicable.

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Box 490 Name of Well Too	O, Stit	taville,	CN_K2	West Technical	pr's Licence No.	IY USE	rapiks.						
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## The Ontario Water Resources Act WATER WELL RECORD

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Mark correct box with a checkmark, where applicable.

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Municipality CON. 193

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		6346 Deermead	ows Dr., Greel	y, ON. K4P 1Mp complete	<sub>4</sub> 29 08	Ol orth year
21	Zone	Easting Northing	NG Elevator	RC Basin Code ii	и <u>- 1 т. 1 т. 1 т. 1 т. 1 т. 1 т. 1 т. 1 т</u>	╸ ┖┸┸┸┛
<u> </u>	1.03 (	F OVERBURDEN AND BEDR	DCK MATERIALS (see	inetructions)		<del></del> _
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Grey	sand & gravel	boulders			12	17
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METHOD OF	CONSTRUCTION o		10 th 4 -		. •	
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I II Plotary €	(reverse) 7 □ Dismond (SE) 1932	17 🗆 🔿	11 Loc 2		230	223
		West Contractor's Licence No.	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	[Commandor sales   Darles	received	कर्मा श
Capital	water Sumply Ltd.	1558		1558	EP 17	2001
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## The Ontario Water Resources Act WATER WELL RECORD

0506 (07/00) From 9

Print only in spaces provided.

Mark correct box with a checkmark, where applicable. ILSOOS KON LINGS [11] 1532535 County or District Township/Borough/City/Town/Village Con block tract survey, etc. Ottawa Carleton Osgoode 8 Address 6346 Deermeadow completed THOOM OT WAY K4P 1M9 Greely ON. 21 ليسسيا يحسحيا LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions) Depth - feet General colour Most common material General description <u>Brown</u> <u>sand</u> 0 5 Grey **Sand** 5 12 vet <u>Grey</u> clay stones 16 **Timestone** Grey 16 48 Note casing was left 12" shove ground level <u>at time of drilling</u> <sup>32</sup> ابيباليابا ويباليابا ايبياليابا ويبلك الإيباليابان ويتاليابان ويبال الايبال والمراه والم والمراه والمراه والمراه والمراه والمراه والمراه والمراه والمراع والمراه والمراه والمراه والمراه والمراه والمراه والمراه والمراع CASING A OPEN HOLE RECORD Water found at - feet Kind of water From To Say De-Depth at top of sprown 37\*\* Malerial and type 26 <sup>13</sup> 0 6 **г/4** .188 1 Galptur
2 Galty : Gals PLUGGING & SEALING RECORD 1 D Steel
2 D Cathanized
3 D Concrete
4 97 Open hote
5 D Plastic 3 | Sulphur 4 | Mirrorado 6 | Gas 1 (1) Fresh 2 (1) Salty Oupth set of - feet Material and type (Commit growt, bentonite, etc.) 6 26 48 ☐ Fresh 3 ☐ Sulphur ☐ Sulty 4 ☐ Minorets ☐ Case 26 I C Freen 1 Steel
2 Galvenized
1 Concrete
4 Copen hate
5 Plants 0 Grouted-cement 3 | Sufphur 4 | Minerals 6 | Gas · [] Fresh 2 [] Salty 25 en enterna LOCATION OF WELL GPM MICE ty⊈ Pump 2 🚨 Baller In diagram below show distances of well from road and lot line. Static level 2 | Recovery indicate north by arrow. 45 minuter <sub>32-34</sub> 15 minutes 712" 45 30 15 w <u>et end (d )</u> GPN fee (S) Cloudy Recommended ovires type pump sattling ∰ Deesp GPN FINAL STATUS OF WELL 1 ② Water supply
2 ② Cherrystics well
3 ③ Test hole
1 ③ Reclurge wat 5 Abandoned, Insufficient supply
6 Abandoned (Other)
7 Owntering Unfinished
Paplecome Deermeadows WATER USE S C Commercial
Dispricipal
C Public supply
C Cooling & air conditioning
Cooling & air conditioning
Cooling & air conditioning # | Not use to | Other -1 E Commente 1 Stock METHOD OF CONSTRUCTION 57 | Cable troi
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Digging \$ 30 Air parcus \$ 0 Boring ? 0 Diamond \$ 0 Jetting 238031 Name of Well Contractor Weil Contractor's Licence No. 1558 <u>JAN 17 2002</u> Capital Water Supply Ltd. Date of inspection 쁔 Box 490, Stittsville, CN. K2S A6 | Wall Technician's Licen **MINISTRY** CSS.ES2 S. Miller T0097 and of Technician Contracto

County or District

General colour

Brown

Grey

Grey

21

Ottawa Carleton

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

Most common meterial

sand & gravel

limestone

sand

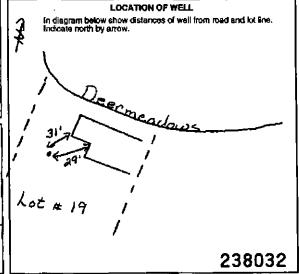
sand

The Ontario Water Resources Act WATER WELL RECORD 1532536 USOOBI CON LIDE 11 Township/Borough/City/Town/Village Con block tract survey, etc. Oegoode Address Date R4P 1m9 11 01 6346 Deermeadows Dr. ليستنها لتياي LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions) Depth - lest Other materials General description stonea 9 bouldera 9 24 73 Note casing was left 12" above ground level at time of drilling.

[3]	-	علطا الد	ــا لــــــــــــــــــــــــــــــــــ	ш	ىل	Щ.	كتينا لتنك	لللبل	سباك	الخلجات	Ш	니니	للسا	1	ш	ىنا ل	بلد	11	ليل
32	<u> </u>	بليل	يا لىك		ىلـ	Щ	لمنتي لتلا	للبليلة	سيال	بليل	بل	┙╚	لحب	ليا	ш	ىپاك	لبلت	411	لپل
41	W	ATER RECO	XAD		_3	1	CASING & O	PEN HOLE	RECORD		Г		es ol openi	ng	35-30	Diameter	ЖŒ	Length	74
Water I		Kind o	Tedaw lo		14	reide Sem	Material	Well Stickress	Depti From	- Nect	20	) (3×	(No.)				inches		ie:
66	ćr-qı	LES TO	G Geo	ï	6	17	3 Galvanized	. 188	0	33'**	979	1	arial and t	ype			Consth	et top of (	SCIWARI ST-SA Spell
	15-16		Sulphur	"	L	17-14	3 Concrete 4 Copen tole 5 Platfic				6	1				EAUN	3 REC	ORD	
	7 <del>4</del> 23	CONTRACT (	Sulphur Minerals Gas	*		6	Stee)   "   Galvantzed   Donoreta   4 (2) Open hole		33	73		Depth	set of · lea	6		nd type (C		rout, bent	
	25-26	D Freeh 4	C) Minerals  C) Minerals	20	$\vdash$	#Æ	S ☐ Plasfo  1 ☐ Steel 2 ☐ Galvanized		33	7.3	F	33	1 0	17 G	<del>).</del> con	ted-c	ener	)£ (1	Ú.
	DZ	- 61 6-4-	Sulphur  Minerale  Gas	· •	Ľ		2 Concrets 4 Coan hole 6 Plants	_			t	24.5	8 =	-33 Lú					

71	Pumping tea 1 M Pump	t mastrod 10 7 (1) Palifer	Puroping rate	20 GPM	Duration of pum	
Ë	Static level	Water tevel and of pumping	Wolar isvel			2 [] Racovery
PUMPING TEST	19-21	22-24	15 minutes 24-24	30 minutes	45 minutes 37-94	60 minutes 35-37
2	8162		70 met	70 tes	50 <b></b>	يبو 25
	If Rowing ga	9 DM 39-11	Pump intake a	4 81	William at wind of t	<u> </u>
15		<b>GPM</b>	ì	ie-st	() Char	□ Cloudy
ľ	Recommende	d pump type	Recommended	43-45	Recommended	44-41
	□ Shallow	🔁 Deep	pump setting	50 test	purap rate	<b>5</b> GРЫ
ᆫ	45					
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95		
FINAL STATUS OF WEL	1 4	
I   Wester supply  Chasavation woll	5 ☐ Absorboned, insufficient supply  B ☐ Absorboned, promountly	<ul> <li>□ Unfirithed</li> <li>□ Replacement web</li> </ul>
" ☐ Teachysia	7 ☐ Abandoned (Other)	I suffrenzielen was
1 🖸 Recharge well	• 🗇 Cemplering	
WATER USE	25-55	<del></del>
r 🔃 Domés≦c	s 🗀 Commercial	# 🖂 Not use
a [] Sãock	s (i) Niurricipul	10 🗖 ORNA
s 🗌 trigation	Public supply	
4 🔲 Industrial	a 🖸 Cooling & air conditioning	
METHOD OF CONSTRU	ICTION 9	
1 () Cebte tool	5yEl Air percussion	° C Driving
<ul> <li>Policy (conventional)</li> </ul>	6. ☐ Boxing	o C Digging
3 (2) Plottery (reverse)	7 🕒 Diprocond	1. [] Other
12 Polety (al.) are 1/2	■ Desting	



[N <del>ies</del>	ne of Well Contractor	Well Contractor's Licence No.	<b>—</b>	Dota	4 [	Contractor		SÓ-ES Dale réceive	<u>a - </u>	500	80
	Capital Water Supply Ltd.	1558	N S	SOLUTION .	]	_1	<u> 558</u>	<u>JAN</u>	<u>17</u>	2002	L
Add E	ou 490, Stittsville, ON. K2S	186	l ag	Date of inspecto	an		Inspector				
	ne of Well Technicien	Wall Technician's Licence No.	I≅	Remarks							
S	. Miller/	10097	15					$\sim$	22	.ES	0
Sig	Natural Technician/Contractor	Bubinibaion dete	ΙŻ					· ·	9	-CO	_
S	Churce II	chey Pro yr	13	<u> </u>							_
_	AMERICATIVE CANDOSHIES	IT AODY							0506 (07/	00) Frant Fo	ЯMI
2	: - MINISTRY OF THE ENVIRONMEN	II ÇOPY									

Ministry of the Environment

## The Ontario Water Resources Act WATER WELL RECORD

Print only in spaces provided.

Mark correct box with a checkmark, where applicable.

Municipality	Can.	
15009	CON	 109
10 14	14	 

County or District			Township/Borough/City	Town/Village			Con bloc	k tract survey.	etc. Lo	* <sup>35</sup>
Ottava C	arleton		Oagoode				3		,,	8
			Address 6346 Deermea	Acus De	Gre	elv.Onta	-io	Date completed <sub>2.3</sub>	day 17a	
21		Zone E	asung Northing	, I		19 ac	Basin Code	1 8	til	vouth()}eer]
<del></del>		کے رہے،	OVERBURDEN AND BEDE	TOW MATE		<u> </u>	<u> </u>			
General colour	Most common	I	Other materiels	TOUR HUNTE	د) هنجيد		rius/ Upszription			- feet
Brown	Sand								From	70
Gray	Sand					<del></del>			<u> </u>	5
Gray									5_	11
Gray	Clay			<del></del>		<del>.</del>			11_	20
Gray		Gravel	Boulders						20	_24
	Limes		<del> </del>							110
Gray & N	<u>hite Sands</u>	cone				· <del></del> -			110	185
										i i
			·		_					<u> </u>
				<del></del>		<del></del> -				
		Note:	Casing was left 1	.5 feet	above	ground	level			<u> </u>
<u> </u>			at time of drilli	ng	<del></del>					l
31   1   1   1   32   1   1   1   1		<u> </u>	<u> </u>	لسحاك		عحا لحد	444	سباليك	444	لا لىلى
	A RECORD	61	CASING & OPEN HOLE	LI LA LA LA LA LA LA LA LA LA LA LA LA LA		البداد <del>الإستانة</del> المستانة المستانة المستانة المستانة المستانة المستانة المستانة المستانة المستانة المستانة الم	nerica	37:33 Demeker	34-36 Leng	الم الم
Water found at - feet	Kind of water	inakia dism	Wall Majorfel thickness	Copth - I		2CU-4 kb- 1			creat	feet
	Fresh 3 [] Sulphur Sally 4 [] Minerals	5 17/4	112 Steel 17 - 188	0	™ 2 <del>0</del> 35	Writerial of	and type		Despite at loo	al screen) 30
181 180	T. IZSTERLEDU		2 Galvanized 3 Gonorale 4 Dopen hote		ł					fael .
2 0	Salty Gas	17:10	F □ Ptoetic 19	<del>    -</del>	20-20	61 -51	PLUGGINO Annular space	& SEALING	RECORD Abandoss	
1	Fresh   Distinguish Selly   Distriction		2 Concepte	26.5	185	Depth set at	- last	erial and type (Can		
	Freeh 7 Sulphur Salty 6 O Minerals		> 1 Pleste	20.5	75 75	25	14-17	outed - (	'enent	- (1)
30-33	Front 1 Suiphur		2 (i) Gervenized 3 (ii) Constelle			16-21	22-75 In T			ite (2)
	Saty 6 Glas		□ Open hole     □ Plestic	<u></u>		74-20	30-33 lb)			
71 Pumping lest m		20 GP		٦ -		LOC	ATION OF	WELL		
Santalant V	Usershauet 25		2 Pumping 2 Percovery	🗴	in diagran	n below show orth by arrow	distances	of well from ro	ad and lo	t line,
1937	22-24 15 minu	30 minutes	31 45 minutes 20 minutes 35 at	<i>V</i>		ot 33		1		
2 14 10	60 <u> </u>				il			l i		
Fifthering give of	OPM	dako inti at M	Water at and of test.   Clear XD Cloudy		i	6	┧	ť		
Pecommended p	l numa e	abing	Ab Recommended 45-49 pump rate		-	 IS	. A 21	į.		
50-10		100 4	5 GPM	] _	<u>i</u>					
FINAL STATU		sa Indoned, installictera	supply * [] Unlinished	<b>i</b> ]		压1,	Kuco	7 _		1
P G Water sup P ☐ Observation	7 ☐ Aba	ndoned, poor quell ratened (Otter)	y 10 C Peplecement wall	]					- }	
<sup>4</sup> □ Redwys				] [		يور				Я
WATER USE 1 125 Danwesse 2   Stock		SS SS TOTAL CAME	♦ ☐ Not use	ر اا	~ c ->	\			- [	্বু
3 () Infigution	7 🗆 Put	nicipal Nic gupply Ning & air conditions		~		~ ~ ~ ~ · ·			-	Respices
	CONSTRUCTION			1	ره د	A Or				8
Cette too		s? percussion ing								
Partary (n	evenas) 7 🗆 Obs	mond	12 Coher	[[					238	035
Name of West Conf. Capital	Water Suppl	v f.td.	Well Contractor's Alexanon No.	AT SOURCE		Se Contractor	K 0	Siler Date recen		2002
Address				Date o	linspecton	<del>-1 0</del>	58	I_JAN		<u> </u>
PaO Box Name of Well Yesti	<u>(490 Stitt</u> ™⇔n	sville,O	TARIO K2S1A6 Well Technician's Licence No.		ts.			_ <del></del>		
S. Mille			70097	NELSIN Parties				C	SS.	ES2
Squary of years	nu ar Lu		Submission data day 22 mo 11 yr 91							
2 MINIC	TRY OF THE E	NVIRONN							0506 (07/0	O) Front Form (

inint only in spac fark correct box	ces provided.  Twith a checkmark, where appliant	icable.	153 <b>25</b>	38 (15009)	CON.
County or District		Township/Borough/City/T	Same Affilia	Con block tract	survey, etc. Lot. 537
Ottawa (		Oscoode	OMERNING	3	survey, etc. CX
Que la la la la la la la la la la la la la	SELECTION -	Address		Date	440
	Zone	6346 Deermead	RC Fig.	ution PC Basis Code	pleted 2.2day 11 mont@1year
21	ليا:	سنبيا ليستبيا	لَيَ لَيْ لِبَا	K48 )116	ليتبلننا
	LOG	OF OVERBURDEN AND BEDR	OCK MATERIALS (	ee instructions)	Depth - leet
General colour	Most common meterial	Other meterials		General description	From To
Brown	Hardpan	Boulders			0 12
Gzay	Sand	Stones			12 28
Gray	Limestone				28 115
Gray &	fhite Sandatone				115 255
	<u> </u>				
-	Not	e: Casing was left	1 foot show	armend level	
	- INGE	at time of drill	_	- <del> </del>	
31 ] , , ,	<u>.                                    </u>		Herriti		السياا البليا ا
32	لللبنا ليليليا		بليلليبيا ل	بلىلىلىبىلىل	<u>ا</u> ليلبلبالبييا
	ER RECORD 5	CASING & OPEN HOLE	RECORD Depte - text	TARTEST IN THE STATE OF THE STA	Nameter 7-3 Cangin 3-0
Water found at - feet	Kind of water di	erri Material Vilcirriesa chiali riches	From To	S (Stot No.)	Out the top of screen 30
	U Fresh   Distriction	1/4 m Steel " 188	0 31:	S	61-44 fast
	Salty Gas	3 Concrete 4 Copen hole 5 Plantic	ļ ;	61 PLUGGING & SI	ALING RECORD
1	Salty & Gate	17/18 1 ☐ Sinel 19 2 ☐ Gelventzed	20:20	y Arrube spice	Abandorment
2	Setty 4 D Ges 5	15 2 Concrete	31 250	10 mp14 g	type (Ceresti grout, beniumbs, etc.)
	☐ Fresh a ☐ Sulphur 29 ☐ Sally a ☐ Gents	16 9 Piartic	730	33 0 Grout	ed - Bentonite (2
20-20 1	C Suphur 34 55	3 Comzete 4 Copenhole		(d) (37-42)	
	Saity s Case	§ ☐ Plastic			
71 Pumping test		2 GPM Duration of purpose	A	LOCATION OF WEL	
Static level	Water level 75 Weter levels during		Indicate	um below show distances of we north by arrow.	ij mom rozo sno iot ime.
1531 16-31	22-24 15 minufate 20 mi	23-34 45 minutes 32.54 60 minutes 32.54		Ç	
2712#k		00 feet 150feet 125 feet   Water of send of feet	Kaca j	2 <sup></sup>	
1 S	GPM	isrd Clear SD Cloudy 49-45 Recommended 48-49	1 / 0xe2 3	J- 500 1	Lot 11
Reconstruence  Shallow	gunip dating	75 cpu	1000	1	
ক্ত			1 4.0	i	
FINAL STAT	US OF WELL 54 REPORT 5 (2) Absendanced, instru	Ficient aupply C Unfinished	<b>\                                    </b>	Í	_ /
3 (Charles) 3 (Charles) 4 (Charles)	in 1 Democrated (CEN	rquality <sup>1d</sup> □ Replacement well 4r)	Н	1	
WATER USE			<b>.</b> [	1	171/18
1 E Domes	aic S [] Commercial e [] Municipal	#   Not use	Elki	wood '	
o D Industri	an ≀⊟Public suppyly	relitoring	11 .1	_	
METHOD O	F CONSTRUCTION 57		3		~
¹ ☐ Ceble	teal 5g2 Air percussion (conventional) 6 13 Boxing	* Criving Objecting	र्वाञ्च		
3 C) Roseuy	(gr) mand ↑ □ Jeding	" D Other			238037
Harne of Wee Co	britractor (	Well Contractor's License No			Date received s1-69
Capita	al Water Supply Ltd		Source Oujé at inspecti	1558	JAN 1 7 2002
Address T			S Oute or inspect	I Department	
Norme of Well To	Rox 490 Stittsvill	7141 1901 1221 3 122 120 12	Agmarks		CSS,ES
S. M.S. Schedul // Ter	Lighter* chinkden/Contractor /	T0097 Submission duty	Remarks		
den	mac	<u>4=y23 mo 11 yr01</u>	<u> </u>		0506 (07/00) From For
2 - MIN	ISTRY OF THE ENVIRO	DNMENT COPY			

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## The Ontario Water Resources Act WATER WELL RECORD

0606 (07/00) Front Form 9

		1 2		19	M 15	25 29 24
ounty or Olistrics		Township/Borough/City/Tox	m/Vilage	Con block tr	act survey, etc. Lot	6-17
<u>Ittawa Ca</u>	rleton	<u>Oagoode</u> Akkes				A
		6346 Deermeado	und Der Card		Date completed 1.25ky 3 mor	190 Suesi
7	U(	eling Northing	FC K4P	THE Basin Code	12-7-5-12	N N
<del></del>	3 10 L	<u> </u>			111111	111
<del></del>		OVERBURDEN AND BEDRO	X MATERIALS	(see Instructions)	Depth -	hat I
menu colour	Most common material	Other materials		General description	From	To
ECOM)	Sand				0	7
icay .	Sand				1 7	12
		David #444	•••			
<u>xay</u>	Sand, Gravel	Roulders			12	_16_
xay	Limestone			Layered	15	<del>- 22</del>
ray	Limestone			Medium Bard	22	47
	Hotos	Casing was left 1				
	10,00		1	droman tever	<del>-  </del> -  -	-
		at time of drillin	<u>g</u>			
5 1 1 1 1 1	<del></del>	<del>┸</del> ┻		<u>┸</u>	<u> </u>	البلا
10 14			لبلبيا			البا
nter found	Kind of water dem	CASING A OPEN HOLE RE	CORD Depth - feet	State of opening star Z (Stof No.)	Otemater 343 Laingth	
- [96]	Scholum 15 Inches	Material Backmass inches	From To	Sign (eq.)	Depth at top of	964 623
	1 Salay t Gas	7 □ Getvanized	0 27*	&		41-41 
15-10	Fried 4   Martin	2 Coxcrete 4 Open hote 5 Plastic				
	17 II	1 C Steel 16	20-22	61 PLUGGING &	SEALING RECORD	1
∟ין	1 Salty 4 C Gass 6	Cl Galvenized     Cl Concrete     X2 Open Inde	27 47	Coupling at lifet Makedal	and type (Coment grout, ben	lonito, e Ic.)
	Fresh 3 C Sulphur 69	S Plestic	2, 3,	10-13 14-17	ted - Cement	/11
	Sany + D Gas	1   Stack   1	273	19-21 22 25	Bentoni	
1.5	Freeh	4 C Open hole t C Plastic		26-29 30-30 M2		
Pumping tasil ra	without 10 Pruncing rate 11-1	L Ourston of numerica				
1 SiPump 2	I		bat	LOCATION OF WI		:
	Visiter level 25 Wrater levels during	<b>⊈</b> Pumping 2 □ Récovéry		ism below show distances of v north by allow.	Keli Irom Tosio sino 101 i	ine.
19-21	27-24 15 minutes 30 milhuhita 35-24 35 milhuhita	45 mirutna 32 54 60 mirutna 26.27	 			
5 🛶	10 met 45 met 25 m					
5 lest Il Bowing give n	ging <sup>(8-4)</sup> Pump intaka sen at GPM la	Water at emit of text   (1) Clear ▼□ Cloudy				
Recommended p		Recommended 44-66 pump rate	1	l l	1	
□ Shallow :	15 <sup>6</sup>	5 GPM	\	·	<u> </u>	
NAL STATU	C OE WELL 4		1	<u>}</u>	ا المحال	
Materacp   Materacp   Observed	ply 5 C Abendoned, insufficient	supply P D Unitriahed  10 D Replacement well	\	,	ا آق	
<sup>3</sup> Test hole  4  Recharge	7 (*) Abandoned (Other)	(a) (c) (c)		1	_	
				1 hota	<sub>22</sub>	
VATER USE (2) Domestic 2 () Stack	SS-SE 5 (*) Commercial	9 🗀 Notues		LOT I	ا دم	
3 🖺 Imigestan	r ☐ Public supply	10 Cither	`		-	
+ C) Industrial	a 🖂 Coording & dir conclineri	ng .			i	<del>-</del>
	CONSTRUCTION 9			Decr mec.do	w5 Dr.	
1 Cettle too 2 Rotary (or	priversional) * 🔲 Ecrisq	P Chiving Digging Cher	$H \rightarrow$			
3 🗍 Rotary (ri 4 💇 Rotary 🙀	everse) <sup>7</sup> 🗆 Olemond	"   Qher	] ''		2381	.00
ers of Well Cont		Well Contractor's Licence No.	₹ 8071.09 > 0801	1558	APR 1 7 20	ሰን "ቸ
Capital	Water Supply Ltd.	1558	Date of support		1 /11 1 7 CV	<u> </u>
P.O. Box	490 Stittsville, C	ntario K2S1A6	85 Jan 1996.			
Anne of Wall Tech	elidan	Well Technicien's Licence No.	Hemads		C20 F	-0~
S. Niller Grandy i pi Jakitan		TOO97 Subminision date			CSS.E	:52
	, ,	14-25 no 3 yr022	1 🖷 1			

Ministry of the Environmen The Ontario Water Resources Act
WATER WELL RECORD

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

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County or District			Township/Boro	vigh/City/To-	wn/Vilage			Con blox	ik traci survey	etc. L	na lo.
Ottawa Ca	rleton		CSgc	ode		<del></del> .		3	ā		7/8
			6346 Dec	······································	wa Dr.	Gree	ly/Onta	rio	Data completed	5 S	month () Alean
21		Zone Easting		Tirig	AC.	Elevai	on AC	Basin Cod		. <del></del>	17
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-		LOG OF OV	ERBURDEN AN		CK MATER	HALS (se				i i i i i i	Hh - Teet
General colour	Most common man	ertal .	Other ma	iteriais.			General	description		From	To
Brown	Sand									O_	22
Grau	sand									22	26
	Limestor	_	<u> </u>				-,-			26	109
gray	IAZARES CO.	-								20	109
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		ىلىلىل	<u>بالبيان</u>	لىلىل	لبييا	<u> </u>	عيالب	ابلت	<u> </u>	1111	لا ليليا
Water found	ER RECORD	Inskie	CASING & OPEN	Vedi	CORD Cepth - le	*	Sizes of Six No.	operiing	31-30 Diameter		nigati 39-40
at - feet	Kind of water	diens Inches	Meterial (f	VICTOR BESS VICTOR	From	Ta	(Sid No.	and type	1	Depth at to	poletreen 20
1 1,1	□ Fresh 4 □ Miramala □ SANy 1 □ Gara	'   1	Genteentood	88	0 3	4.5	Natwal Matwal				Family 1
15-10	A C Marine	4	Concrete Cl Open hole D Pleado	ì							
<del></del>	U Sely   C GAs	17-t <b>fi</b> 1	☐ Stool 12			#P 27		Villega, abs	ig & Sealing	Abendo	
	O Freush 2 U Stepher 2 O SMAY 6 U Clear	L ] <sup>1</sup>	☐ Gertywnioed ☐ Constrets (☐ Open hote	] .	34.5 10	76	Copts set a From	To M	eterial and type (G	MYNTH STOUR,	bentonika, sic.)
	☐ Fresh 7 ☐ Sulphur 71		Plestic		3113	77-30	31 ""	14.17	routed -	Bento	nite ((2)
~=	Li Sery 6 GAA	2	☐ Galverized ☐ Concrete		}	*	18-21	22-25	, <u></u>	Cemen	
1 ''	Diffreent 4 Diffreents DiSatry 6 DiGass	1 14	Cipen hale	l l	- 1		25-28	34 35 AD			
Pumping test		11:41	Duration of ourselve								
/1 (92) Pump 2	- Baller	15 GPM	Duration of purpoing	17:4	, .	o diena-		CATION D	FWELL 6 of well from :	road and	ict line.
I. I STANCE MANUEL	AND OF DUMPING 1	•		Recovery	j	ndicate no	ath by mich	V	- 34 #351104111		1
TEST (93)	22-24 15 minutes	30 minutae 38-31	45 minutes 32-34 80 m	minulas 35-37		<u> </u>	CK 27	تجارات	-		×օ, ∣
UNI 14 Mark	40 tm 100 tm		60 het 4	10 <del>14</del>				10	έ,		-
를 (fileming glvs	GPM Pump intake			Cloudy				, 23, ,	┚┈	)	
Recommended	Course setting	. I	Pancommended purite falls	4-0				- 1	Ы	ļ	
Shakes	2000	75 🚧		G/M					of 30	- {	
FINAL STATE	US OF WELL S	<del></del>			1					4	
1 X2 Water en	planivnari) ¶ ⊟ Abaundo	med, poor quality	aphy □ Unffréehed. 19 □ Resptecteme	ng week							
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Ministry of the Environment

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Ministry of the Environment The Ontario Water Resources Act WATER WELL RECORD

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0508 (07/00) Front Form 9

Ministry of the Environment

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## The Ontario Water Resources Act WATER WELL RECORD

0508 (97/00) Frant Form 9

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INSPECTION ID#: 869

COMPANY/MUNICIPALITY: Sleepy Cedars Family Camping

MAILING ADDRESS: 1893 Manotick Station Road, Ottawa, ON K4P 1H2

INSPECTION SITE ADDRESS:

Sleepy Cedars Family Camping

1893 Manotick Station Road, Ottawa, ON K4P 1H2

City of Ottawa (former Osgoode Township)

K4P 1H2

CONTACT NAME: Jim Lefebvre

TITLE: owner

CONTACT TELEPHONE: 613-821-0756

FAX: none

INSPECTION DATE: 2001/06/12

DATE OF LAST INSPECTION:

WATER WORKS NUMBER: Not Applicable

OPERATING AUTHORITY: Sleepy Cedars Family Camping (878854 Ontario Inc.)

OP. AUTHORITY ADDRESS: 1893 Manotick Station Road, Ottawa, ON K4P 1H2

OP. AUTHORITY TOWN/CITY: City of Ottawa (former Osgoode Township)

OP. AUTHORITY POSTAL CODE: K4P 1H2

OP. AUTHORITY CONTACT NAME: Jim Lefebvre

TITLE: owner

OP. AUTHORITY TELEPHONE:

FAX:

#### INTRODUCTION 1.0

The Sleepy Cedars Campground was inspected in order to determine applicability of the water works pertaining to the Ontario Water Resources Act (OWRA) s.52 and Ontario Regulation 459/00 (O.R. 459/00). The ground water facility was inspected to assess compliance with the Ministry of the Environment's requirements concerning treatment process, process management, monitoring, record keeping and reporting.

An Occurrence Report (oris no. 990037645) was generated for this site concerning an adverse water quality event on May 29, 2001. Tracy Zakordonski of the Ottawa Public Health Laboratory advised the Spills Action Centre of a total coliform count of 1. Subsequent re-sampling of the well produced a total coliform count of 0 coliforms.

Certificate of Approval List:

Not Applicable

### 2.0 INSPECTION OBSERVATIONS

## 2.1 SYSTEM DESCRIPTION

Drinking water at this site is supplied from a 6 inch diameter drilled well completed to a reported depth of 165 feet and constructed in 1979 (as reported by previous owner - Art Albert). Water is distributed to 100 individual campsites without the benefit of disinfection or filtration. Typical residency of the campground is 35 - 40 percent. There is currently only one full time resident at the park.

The eight inch diameter well head extends 25 centimetres above grade and is secured with a steel expansion cap attached to the top of the casing. The discharge line and electrical connections enter the well through the top of the cap. The well and associated plumbing is housed in a padlocked garden shed, located 25 metres north of the park office. The land is graded away from the well head and is separated from the nearest sanitary weeping bed by a height of land and a distance exceeding 50 metres. A totalizing flow meter was installed in the discharge line at the well head, on April 30, 2001. No other visible sources of contamination were identified.

## 2.2 PERMIT TO TAKE WATER ASSESSMENT

PERMIT NUMBERS	SOURCE	RENEWAL DATES	PERMITTED AMOUNT OF TAKING	UNITS
NA	Drilled Well			<del></del> :
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## 2.3 CAPACITY ASSESSMENT

1998	1999	2000
	1998	1998 1999

A capacity assessment was not completed upon this well. A flow meter installed April 30, 2001 indicates that the average daily discharge is less than 9000 litres during the operating season.

## 2.4 PLANT TREATMENT REQUIREMENTS

## A) SURFACE WATER SOURCE(S)

Does the plant comply with the requirements of Ontario Regulation 459/00 regarding treatment requirements for surface water?

N/A

Does the plant provide the following:

Chemically-assisted filtration: N/A

Disinfection: N/A

If the plant does not provide minimum level of treatment for surface water as per Ontario Regulation 459/00 s.5(2), has the owner delivered a written notice to the Director by October 31, 2000 in accordance with Ontario Regulation s.5(5)(b), describing a timetable of actions required to achieve compliance?

N/A

Do records show that water entering the water distribution system has been treated with chlorination (or another treatment that, in the Director's opinion, is as effective as chlorination to achieve disinfection that persists into the distribution system) in accordance with Ontario Regulation 459/00 s.5(3) and any applicable instrument or authorizing document (i.e. Order, Certificate of Approval)?

N/A

INSPECTION STATUS: FINAL

## B) GROUND WATER SOURCE(S)

Does the plant comply with the requirements of Ontario Regulation 459/00 regarding treatment requirements for ground water (i.e. Disinfection)?

NO

Chlorination or any other approved disinfection process is not practised upon this ground water supply.

Do records show that water entering the water distribution system has been treated with chlorination (or another treatment that, in the Director's opinion, is as effective as chlorination to achieve disinfection that persists into the distribution system) in accordance with Ontario Regulation 459/00 s.5(3) and any applicable instrument or authorizing document (i.e. Order, Certificate of Approval)?

NO

If the plant does not provide minimum level of treatment of ground water as per Ontario Regulation 459/00 s.5(1), has the owner:

- (i) delivered a written notice to the Director by October 31, 2000 in accordance with Ontario Regulation s.5(5)(b), describing a timetable of actions required to achieve compliance or their intention to seek a variance in their Certificate of Approval in accordance with Ontario Regulation 459/00 s.6(2)(b), or
- (ii) obtained a variance in their Certificate of Approval in accordance with Ontario Regulation 459/00 s.6(2)(b)?

NO

## 2.5 SAMPLING AND ANALYSIS REQUIREMENTS

Does the plant comply with all sampling and analysis requirements in accordance with Ontario Regulation 459/00 s.7 and any applicable Order and Certificate of Approval?

NO

The only sampling completed upon the water supply consists of bacteriologic submissions to the Public Health Unit, every two weeks during the operating season of the campground as well as regular Health Unit inspection and sampling of the swimming pool water.

## 2.6 WATER QUALITY ASSESSMENT

Specifically with regard to health-related water quality parameters only, is the plant meeting the water quality requirements of its Certificate of Approval, Ontario Drinking Water Standards, or an Order or direction?

NO

#### MINISTRY SAMPLE RESULTS 2.7

Were Ministry samples collected during the inspection?

Do sample results show compliance with Ontario Drinking Water Standards and any applicable instrument or authorizing document (i.e. Order, Certificate of Approval) for those parameters which were required to be analysed?

### Comment:

The Ministry sample results indicated that the turbidity analysis of 1.37 NTU was in exceedance of the MAC value of 1.0 NTU for treated water leaving the plant. This MAC value was established to ensure efficiency of the disinfection process and disinfection is not currently practiced at this facility.

#### 2.8 REPORTING REQUIREMENTS

Is the owner complying with reporting requirements of Ontario Regulation 459/00 s.12 (quarterly reports), section 13 (engineer's reports), section 8 (adverse water quality notification), and those of any applicable instrument or authorizing document (i.e. Order, Certificate of Approval)? NO

#### PLANT AND OPERATOR CERTIFICATION 2.9

a) Plant Certification

i) Facility Level:

Not Applicable ii) Certificate Number: Not Applicable

iii) Date of Issue:

b) Do the plant operators have the appropriate level of certificate for this plant?

Jim Lefebvre, owner of Sleepy Cedars Family Camping, is resposible for the operations, maintenance and sampling of the water works.

#### PROCESS WASTEWATER 2.10

Is the process waste water treated prior to discharge?

No process waste water is generated at this water works.

Does the discharge meet the requirements outlined in:

a) its Certificate of Approval

N/A

b) Ministry policy?

N/A

## 3.0 REVIEW OF PREVIOUS NON-COMPLIANCE ISSUES

There are no previous non-compliance issues associated with this facility.

## 4.0 SUMMARY OF INSPECTION FINDINGS (HEALTH/ENVIRONMENTAL IMPACT)

Was there any indication of a known or anticipated human health impact during the inspection and/or review of relevant material, related to this Ministry's mandate?

YES

The level of treatment provided fails to conform with that identified in O.R.459/00.

## Specifics:

The operating authority fails to provide disinfection which is identified as the minimum level of treatment for ground water sources of drinking water (O.R. 459/00 s.4).

Was there any indication of a known or anticipated environmental impact during the inspection and/or review of relevant material?

NO

- a) If the CofA contains conditions dictating monitoring and/or effluent quality for process wastewater treatment, is the facility operating in compliance with those conditions?
- b) If the water works has no process wastewater treatment provisions in place, is there evidence that untreated discharges have adversely impacted the environment or have a significant potential to adversely impact sensitive receivers?

## Specifics:

Was there any indication of a known or suspected violation of a legal requirement during the inspection and/or review of relevant material which could cause a human health impact or environmental impairment?
YES

- a) Do the maximum water takings comply with those prescribed in applicable Permits To Take Water?
- b) Has the water works complied with sampling and analysis provisions contained in O.R. 459/00, or all MAC-related monitoring provisions contained in a CofA and Orders?

  Sampling and analysis is currently provided for bacteriologic parameters, only.
- c) Are all operators licensed as required under O. R. 435/93?

## Specifics:

Mr. Lefebvre is not a licensed operator. Operations presently consist solely of maintenance and repairs to the pump and distribution system as well as bi-monthly bacteriologic sampling.

Was there any indication of a potential for environmental impairment during the inspection and/or the review of relevant material?

NO

Specifics:

## 5.0 ACTION(S) REQUIRED

A Provincial Officers Order was issued to for the owner to attain the services of a qualified consultant to assess the water works with respect to the applicability of the Ontario Water Resources Act and Ontario Regulation 459/00.

### ACTIONS TAKEN

ACTION	ORDER ISSUED	COMPLIANCE DATE	COMPLIED WITH
Assessment of water works	YES	2001/09/30	PENDING
			<u></u>

Provincial Officers Order # P805-010712-01

## 6.0 OTHER INSPECTION FINDINGS

Casing stick-up is slightly less than the requirements of Ontario Regulation 903 s. 13(3). Casing should be extended to correct height or granular backfill material removed to ensure a minimum extension of 30 centimetres above ground surface.

The operator of the water works does not possess the appropriate certification for this facility as required under O.R. 435/93.

Minimum level of treatment for a groundwater supply water works (ie. disinfection) is not provided as indicated by O.R. 459/00 section 5.(1).

Containers of paint and other non-essential materials should be removed from the structure enclosing the well head.

A system of record keeping should be established to document analytical results and flow volumes.

## 7.0 OCCURRENCE REPORT #:

## 9940008744

A Provincial Officers Order was issued August 20, 2001 to Jim Lefebvre (owner) to attain the services of a qualified consultant to undertake an assessment of the water works to determine the applicability of Section 52 of the Ontario Water Resources Act and Ontario Regulation 459/00 and to provide a written report of this assessment to the Provincial Officer.

PREPARED BY ENVIRONMENTAL OFFICER:

	Timothy O'Brien	Lin Bien	Ottawa	2001/08/20
L	(Print)	(Signature)	(District Office)	(Date)

## ENDORSED BY DISTRICT SUPERVISOR:

	Paul Kohoe	Paul Riber	Ottawa	Cuy 22/01
l	(Print)	(Signature)	(District Office)	(Date)

REPORT MAILED OUT ON: LAB RESULTS MAILED OUT ON: STATUS: FINAL

NOTE: "This inspection does not in any way suggest that there is or has been compliance with applicable legislation and regulations as they apply or may apply to this facility. It is, and remains, the responsibility of the owner and/or the operating authority to ensure compliance with all applicable legislative and regulatory requirements."

## CHEMICAL/PHYSICAL OBJECTIVES HEALTH RELATED

(Sleepy Cedars July 12/01)

PARAMETER (mg/L unless specified)	Sample Results	MAC¹	IMAC <sup>2</sup>	AO <sup>3</sup>
Alachior	NA		0.005	<u> </u>
Aldicarh	NA	0.009		<del></del>
Aldrin + Dieldrin	NA	0.0007		
Arsenic	0.0		0.025	-
Atrazine + - dealkylated metabolites	NA		0.005	
Azinphos-methyl	NA	0.02		
Barium	0.0805	1		
Bendiocarb	NA.	0.04		
Benzene	0.0	0.005		
Велго(а)ругеле	NA	0.00001	<del></del>	
Boron	0.121		5	
Bromoxyail	NA	·	0.005	
Cadraium	0.0	0.005	<del></del>	<del> </del>
Carbaryl (Sevin)	NA	0.09		
Carbofuran	NA	0.09		
Carbon Tetrachloride	0.0	0.005		
Chlordane 4	NA	0.007		
Chloramines	NA	3.0	. <u> </u>	
Chlorpyrifos (Dursban)	NA,	0.09		
Chromium	0.0026	0.05		
Cyanazine (Bladex)	NA		0.01	
Diazinon	NA	0.02		
Dicamba	NA	0.12		
1,2-Dichlorobenzene	0.0	0.2		0.003
1,4-Dichlombenzene	0.0	0.005	· · · · · · · · · · · · · · · · · · ·	0.001
DDT + metabolites 5	NA	0.03		
1,2-Dichloroethane	0.0		0.005	
1,1-Dichloroethylene (vinylidene chloride)	NA	0.014		
Dichloromethane	0.0	0.05		
2,4-Dichlorophenol	NA	0.9	<u> </u>	0.0003
2,4-Dichlorophenoxy acetic acid (2,4-D)	NA		0.1	<u> </u>
Diclofop-methyl	NA	0.009		
Dimethoate	NA		0.02	
Diquat	NA NA	0.07		
Diuron	NA	0.15	— <u>— — — — — — — — — — — — — — — — — — </u>	
Fluoride	0.41	b		
Heptachlor + Heptachlor Epoxide	NA	0.003		
Lead	0.00017	0,01 c		

	-	^	
-	1	U	-

	-10-			
(Hexachlorocyclohexane (Lindane)	NA	0.004	1	
Malathion	NA	0.19		<del></del>
Mercury	0.0	0.001	<del>                                     </del>	<del></del>
Methoxychlor (DMDT)	NA	0.9	<del> </del>	
Metolachlor	NA		0.05	
Metribuzin (Sencor)	NA	0.08		<del></del> -
Monochlorubenzene	NA	0.08	† · · · · · · · · · · · · · · · · · · ·	0.03
Nitrate (as Nitrogen)	0.013	10.0 đ	1	<del></del>
Nitrite (as Nitrogen)	0.003	1.0 d		· <del></del>
Nitrate + Nitrite	0.016	10.0 d	1	
Nitrotiacedic Acid (NTA)	NA	0.4		
Nitrosodimethylamine (NDMA)	NA		0.000009	· — · — · · · · · · · · · · · · · · · ·
Paraquat	NA		0.01	
Parathion	NA	0.05		· · · ·
Pentachlorophenol	NA	0.06		0.03
Phorate (Thirnet)	NA		0.002	
Pichloram	NA		0.19	
Polychlorinated Biphenyls (PCB)	NA		0.003	· -
Prometryne	NA		0.001	· <u> </u>
Selenium	0.001	0.01		
Simazine	NA		0.01	
Temephos	NA		0.28	
Terbufos	NA		0.001	
Tetrachloroethylene (perchloroethylene)	NA	0.03		<u> </u>
2,3,4,6-Tetrachlorophenol	NA	0.1		0.001
Triallate	NA	0.23		
Trichloroethylene	NA	0.05		
2,4,6-Trichlorophenol	AN	0.005		0.002
2,4,5-Trichlorophenoxy acetic acid (2,4,5-T)	NA	0.28		0.02
Trifluralin	NA		0.045	
Tribalomethanes	0.00	0.1 e		
Turbidity (NTU)	1.37	f		f
Uranium	0.00012	0.1		
Vinyl Chloride (chloroethylene)	NA	0.002		·········

## Shortforms:

<₩ ND	- A measurable trace amount; interpret with caution - No measurable response (200) - Not detected - No appropriate procedure available	NS NTU ng/L <b>Φ</b> g/L	Not sampled     Nephelometric Turbidity Unit     Nanograms per litre     Micrograms per litre
NA	- Result not available	mg/L	- Milligrams per litte

Footnotes:

	<del></del>
1	Maximum Acceptable Concentration (MAC)
2	Interim Maximum Acceptable Concentration (IMAC)
3	Aesthetic Objective (AO)
4	Includes O-Chlordane, O-Chlordane and Oxychlordane
5	Includes p,p'-DDE, o,p'-DDT, p,p'-DDD and p,p'DDT

Total toxic equivalents when compared with 2,3,7,8-TCDD (tetrachlorodibenzo-p-dioxin)

b) Where fluoridation of drinking water is practised, it is recommended that the concentration be adjusted to 1.0 (+/- 0.2) mg/L, the optimum level for control of dental caries. Communities in Northern Ontario, where the annual mean daily maximum temperature is less than 10 °C may wish to consider adjusting the fluoride concentration to 1.2 (+/- 0.2) mg/L. Adverse effects of fluoride in drinking water above 1.5 mg/L and below 2.4 mg/L are cosmetic in nature (dental mottling in a small portion of the population). Levels above 1.5 mg/L should be reported to the local medical officer of health.

This objective applies to water at the point of consumption. Since lead is a component in some plumbing systems, first flush water may contain higher concentrations of lead than water that has been flushed for five minutes. Faucets, therefore, should be thoroughly

flushed before water is taken for consumption.

Where nitrate and nitrite are present, the total of the two should not exceed 10 mg/L.

The interim maximum acceptable concentration (IMAC) for total tribalomethanes (THMs) in drinking water is 0.1 mg/L (100 ug/L), expressed as a running annual average of quarterly samples. This IMAC is based on the risk associated with chloroform, the THM most often present and generally found in the greatest concentrations in drinking water. The guideline is designated as interim until such time as the risks from other disinfection byproducts are ascertained.

A MAC for turbidity of 1 NTU in drinking water leaving the treatment plant was established to ensure the efficiency of the disinfection process. Treatment processes can result in increased turbidity in the distribution system. To ensure that the aesthetic objective

for turbidity at the free flowing outlet of the ultimate consumer has been set at 5 NTU.

## MICROBIOLOGICAL OBJECTIVES HEALTH RELATED

(Sleepy Cedars July 12/01)

PARAMETER (usganisms/100 ml.)	SAMPLE RESULTS	MAXIMUM ACCEPTABLE CONCENTRATION
Total Coliforms	0.0	0
E. Coli	0.0	0
Background	NA	200**
Standard Plate Count	NA	500**

## Footnotes:

Escherichia coli is a more definitive indicator of feeal contamination than other feeal coliforms or total coliforms.

At elevated levels, the general bacterial population may interfere with the detection of coliforms. This general population can be estimated from either background colony counts on the total coliform membrane filters or heterotrophic plate counts (HPC). If the membrane filter contains more than 200 background colonies on a total coliform medium per 100 mL or if the HPC exceeds 500 colonies per mL, the site should be resampled. If there is a recurrence of unacceptable background or beterotrophic plate counts, an inspection of the site should be undertaken to determine the cause.

## CHEMICAL/PHYSICAL OBJECTIVES NON-HEALTH RELATED

(Sleepy Cedars July 12/01)

Sample Results	Objective	Type of Objective
0.0182	0.1	OG
0.0031	1	AO
0.0	0.0024	AO
0.115	0.3	AO
0.0117	0.05	AO
0.0	0.024	AO
NA	500	AO
0.0	0.3	AO
0.0064	5	AO
	0.0182 0.0031 0.0 0.115 0.0117 0.0 NA 0.0	Results

## Shortforms:

<ul> <li>A measurable trace amount, interpret with caution</li> <li>NA Result not available</li> <li>ND Not detected</li> <li>Mg/L - micrograms per litre</li> <li>OG - Operational Guideline</li> </ul>	<w NS mg/L AO TCU</w 	No measurable response (zero)     Not sampled     adiligrams per litre     Aesthetic Objective     True Colour Units
--	---	--

WATER	KEUL .	INTA	2121EN	000 29	1777						-							
MUNICI	ידי זולם	v		UTM				ÇSG	KIND	WATER	STAT	PUMP	Test	TEST		SC	reen	OWNER
CONCES			WELL.		ELEV			TATE	OP	FOUND	LVL	LVL	RATE	TIME	WATER	DESTH	LENGTH	DEPTHS IN FEET TO WHICH
ETC		LOT	NO	NORTHING	FEET	DATE	DRILLER	INS	WATER	PEET	FEET	FEET	GPM	HR:MN	USE	PEET	FEET	FORMATIONS EXTEND
510		<b>4</b> 0.																
CONTIM	JING.	os	GOODE '	TOWNSHIP														
															DΟ			T. PRINCIOTTA CONST.
CON	03	009	15-	999999		1998/	06 1558	06	UK	0210	16	125	10	1 :0	DO			ERWN SAND DRY 0003 GREY SAND WBRG 0009 GREY CLAY
•			30072	9999999														STKY 0020 GREY SAND GRVL PCKD 0035 GREY LMSN HARD
																		0112 WHIT SNDS HARD 0220
													_		••			T. PRINCIOTTA CONST.
COM	03	009	15-	999999		1996/	06 1558	06	UK	0190	27	245	5	1:0	DO			BRWN LOAM BLDR PCKD 0007 GREY LMSN HARD 0143 WHIT
			30076	9999999														SNDS HARD 0250
											_		_		con N	^		PIPER G
CON	03	009	15-	452530	340	1963/	11 3113	04	FR	0068	15	15	7	1 :0	ST D	U		RED MSND 0030 GREY LMSN 0068
			07186	5008190														BROADFOOT W
CON	0.3	009	1.5 -	452448	3,20	1973/	04 3644	05	FR	0081	4	40	15	1 :0	DO			GREY SAND 0028 GREY LMSN 0081
				5007994										_				RICKOL CONST.
CON	С3	010	15-	999999		1992/	11 3749	06	FR	0194	46	145	21	1 :0	ST			BRWN FILL STNS LOOS 0005 GREY LMSN MGRD HARD 0205
	**			9999999														RAINA. JAMES
CON	03	010		999999		1994/	05 1558	06	UK	0217	14	25	6	1 :0	DO			DRWN SAND BLDR PCKD 0010 BRWN SAND STNS WBRG 0050
	••	•		9999999														GREY SAND GRVL WERG 0040 GREY LMSN MGRD HARD 0160
																		GREY SNDS 0223
CON	03	010	1.5 -	452533	320	1974/	08 1558	06	FR	0040	5	20	25	1 :0	DO			BANNER CONSTRUCTION
400.	••			5007883														BRWN SAND 0012 GRVL BLDR 0040 BLCK LMSN 0041
CON	0.3	010		999999		1996/	06 4006	06	UK	0094	23	47	5	1:0	00			HUTT, PAUL BRWN SAND STNS 0006 BRWN HPAN GRVL SAND 0035 GREY
CON	02			9999999														LMSN FCRD 0041 GREY LMSN MGRD 0068 GREY LMSN HARD
																		0100
CON	0.3	010	15-	454210	320	1973/	09 1558	06	FR	0048	12	30	15	1 :0	DO			NEUEND CONSTR LTD
COM				5008896														BRWN SAND BLDR 0025 GREY HPAN BLDR 0036 BLCK LMSN
																		0048
CON	0.3	011	15-	999999		1995/	06 1119	06	UK	0100	12	90	1.3	1:0	DO			PHILLIPPEE, MARCEL
COM		011		9999999														SAND BLDR 0049 GREY LMSN 0107
CON	กร	011		454444	315	1974/	11 1558	06	SU	0045	4	20	50	1:0	DO			JER BARLOW EXCAV CO
				5008631	-													GREY SAND 0010 GRVL BLCR 0041 BLCK LMSN 0046
CON	03	011		454440	312	1974/	09 2557	06	FR	0170	22	70	12	1:30	ST D	0		O'ERIEN JOHN
	•••			5008540														SAND GRVL 0036 GREY LMEN 0170
CON	03	011		452700	320	1962/	03 1603	02	FR	0089	13	25	8	3 :0	ST D	0		ADAMS S
COM	02	<b>U</b>		5007520														BLDR MSND GRVL 0051 GREY LMSN 0089
CON	0.3	011		454510	308	1971/	07 3504	06	FR	0110	1	1	20	1 :30	DO .			MAI J
CON	• • •	V2.4		5008330														SAND SILT 0015 CSND 0040 GRVL BLDR 0048 HPAN 0056
																		LMSN 0115
CON	03	011	15-	454466	313	1973/	09 1558	06	FR	0102	1	30	30	1:0	OC			MAI G
		72		5008430														BRWN GRVL STNS 0005 GREY SAND STNS 0035 GREY GRVL
																		SAND BLDR 0058 GREY LMSN 0102
CON	ดจ	012	15-	999999		1998/	06 1119	06	FR	0074	15	60	20	1 :	DO			GORD WIENA CONST
CON		V		9999999														SAND GRVL 0048 GREY LMSN 0080
			3030															
CON	03	012	15-	999999		1987/	/11 1558	06	FR	0050	3	20	15	1 :0	DO			C V CONST. LTD.
	0.5			7 9999999														BRWN SAND 0003 BRWN CLAY 0006 GREY CLAY SNDY BLDR
																		0030 GREY SAND GRVL BLDR 0042 GREY LMSN 0055
CON	03	012	15-	454440	315	1978/	/11 3644	06	FR	0058	15	50	8	1 :0	DO			POWERS M
****			-	5008000														GREY HPAN GRVL 0037 GREY LMSN 0064
CON	03	012		452780		1978/	/07 3644	06	PR	0160	25	120	12	1 :0	PS			ALBERT A
	03			5007180									,					GREY SAND STNS 0040 GREY LMSN 0120 WHIT SNDS LMSN
													ıb					0165
													f		L	احا		
														યું જા	علال لاز	1ag.		
												Cape.	1/2	יע, טון	is Lla	4		

# JOHN D. PATERSON AND ASSOCIATES LIMITED



Consulting Engineers

28 Connaulog Gate. Unit 1 Orlawo, Orranio KOE 777 Teh (\$13) 225 7381 Febr. (\$10) 225-60 42

November 26, 2001 File No. G8399.LET.01

Ministry of the Environment 2435 Holly Lane Ottawa, Ontario K1V7P2

Attention:

Mr. Tim O'Brien

Subject:

Assessment of Existing Water Works
Sleepy Cedars Family Campground
1893 Manotick Station Road

Ottawa (Manotick Station), Ontario

Dear Sir.

Pursuant to the Provincial Officer Order, P805-010712-01, the owners of the Sleepy Cedars Family Campground have engaged the services of John D. Paterson & Associates Limited to carry out an assessment of the existing water works to determine the applicability of Ontario Regulation 459/00.

Sleepy Cedars Family Campground is a privately owned seasonal operation with approximately 100 campsites. The park is in operation for approximately 6 months of the year between the months of May and October. The potable water supply park is serviced by single drilled well. Based on the information obtained from the water well data system, the well was drilled in 1978 to a depth of 50.3 metres.

The well is equipped with a submersible well pump, which feeds two pressure storage tanks. The well water is pumped to each site through a shallow 25 mm diameter piping distribution network. The well and distribution piping network is contained completely on the subject property. No water treatment or disinfection system is in place. A water meter was installed on the well head in April, 2000 and the peak daily flow recorded in the summer, when the park was near full occupancy, was approximately 10, 000 litres. It is our understanding that no Certificate of Approval exists for the subject water works.

Mr. Tim O'Brien

Page 2

File: G8399.LET.01 November 26, 2001



A constant discharge pump test was carried out, by this firm, on October 22, 2001. The main purpose of the pump test was to determine the capability of the existing water works. In addition, an analysis of the water bearing aquifer has been carried out to determine its characteristics. The existing well pump and existing water line in the well was used for this test. The existing water distribution line was disconnected from the pressure tanks and rerouted to the nearby field. The submersible pump consists of a one-half horsepower Gould pump Model 5GS05. The flow range for this pump according to the manufacturer's specifications is 6.8 L/min to 34.0 L/min (1.5 igpm to 7.5 igpm).

The existing well was pumped for a total of 250 minutes. Water meter readings were recorded throughout the pump test and based on these readings, the total volume of water pumped over duration of the test was 7.995 m³. As such, the average pump rate for the test duration was calculated to be 31.98 L/ min (7.03 igpm). In addition, the pump rate of the existing water works was measured at random times during the pump test using a fixed volume container. Using this method the average pumping rate was calculated to be 34 L/min (7.5 igpm).

Using the pump test data, the aquifer was evaluated using the Cooper & Jacob Time-Drawdown method, the results of which have been attached to this submission. At a pumping rate of 34 L/min, the water level in the well was lowered 4.285 m. The rate of recovery was rapid with the water level returning to approximately 96% of the static level in approximately 33 minutes. A transmissivity of 4.40 x 10<sup>-3</sup> m²/min was calculated from the test data. A transmissivity of this magnitude is considered to be moderately acceptable.

Based on our findings, it is our opinion that the aquifer at this site is capable of supplying water in excess of 50,000 L/day. However, the existing water works is only capable of supplying water at a maximum rate of 34 L/min or 48,960 L/day. As such, since the existing water works is not capable of supplying water at a rate greater than 50,000 litres per day, it is our interpretation of the regulations that no Certificate of Approval is required according to Section 52 of the OWRA. Since no Certificate of Approval is required, the water works is also exempt from Regulation 459/00, which mandates a minimum level of treatment (i.e. disinfection).

Although, the existing water works is, in our opinion, exempt from Regulation 459/00, the owner of the facility is encouraged to continue weekly bacteriological testing when the facility is in operation. Also, regular maintenance of the pump and distribution system of the water works, is recommended.

Mr. Tim O'Brien

Page 3

File: G8399.LET.01 November 26, 2001



We trust that this submission satisfy your requirements. Should you have any questions please do not hesitate to contact us.

Yours truly

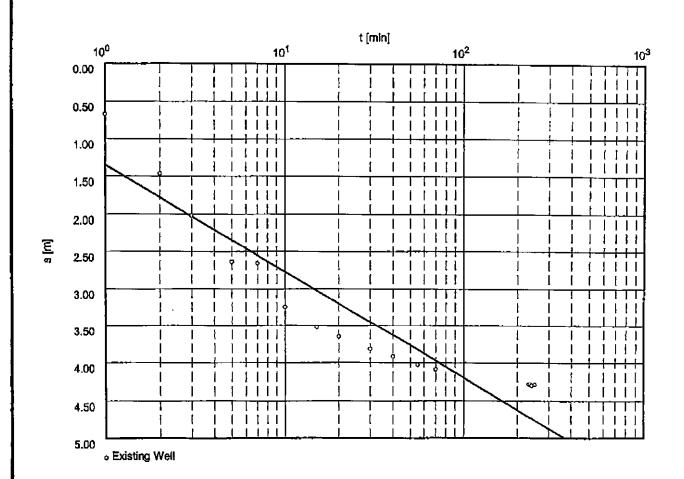
JOHN D. PATERSON & ASSOCIATES LTD.

Albert Van Schie, C.E.T.

Andrew J. Tovell, P.Eng.

cc. Sleepy Cedars Family Campground

John D. Paterson & Associates Ltd. 1-28 Concourse Gate Nepean, Ontario K2E 777	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Project: Sleepy Cedars Family Camping Evaluated by: SJW
Pumping Test No. 1	Test conducte	ed on: 02.11.2001
Existing Well		
Discharge 0.57 I/s		



Transmissivity [m²/min]: 4.40 x 10<sup>-3</sup>

John D. Paterson & Associates Ltd. Date: 21.11.2001 Pumping test analysis Page 2 1-28 Concourse Gate Time-Drawdown-method after Project: Sleepy Cedars Family Camping **COOPER & JACOB** Nepean, Ontario Confined aquifer K2E 7T7 Evaluated by: SJW Pumping Test No. 1 Test conducted on: 02.11.2001 Existing Well Existing Well Discharge 0.57 Vs Distance from the pumping well 0.150 m Static water level: 5.180 m below datum Pumping test duration Water level Drawdown [min] [m] [m] 1.00 5.850 0.670 2 2.00 6,650 1.470 3 3.00 7.200 2.020 4 5.00 7.820 2.640 5 7.00 7.840 2,660 6 10.00 8.430 3.250 7 15.00 8.700 3.520 8 20.00 8.830 3.650 9 30.00 9.000 3.820 10 40.00 9.100 3.920 55.00 11 9.210 4.030 12 70.00 9.270 4.090 13 232.00 9.460 4.280 14 235.00 9.460 4.280 15 240.00 9.475 4.295 16 250.00 9.465 4.285

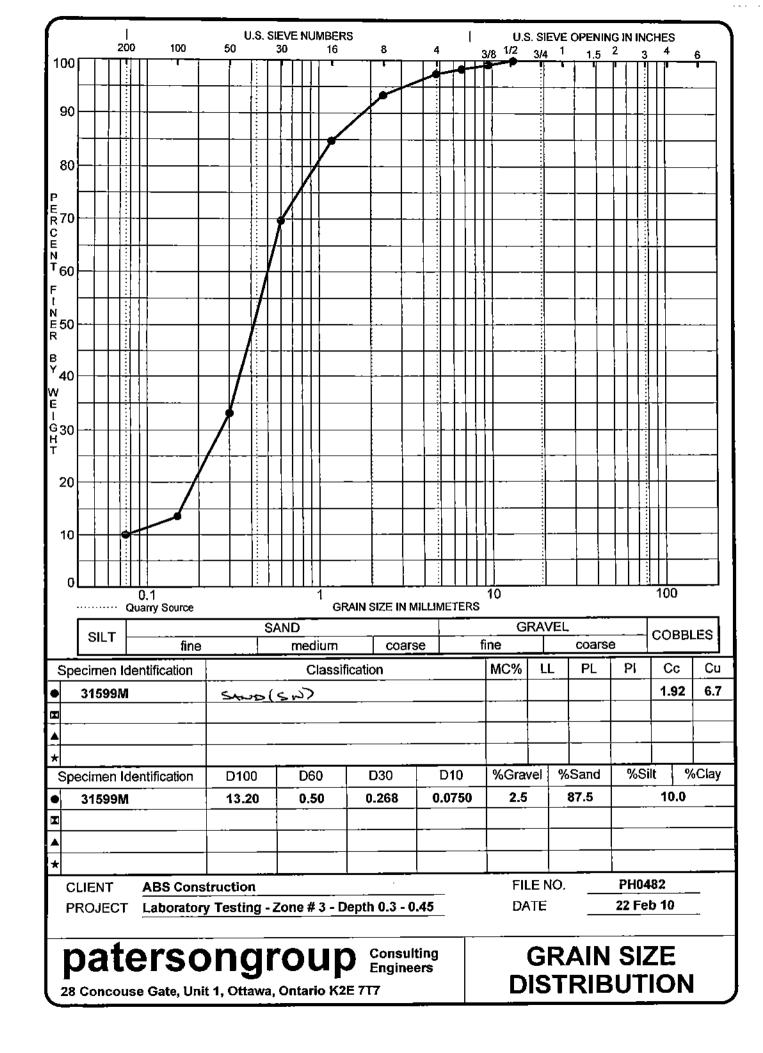


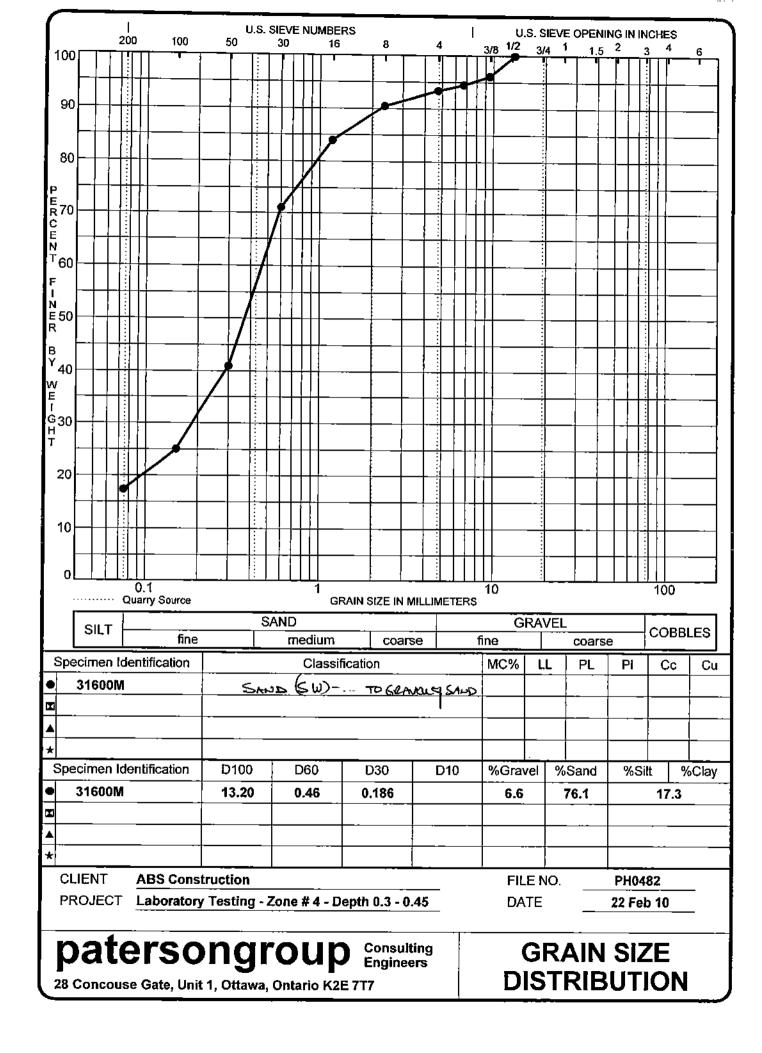
# **APPENDIX 3**

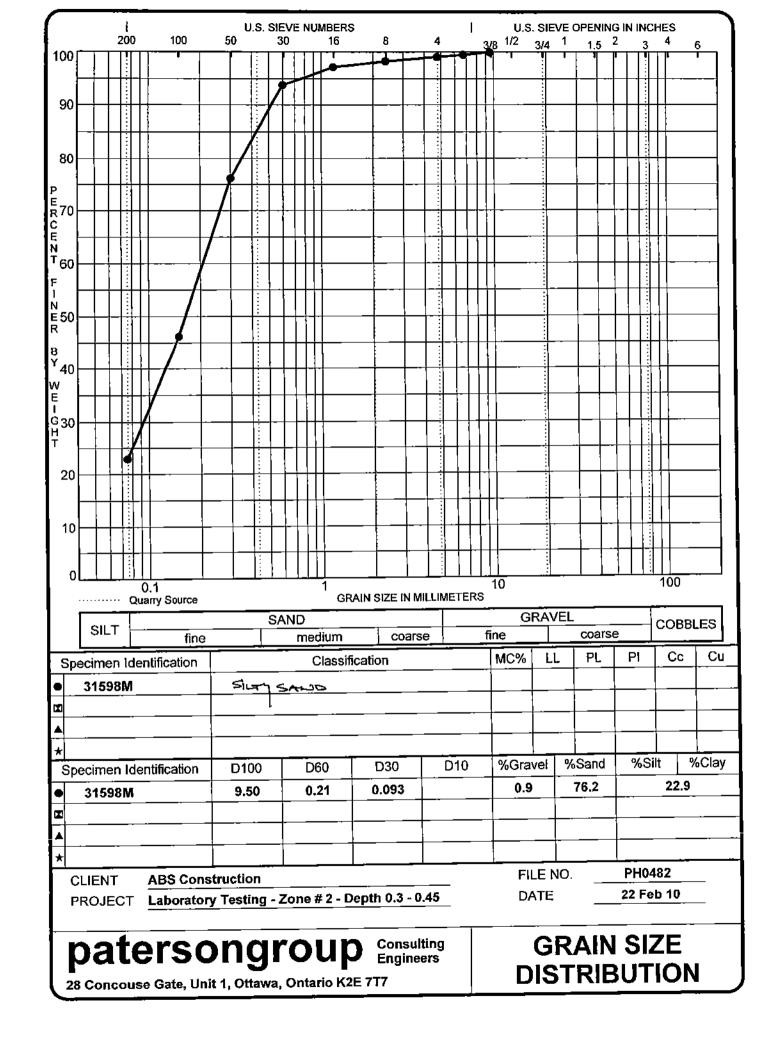
Soil Laboratory Test Results

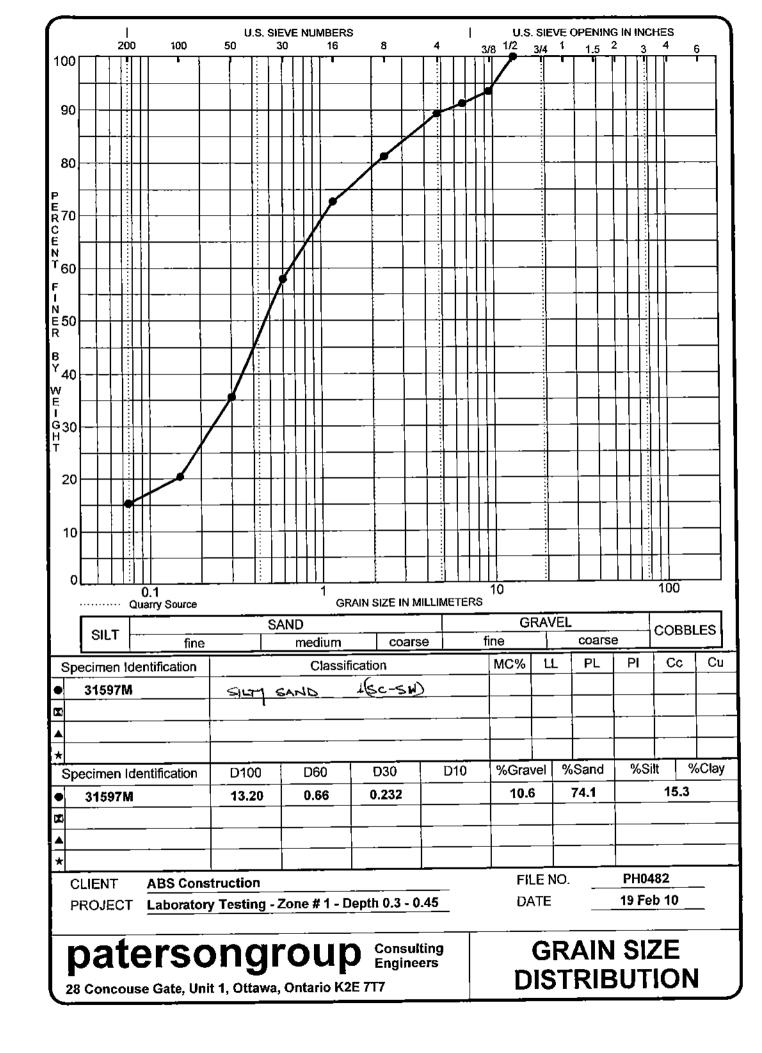
Water Laboratory Test Results











28 Concourse Gate, Unit 1

Client: Paterson Group

Nepean, ON

K2E 7T7
Attention: Mr. Robert Passmore

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ACCUTEST LABS

Report Number: Date:

2007-02-19 2007-02-14

Date Submitted:

2703126

Project:

PH0482

.01000

INVOICE: Paterson Group Inc. Chain of Custody Number: 49792							P.O. Number: Matrix:		5391 Waler	
		AB ID:	524516	524517			T		GUIDELINE	
	Sampi	le Date:	2007-02-14	2007-02-14		1				
		aple ID:	TW1 WS1	TW1 WS2					ODWSOG	
PARAMETER	UNITS	MDL					-	TYPE	LIMIT	UNITS
Total Coliforms	cl/100mL		0	0	1	1	ĵ	MAC	0	cl/100mL
Escherichia Coli	ct/100mi.		0	O		1		MAC	0	ct/100mL
Heterotrophic Plate Count	ch1mr		0	. a						1
Faecal Coliforms	ct/100mL		0	O				ļ	F	
Faecal Strephococcus	ct/1 00mL		0	0						
								;		

MDL = Method Detection Limit INC = Incomplete AO = Absthc/ic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interfin Maximum Allowable Concentration Comment.

PPROVAL:\_

Microbiology Analysi

→ John O Paterson ᡚ001/001

Client: Paterson Group

28 Concourse Gate, Unit 1

Nepean, ON K2E 7T7

INVOICE: Paterson Group Inc.

Attention: Mr. Robert Passmore

Report Number:

2703139

Date: Date Submitted: 2007-02-16

2007-02-14

16/02

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5222

ACCUTEST LABS

Paterson 図001/001

Project:

PH0482

5391

P.O. Number:

Chain of Custody Number: 49792				Matri	x:_	Water		
		LAB ID:	524535			<u> </u>	GUIDELINE	=
	Samp	le Date:	2007-02-14					
		mple ID:	TW1 W52				ODWSOG	
				i !				
PARAMETER	UNITS	MDL				TYPE	LIMIT	UNITS
Alkalinity as CaCO3	mg/L	5	243			OG	500	mg/L
Chloride	mg/L	1	8		l i	AO	250	rng/L
Colour	TCU	2	≺2	<b>!</b>		AO	5	TCU
Conductivity	uS/cm	5	527		1 1			1
Dissolved Organic Carbon	rng/L	0.5	1.5			AO	5	πg/L
Fluoride	mg/L	0.10	0.39	]	1	MAC	1.5	mg/L
Hydrogen Sulphide	mg/L	0.01	<0.01		j j	AO	0.05	mg/L
N-NH3 (Arnmonia)	mg/L	0.02	0.09			1	Į.	
N-MO2 (Nitrite)	mg/L	0.10	<0.10	}	<b>)</b> [	MAC	1.0	mg/L
N-NO3 (Mitrate)	mg/L .	0.10	<0.10	1	1 1	MAC	10.0	mg/L
рН			8.13		1	AO	6.5-8.5	_
Phenois	∫ mg/L	0.001	< 0.001			ļ.		ļ
Sulphaie	mg/L	1	33		1 1	AO	500	mg/L
Tannin & Lignin	mg/L	0.1	0.2			ł	ĺ	] -
TDS (COND - CALC)	mg/L	5	343		<b>,</b>	AO	500	mg/L
Total Kieldahi Nitrogen	rng/L	0.05	0.15		1 1		i	_
Turbidity	иTu	0.1	4.6≪	}		AC	1.0	NTU
Hardness as CaCO3	mg/L	1	211		1 1	OG	100	mg/L
Ion Balance	l i	0.01	0.94		1 }	ı, ı		1
Calcium	i mg/∟	1	45		i	i	ŀ	
Magnesium	rng/L	1	24	Ì	1 1			}
Potassium	mg/L	1	4		l j	Ţ	)	
Sodium	mg/L	2	2 <del>5</del>			AO	2:0	mg/L
Iron	mg/L	0.03	0.47 🛶		ļ <u>l</u>	AC	0.3	Ing/L
Manganese	mg/L	0.01	0.02	i F		AO	0.05	mg/L
•		•	!					ļ -
						ŀ	[	

MDL = Mathed Detection Limit INC = Incomplete AD = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration Comment:

APPROVA

28 Concourse Gate, Unit 1

Client: Paterson Group

K2E 717 Attention: Mr. Robert Passmore

Nepean, ON

INVOICE: Palerson Group Inc.

2703138

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08:27

FAX

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5222

ACCUTEST LABS

2007-02-19 Date Submitted: 2007-02-14

PH0482

P.O. Number:

Report Number:

Date:

Project:

5391

OF 1 A County Alexander 16700						P.O. Number:		5391	
Chain of Custody Number: 49792			1	<del></del>	 -, — <u> </u>	Matrix:		Water	
	-	AB ID:	524534		 <del> </del>		<b></b>	GUIDELINI	
	•	e Date:	2007-02-14		 	· I	1		
	Sam	ıple ID:	TW1 WS1	1	1			ODWSOG	
				i		1			
PARAMETER	UNITS	MDL			 	+	TYPE	LIMIT	UNITS
Alkalinity as CaCO3	mg/L	5	242	1	 <del> </del>		06	500	mg/L
Chloride	mg/L	1	7		)		AO	250	mg/L
Colour	TCU	2	2		}		AO	5	TCU
Conductivity	uS/cm	5	527		i	1	1	1	1
Dissolved Organic Carbon	mg/L	0.5	1.7		ĺ		AO	5	mg/L
Fluoride	mg/L	0.10	0.36	]	]	1	MAC	1,5	mg/L
Hydrogen Sulphide	mg/L	0.01	<b>0.01</b>	}		1	AO	0.05	.mg/t.
N-NH3 (Ammonia)	mg/L	0.02	0.10		i	ŀ	1	1	1
N-NO2 (Nitrite)	mg/L	0.10	<0.10	i	Į.	1 1	MAC .	1.0	mg/L
N-NO3 (Nitrate)	mg/L	0.10	<0.10		]		MAC	10.0	mg/L
pH	1 - 1		8.13		İ	1	AO	6.5-8.5	"-
Phenois	mg/L	0.001	<0.001	1	7	1			
Sulphate	mg/L	1	34	ľ		i !	AG	500	mg/L
Tannin & Lignin	rng/L	D.1	0.2					525	
TDS (COND - CALC)	mg/L	5	343	1			AQ I	500	mg/L
Total Kjeldahl Nitrogen	mg/L	0.05	0.15			[ ]			"
Turbidity	NTU	0,1	12.0	1		}	AO	1.0	NTU
Hardness as CaCO3	mg/L	1	232		}		OG	100	mg/L
Ion Balance		0.01	0.99	į		) (			
Calcium	nrg/L	1	50			J 1			
Magnesium	mg/L	1	26			i			
Polassium	rng/L	§ .	5	1		, ,	. )		
Sodium	rng/L	2	22			]	AC	20	mg/L
lron .		0.03	0.66			ļ <b>إ</b>	AO	0.3	rng/L
Manganese		0.01	0.02	}	ı	1	AO	0.05	rng/L

MDL = Method Detection Limit INC = Incomplete AO = Aesitetic Objective OG = Operational Guideline MAC = Moximum, Allowable Concentration IMAC = Interim Maximum Allowable Concentration Comment:

APPROVAL

Cab Supervisor

Client: Paterson Group

28 Concourse Gale, Unit 1

Nepean, ON K2E 717

INVOICE: Palerson Group Inc.

Attention: Mr. Robert Passmore

Report Number:

2704804

Date: Date Submitted:

2007-03-15 2007-03-12

15/03 2007

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ACCUTEST LABS

Paterson മাতিত3/০০3

Project:

PH0482

P.O. Number:

4247

Sample Date: 2007-03-12 2007-03-12 TM2 MS2	ODWSOG  LIMIT  0 0	UNITS cl/100mL
Sample Date:   2007-03-12   2007-03-12	ODWSOG	UNITS cl/180mL
Sample ID: TW2 WS1 TW2 WS2   TW2 W	LIMIT 0	cl/100mL
PARAMETER	LIMIT 0	cl/100mL
Total Coliforms	0	cl/100mL
Total Coliforms	,	
Heterotrophic Plate Count ct/1mL >500 185 Faecal Coliforns ct/100mL 0 0	0	cl/100m).
Heterotrophic Plate Count   ct/1mL   >500   185		
. 4444. 4444. 4444. 4444. 4444. 4444. 4444. 4444. 4444. 4444. 4444. 4444. 4444. 4444. 4444. 4444. 4444. 4444.		
Faecal Straptocoocus  ct/100mL  0  0		
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MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Meximum Allowable Concentration Comment:

Microbiology Analyst

Client: Paterson Group

28 Concourse Gate, Unit 1

Nepean, ON K2E 717

INVOICE: Paterson Group Inc.

Altention: Mr. Robert Passmore

Report Number: Date:

2704803

Date Submitted:

2007-03-15 2007-03-12

Project:

PH0482

4247

P.O. Number:

Chain of Custody Number: 51925					Matrix:		Water	
	<u> </u>		529573				GUIDELINE	•
Samp	ile Date:	2007-03-12						
Sal	Sample ID:		TW2 WS2				ODWSOG	
UNITS	MDL					TYPE	LIMIT	UNITS
mg/L	5	193	199	Ţ		OG	500	лъд/L
<b>տք</b> /L	1	6	6			AO	250	mg/L
TCU	2	<2	<2	1		I AO	5	TCU
j uS/cπ	5	414	419	<b>i</b>		1		
mg/L	0.5	2.8	2.4			AO	5	mg/L
mg/L	0.10	0.40	0.42	! !		MAC	1.5	mg/L
mg/L	0.01	0,02	0.02	]		AO	0.05	mg/L
mg/L	0.02	0.23	0.23	1				1
mg/L	0.10	<0.10	<0.10			MAC	1.0	mg/L
mg/L	0.10	<0.10	<0.10	1 1		MAC	10.0	mg/L
		8.29	8.33	1 1	)	AC	5.5-8.5	Ů
mg/L	0.001	<0.001	<0.001	}	ſ,			
rng/L	1	20	20	[		AO	500	mg/L
mg/L	0.1	0.2	0.1	ļ				""
mg/L	5	269	272	1 1	j j	AO	500	mg/L
mg/L	0.05	0.29	0.20		l .			
NTU	0.1	23.4	15.6 🚈			AO	1.0	NTO
mg/L	1	204	213		j	05	100	mg/L
	0.01	1.06	1.06					" •
mg/L	1	37	39	!				
mg/L	1	27	28					
mg/L	1	5	4					
mg/L	2	12	11	i		AO	20	mg/L
mg/L	D,03	1.47	0.33			AO	0.3	നുവ
mg/L	0.01	0.03	0.02			AD		mg/L
	UNITS  mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/	mg/L 5 mg/L 1 TCU 2 uS/cm 5 mg/L 0.5 mg/L 0.5 mg/L 0.01 mg/L 0.02 mg/L 0.10 mg/L 0.10 mg/L 0.10 mg/L 0.10 mg/L 0.10 mg/L 1 mg/L 0.1 mg/L 0.1 mg/L 1 mg/L 0.1 mg/L 1	Sample Date:   2007-03-12   TW2 WS1	UNITS   MDL   TW2 WS1   TW2 WS2	Sample Date:   2007-03-12   2007-03-12   TW2 WS1   TW2 WS2	LAB  D:   S29572   S29573   Sample Date:   2007-03-12   2007-03-12   Sample  D:   TW2 WS1   TW2 WS2	LAB ID:   Sample Date:   Sample Date:   Sample ID:   TW2 WS1   TW2 WS2 WS2   TW2 WS2   TW2 WS2   TW2 WS2   TW2 WS2   TW2 WS2   TW2 WS2 WS2   TW2 WS2   TW2 WS2   TW2 WS2   TW2 WS2   TW2 WS2   TW2 WS2 WS2   TW2 WS2   TW2 WS2   TW2 WS2   TW2 WS2   TW2 WS2   TW2 WS2 WS2   TW2 WS2   TW2 WS2   TW2 WS2   TW2 WS2   TW2 WS2   TW2 WS2 WS2   TW2 WS2   TW2 WS2   TW2 WS2 WS2   TW2 WS2 WS2   TW2 WS2 WS2   TW2 WS2 WS2   TW2 WS2 WS2   TW2 WS2 WS2   TW2 WS2 WS2   TW2 WS2 WS2   TW2 WS2 WS2   TW2 WS2 WS2   TW2 WS2 WS2   TW2 WS2 WS2 WS2   TW2 WS2 WS2   TW2 WS2 WS2   TW2 WS2 WS2   TW2 WS2 WS2   TW	LAR  D:   S29572   529573   GUIDELINE

MOL = Method Detection Limit INC = Incomplete AC = Aesthebo Objective CG = Operational Guideline MAC = Maximum Altowable Concentration IMAC = Interim Maximum Altowable Concentration Comment:

529572: Holding time for furbidity analysis was exceeded 529573: Holding time for turbidity analysis was exceeded.

APPROVAL:

legganic Lab Supervisor

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ACCUTEST LABS

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ACCUTEST LABS

0 Paterson 2001/001

Client: Paterson Group

28 Concourse Gate, Unit 1

Nepean, ON K2E 7T7

Attention: Mr. Robart Passmore

INVOICE, Paterson Group inc.

Report Number: Date:

2007-03-08

Date Submitted:

2007-03-02

Project:

PHO482

2704187

P.O. Number:

4251

Chain of Custody Number: 55862				Matrix:		Water			
		LABID:	527607	527608			ĺ	<b>GUID ELINE</b>	
	Sam	ple Date:	2007-03-01	2007-03-01					
	Sample ID:		TW3 WS1	TW3 WS2			ODWSQ		
PARAMETER	UNITS	MDL			<del></del>		TYPE	LIMIT	UNITS
Alkalinity as CaCO3	mg/L	5	212	212			OG	500	ng/L
Chloride	mg/L	1	44	44	1		AD	250	mg/L
Colour	עסד	2	2	<2	{ }		AO	5	TCU
Conductivity	uS/cm	5	<del>6</del> 17	619	1		i		
Dissolved Organic Carbon	rng/L	0.5	1.6	1.5	<u> </u>	}	AO	5	mg/L
Fluoride	mg/L	0.10	0.30	0.30			MAC	1.5	mg/L
Hydrogen Sulphide	mg/L	0.01	<0.01	<0.01			AO	0.05	mg/L
N-NH3 (Ammonia)	mg/L	0 02	0.08	<0.02	<b>!</b>	İ		1	
N-NO2 (Netile)	mg/L	0.10	<0.10	<0.10	1		MAC	1.0	mg/L
N-NO3 (Nitrale)	mg/L	0.10	<0.10	<0.10	1		MAC	10.0	rng/L
ρH	1	<b>J</b> .	7.97	8.00			AO	6.5-8.5	
Phenais	mg/L	0.001	<0.001	<0.001	1	i i	1,15	9.2 2.2	l
Suiphate	mg/L	1 1	48	48	1		AO	500	mg/L
Taxnin & Lignin	mg/L	0.1	<0.1	<0.1				1	
TDS (COND - CALC)	mg/L .	5	401	402			AO	500	mg/L
Total Kjeldahi Nitrogen	mg/L	0.05	0.11	60.0	1				
Turbldity	NTU	0.1	2.3	1.9			AO	1.0	NTU
Hardness as CaCO3	mg/L	ı	252	261	<b>!</b>	ĺ	og l	100	mg/L
Ion Balance	· -	0.01	1.01	1,03				, , ,	
Calcium	mg/L	1	58	60					
Magnesium	mg/∟	1	26	27		}			
Potassium	mg/L	1	4	4			ļ	l	
Sodium	rag/L	2	32	32	†	[	AO	26	mg/L
Iron	mg/L	0.03	0.25	0.26		<b>i</b> j	AO	0.3	mg/L
Manganese	mg/L	0.01	0.02	0.02	ļ		AO	0.05	mg/L
	<b>-</b>								n dic

MDL = Method Detection Limit INC = Incomplete AO = Aesthotic Objective OG = Operational Suideline MAC = Maximum Allowable Concentration IMAC = Interim Meximum Allowable Concentration Comment:

**APPROVAL** 

Client: Paterson Group

28 Concourse Gate, Unit 1

Nepean, ON **K2€ 7T7** 

Altention: Mr. Robert Passmore

INVOICE: Paterson Group Inc.

Report Number:

2704188

Date: Date Submitted: 2007-03-05 2007-03-02

Project:

PH0482

P.O. Number:

involue, materson droup inc.					P.O. MUIND	en.		
Chain of Custody Number: 55862			<del>,</del>	.,	Matrix:		Water	
	LAB ID		527615				GUIDELINE	
	Sample Date		2007-03-01	<u> </u>				
	Sample (D	: TW3 W81	TW3 WS2			Ħ	QDWS0G	
						II.	ODWSOG	
				<u> </u>				
PARAMETER	UNITS MOL			l		TYPE	LIMIT	UNITS
Total Coliforins	cl/100ml	0	D			MAC	0	c₩100mL
Escharichia Coli	ct/100mL	0	0	1		MAC	a	ct/100mL
Heterotrophic Plate Count	ct/1mL	0	0	[		4	j	i
Faecal Collionns	cl/100mL	ס	1 0	1		ļ.		
Faecal Streptococcus	ct/100mL	٥	1 0					1
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MDL = Method Detection Limit | INC = Incomplete | AO = Aesthetic Objective | DG = Operational Guideline | MAC = Meximum Allowable Concentration | INAC = Interim Maximum Allowable Concentration Comment.

> Krista Quantrill Microbiology Analyst

1 of 1

ACCUTEST LABS Paterson 園001/002

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12/03 2007 19:04 FAX ത  $\vec{\omega}$ 727 5222

ACCUTEST LABS

Client: Paterson Group

26 Concourse Gate, Unit 1

Nepean, ON K2E 7T7

Attention: Mr. Robert Passmore

INVOICE: Paterson Group Inc.

Report Number:

Date:

27(14215 2007-03-12

Date Submitted:

2007-03-02

Project:

PH0482

P.O. Number:

4251

Chain of Custody Number: 55863   LAB ID:   527650   527651	Matrix:	Water GUIDELIN ODWSOG	
Sample Date:   2007-03-02   2007-03-02	OG	ODWSOG	
Sample ID:   TW4 WS2     TW4 WS2	OG		,
PARAMETER	OG		<b>,</b>
Alkalinity as CaC03 mg/L 5 249 242 Chloride mg/L 1 5 2	OG		
Alkalinity as CaC03 mg/L 5 249 242 Chloride mg/L 1 5 2	OG	LIMIT	
Alkalinity as CaCO3	OG	I CIMILI	4411
Chloride mg/L 1 5 2	1	can	UNITS
	i i AO	500 250	mg/L
Colour   TCU   2   <2   <2	AO		mg/L
Conductivity uS/om 5 525 525	~~	5	TCU
Dissolved Organic Carbon mg/L 0.5 1.2 1.3	AO	1 -	
Fluoride mg/L 0.10 0.12 0.12	MAC	5	mg/L
Hydrogen Sulphide mg/L 0.01 <0.01 N/A	AO	1.5	mg/L
N-NH3 (Ammonia) mg/L 0.02 0.03 <0.02	40	0.05	mg/L
N-NO2 (Nitrile) mg/L 0.10 <0.10 <0.10	J		I .
N-NO3 (Nitrate) mg/L 0.10 <0.10	MAC MAC	1.0	ጠይላኒ
pH 7.94 7.90		10.0	.mg/L
Phenois mg/L 0.001 <0.001 <0.001	AO	6.5-8.5	1
Suppose mg/L 1 43 44	AO		1
Tarnin & Lignin mg/L 0.1 <0.1 <0.1	40	500	mg/L
TDS (COND - CALC) mg/L 5 341 341	l AO	600	
Total Kjeldahi Nitrogen mg/L 0.05 <0.05	^0	500	mg/L
Turbidity NTU 0.1 10.8 64.9	AO	١.,	
Hardness as CaCO3 mg/L 1 288 291	OG	1.0	NTU
on Balance 0.01 1.04 1.05		100	mg/L
Calcium mg/L 1 71 72		1	l
Magnesium mg/L 1 27 27		<b>!</b>	ĺ
Potassium mg/L 1 1 1		1	ĺ
Sodium mg/L 2 6 6		20	
ron mg/L 0.03 0.26 0.69	AO AO	20	rng/L
Manganese mg/L 0.01 0.04 0.06	11	0.3	mg/L
1 0.00	AO	0.05	mg/L
			ı
		] ]	
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MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration Comment:

527651: H2S analysis is not available due to cloudy sample. N/A = Not Available.

APPROVAL

Jnomanic Lab Supervisor

Client: Paterson Group

28 Concourse Gate, Unit 1

Nepean, ON

K2E 717

Attention: Mr. Robert Passmore

Report Number:

2704213

Date:

2007-03-05 2007-03-02

Date Submitted: Project:

PH0482

05/03

2007

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ACCUTEST LABS

Paterson ②002/002

P.Q. Number;

LAB ID:   \$27648   527649	Matrix:			
Sample Date:   2007-03-02   2007-03-02			Water GUIDELINE	
Sample ID: TW4 WS1   TW4 WS2				_
PARAMETER			00	
Total Coliforms			ODWSOG	
Total Coliforms		TYPE	LIMIT	UNITS
Escherichia Coff		MAC	0	ct/100mL
Heterotrophic Plate Count ct/1mL 0 0 Faccat Coliforns ct/100mL 0 0		MAC	0	d/100mL
Faecal Coliforms ct/100mL 0 0	1 1		İ	1
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MDL = Medical Detection Limit 4NC = Incomplete AO = Assistatic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration Comment:

APPROVAL

Krista Quantrill Microbiology Analyst

#### **REPORT OF ANALYSIS**



Cilent: Paterson Group

28 Concourse Gate, Unit 1

Nepean, ON K2E 7T7

Attention: Mr. Robert Passmore

Report Number:

1025567

Date: Date Submitted: 2010-10-25 2010-10-18

\_...

Project:

PH0482

INVOICE: Paterson Group Inc.

Chain of Cuetody Number: 124240

P.O. Number: Matrix:

Water

Chain of Cuetody Number: 124240							matrix:		water	
		LAB ID:	837627						GUIDELINE	-
	Samı	ple Date:	2010-10-18							
	\$a	mple ID:	TW4					1		
			TW4 WS10/ <b>18</b>			1				
						1		Ħ		
PARAMETER	UNITS	MRL						TYPE	LIMIT	UNITS
Total Coliforms	CFU/100mL		Ó						]	
Escherichia Coll	CFU/100mL		0		İ				]	
Heterotrophic Plate Count	CFU/1mL		0					1	ſ	
Faecal Coliforms	CFU/100mL		0			1		1		]
Faecal Streptococcus	CFU/100mL		0					li	ļ	
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MRL = Method Reporting Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration Comment:

APPROVAL:

Microbiology Lab Supervisor

#### **REPORT OF ANALYSIS**



Client: Paterson Group

28 Concourse Gate, Unit 1

Nepean, ON K2E 7T7

INVOICE: Paterson Group Inc.

Attention: Mr. Robert Passmore

Report Number:

1022331

Date: Date Submitted:

2010-09-20 2010-09-15

Project:

PH0482

P.O. Number:

7892

Obele of O at a black to admind							C.O. HURIDO	•	1032		
Chain of Cuetody Number: 129681	<del></del>			1			Matrix:		Water		
		LAB ID:	828613	828614		,			GUIDELIN	<u> </u>	
	Sem	ple Date:	2010-09-14	2010-09-14							
	Sa	ımple ID:	WS1-TW4-	WS2-TW4-				<b>∄</b>	ODWSOG		
			14/09/10	14/09/10				l.	ODWSOG	1	
					1						
PARAMETER	UNITS	MRL			1			TYPE	LIMIT	UNITS	
Total Coilforms	CFU/100mL		OG	OG	}			MAC	0	CFU/100mL	
Escherichia Coli	CFU/100mL		0	0		1		MAC	0	CFU/100mL	
Helerotrophic Plate Count	CFU/1mL		82	58		l		1			
Faecal Collforms	CFU/100mL		0	0		1	;		1	•	
Faecal Streptococcus	CFU/100mL		0	ō				1	ł		
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MRL = Method Reporting Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration Comment:

828613: OG = Overgrown. 828614: OG = Overgrown.

Jennifer Mitchell

Microbiology Lab Supervisor

#### **REPORT OF ANALYSIS**

Exova Accutest

Client: Paterson Group

28 Concourse Gate, Unit 1

Nepean, ON K2E 7T7

Attention: Mr. Robert Passmore

INVOICE: Paterson Group Inc.

Report Number: Date:

1022296

Date Submitted:

2010-09-21 2010-09-14

Project:

PH0482

P.O. Number:

Obel - Country of the country of the						P.O. Number:			
Chain of Cuetody Number: 129681	<del></del>					Matrix:		Water	
		LAB 1D:	828519	828520				GUIDELINE	
		nple Date:	2010-09-14	2010-09-14					
	S	ample ID:	WS1-TW4-	WS2-TW4-		"	i	opwsog	
			14/09/10	14/09/10	1		1	DDWSOG	
PARAMETER	UNITS	MRL						T	т
Alkalinity as CaCO3	mg/L	5	195	195	····		TYPE	LIMIT	UNITS
Chloride	mg/L	1 1	45	44			OG	500	j mg/L
Colour	TCU	2	<2	2		ľ	AO	250	mg/L
Conductivity	uS/cm	5	579	577			AQ	5	TCU
Dissolved Organic Carbon	mg/L	0.5	1,4	1.5			1	1 -	
Fluoride	mg/L	0.1	0.34	0.33		ľ	AO MAC	5 1.5	mg/L
Hydrogen Sulphide	mg/L	0.01	<0.01	<0.01		1	i P		mg/L
N-NH3 (Ammonia)	mg/L	0.02	0.03	0.03			AO	0.05	mg/L
N-NO2 (Nivile)	mg/L	0.1	<0.10	<0.10			١		
V-NO3 (Nitrate)	mg/L	0.1	<0.10	<0.10			MAC	1.0	mg/L
о <del>Н</del>	""3"	0.,	8.18	8.21			MAC	10.0	mg/L
Phenois	mg/L	0.001	<0.001	<0.001			ĺ	6.5-8.5	
Sulphate	mg/L	1	37	36		1			
Tannin & Lignin	mg/L	0.1	<0.1	<0.1			AO	500	mg/L
Total Dissolved Solids (COND - CALC)	mg/L	5	376	375					
Total Kjeldahl Nitrogen	mg/L	0.1	<0.10	<0.10			AO	500	mg/L
Turbidity	NTU	0.1	0.6	0.10					
fardness as CaCO3	mg/L	1 1	217	215	ŀ		MAC	1.0	NTU
on Balance	""9"-	0.01	1.01	0.99			OG	100	mg/L
Calcium	mg/L	1 1	49	48					
Magnesium	mg/L	' i	23	23					
Polessium	mg/L	1	4	4			1		
Sodium	mg/L	ż	36	34				1	
гол	mg/L	0.03	0.12	0.11		i i	AO	200	mg/L
#anganese	mg/L	0.01	0.02	0.02		1 1	AO	0.3	mg/L
	ing/L	3.01	0.02	0.02			AO	0.05	mg/L
						,			
		ļ							

MRL = Method Reporting Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Meximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration Comment:

Ingreamic Lab Supervisor

Client: Paterson Group

28 Concourse Gate, Unit 1

Nepean, ON

K2E 717 Attention: Mr. Robert Passmore Report Number:

Date:

2704935 2007-03-19

Date Submitted:

2007-03-14

Project:

PH0482

INVOICE. Paterson Group Inc. Chain of Custody Number: 51926					P.O. Number:		4247	
ONE IN OF COOLERY (SUMBE). 3 1320	LAB ID:	529993	529994	<del></del>	Matrix:		Weler	
	Sample Date:			+			GUIDELIN	<u> </u>
			2007-03-13	<del></del>				
	Sample (D:	1095 0961	TW5 WS2	1 1		DDWS00		
		1		1	ļ			
PARAMETER	UNITS MOL			†	<del></del>	TYPE	LIMIT	UNIT
otal Coliforms	ci/100mL	3	a			MAC	0	ct/100r
scherichia Coli	ct/100mL	0	ð			MAC	o	cV100r
eterotrophic Plate Count	cl/1mL	17	21		}		1	*******
aecal Coliforms	ct/180mL	0	0				ſ	
aecal Streptococcus	ct/100mL	0	o	{			ì	
	l i			1 1	1			1
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MOL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Internal Maximum Allowable Concentration Comment:

Microbiology Analyst

19/03 2007

13:10

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6 <u>...</u> 727

28 Concourse Gate, Unit 1

Nepean, ON

K2E 717 Attention: Mr. Robert Passmore

INVOICE: Paterson Group Inc.

Report Number:

Date:

2704924 2007-03-19

Date Submitted:

2007-03-14

. •

ACCUIEST LABS

<u>-</u>

Paterson

**図**001/001

Project:

PH0482

4247

P.O. Number:

Chain of Custody Number: 51926					Matrix		Water		
	i	LAB ID:	529977	529978				GUIDELINE	
	Samp	e Date:	2007-03-13	2007-03-13			J		
	Sen	nple ID:	TW5 WS1	TW5 WS2				ODWSOG	
PARAMETER	UNITS	MDL					TYPE	LIMIT	UNITS
Alkalinity as CaCO3	mg/L	5	178	178			0G	500	mg/L
Chloride	rng/L	1	4	4			AO	250	mg/L
Colour	TGU	2	<2	3			AO	5	TCU
Conductivity	uStom	5	376	376	1	J			
Dissolved Organic Carbon	mg/L	0.5	1.7	1.7			CA	5	mg/L
Fluoride	mg/L	0.10	0.71	0.71			MAC	1.5	mg/L
Hydrogen Sulphide	mg/L	0.01	<0.01	< 0.01	!		AO	0.05	mg/L
N-NH3 (Ammonia)	mg/L	0.02	0.14	0.14	] [		()		
N-NO2 (Nitrite)	mg/L	0.10	<0.10	<0.10		]	MAC	1,0	mg/L
N-NO3 (Nitrate)	mg/L	0.10	<0.1D	<0.10	1	i	MAC	10.0	mg/L
p <b>H</b>	l i	ì	8.19	8.20			AO	6.5-8.5	
Phenols	mg/L	0.001	< 0.001	<0.001		!	]	l	
Sulphete	mg/L	1	15	15		1	AO	500	mg/L
Tannin & Lignin	rng/L	0.1	0.1	0.1		<b>,</b>			
TOS (COND - CALC)	mg/L	5	244	244	ĺ	<b>1</b>	OA	500	mg/∟
Total Kjeldahl Nitrogen	mg/L	0.05	0.17	0.17					
Turbidity	ทาบ	0.1	0.3	0.6			AO .	1,0	NTU
Hardness as CaCO3	mg/L	1	121	127			OG	100	rng/L
on Balance	1 i	0.01	0.96	1.00		l		Į į	
Calcium	mg/L	1	22	23			ļ.	i	i
Magnesium	mg/L	1	16	17			ŀ		
Potaesium	mg/L	1	4	A					
Sodium	mg/L	2	31	3†			AO .	20	mg/L
ran	mg/L	0.03	0.05	0.05			AC)	0.3	mg/L
	mg/t.	0.01	<0.61	<0.01	1		AO	0.65	mg/L

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration Comment:

608 Nonis Court, Kingston, ON, K7P 2R8

**APPROVAL** 

Client: Paterson Group

28 Concourse Gate, Unit 1

Nepean, ON K2E 717

Attention: Mr. Robert Passanore

Report Humber: Date:

2705468 2007-03-26

Ozta Submitted:

2007-03-22

Project

PH0482

P.O. Number:

Matrix:	Water

STATE OFFICE GROUP IN							Matrix:		Water	
NVOICE: Paterson Group Inc.						<del>                                     </del>		1	GUIDELINE	
Chain of Custody Number: 52194		LAB IO:	531325	531326		+				_
	Samp	le Date:	2007-03-21	2007-03-21		<del> </del>		1	0011000	
		npte ID:	TW6 W51	TW6 WS2			Ì	f	ODWSOG	
				i				l l		
			1					TYPE	LIMIT	บทเร
	UNITS	MDL						1 TPE	O O	ct/100m
PARAMETER		IND L	0	0			ļ	MAC		ct/100m
Total Coliforms	ct/100mL		ا آ	อ	ì	1	]	MAC	0	En locals
Escherichia Coli	ct/100ml.		1 0	1 1	1		}			1
Heterotraphic Plate Count	ct/1mL	ļ	1 "	a		ļ	Į.	N .		
Hetelondburg Liste Appril	ct/100mL		0				1	Į.	ł	1
Faecal Coliforms	ct/100mL	į.	0	0	ļ	ì		H	1	
Faecal Streptococcus				1		}	ł	1		1
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	I				<u>. L</u>	IAC = Interior Maxt	num Albushie C	onemetration		

MOL ~ Method Detection Limit INC = Incomplete AC = Asstratio Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Microbiology Analyst

2007

10:55

613

ACCUTEST

Comment:

Nepean, ON K2E 717

INVOICE: Paterson Group Inc.

Attention: Mr. Robert Passmore

28 Concourse Gate, Unit 1

Report Number:

2705474 2007-03-26

Date: Oate Submitted:

2007-03-22

28/03

2007

16:10

FAX

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5222

ACCUTEST LABS

Project:

PH0482

F.O. Number:

Water

Chain of Custody Number: 52194	of Custody Number: 52194					Matrito		Water	
Aithur at adheral hallmann anna.		LAB ID:	531353	531354				GUIDELINE	
	Samp	ile Date:	2007-03-21	2007-03-21					
	•	mple <b>i</b> D:	TW6 WS1	TW6 W52			Ĭ	ODWSOG	
				ļ	{			OBNEGO	
							<u> </u>		
PARAMETER	UNITS	MOL					TYPE	LIMIT	UNITS
Alkalinity as CaCO3	mg/L	5	227	226	1		OG	500	mg/L
Chlaride	mg/L	1	7	7	l j		AO	250	mg/L
Colour	₹ TCU	2	3	3			AO	5	TCU
Conductivity	u\$/cm	5	477	475	l !			ļ	
Disselved Organic Carbon	mg/L	0.5	2.0	2.1			AÓ	5	mg/L
Fluoride	mg/L	0.10	0.32	0.32	1		MAC	1.5	mg/L
Hydrogen Sulphide	mg/L	0.01	0.01	<0.01			OA	0.05	mg/L
N-NH3 (Ammonia)	mg/L	0.02	0.15	0.15				ļ	
N-NO2 (Nitrite)	mg/L	0,10	<0.10	<0.10			MAC	1.0	mg/L
N-NO3 (Nitrate)	mg/L	0.10	<0.10	<0.10	1	Į	MAC	10.0	mg/L
pH			8.11	8.14			AO	6.5-B.5	
Phenois	mg/L	0.001	<0.001	<0.001		į.			
Sulphate	mg/L	1	24	24		i	OA	500	mg/L
Tannin & Lignin	mg/L	0.1	0.2	0.2		1 ;			
TOS (COND - CALC)	mg/L	5	310	309			AO	500	rng/L
Total Kisidahi Nitrogen	mg/L	0.05				ľ			
Turbidity	NTU	0.1	1.0	1.0			AO	1.0	NITU
Hardness as CaCO3	mg/L	1	222	229		1	OG	100	mg/L
Ion Batance		0.01	0.91	0.95					
Calcium	mg/L	1	46	47					
Magnesium	mg/L	1	26	27		ł			
Potassium	rng/L	1	3	3		<b>!</b>			•
Sodium	mg/L	2	6	7		•	AO	20	mg/L
Iron	mg/L	0.03	0.17	0.18	1		AC	0.3	mg/L
Manganese	mg/L	0.01	0.01	0.01			ΑO	0.05	mg/L
Inter the state of	,,	į	]	j ,	1	]			
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MDL = Misthod Detection Limit | INC = Incomplete AO = Acsthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration | IMAC = Interim Maximum Allowable Concentration Comment:

APPROVAL

Inorganic Lab Supervisor

28 Concourse Gate, Unit 1

Nepean, ON

INVOICE: Paterson Group Inc.

K2E 7T7

Attention: Mr. Robert Passmore

Report Number:

2601811

Date:

2008-01-28 2008-01-25

Date Submitted:

PH0482

Project:

P.O. Number:

Chain of Custody Number: 74467					P.O. Number: Matrix:		6758 Water	
•	L/	AB ID: 600	0527 600528		MIGUAL		GUIDELINE	
	Sample		-01-24 2008-01-24			<u> </u>	GOIDEERIG	<del>-</del>
			WS1 TW5 WS2				ODWSOG	
PARAMETER	UNITS	MRL		<del>                                     </del>		TYPE	LIMIT	UNITS
Total Coliforms	ct/100mL		0 0		<del></del>	MAC	. 0	cl/100ml
Escherichia Coli	ct/100mL		0 0			MAC	j ,	ct/100m
felerotrophic Plate Count	ct/1mL		0 0	1	l i	711710		COTOOR
Faecal Coliforms	ct/100mL		0 0	· [				
Faecal Streptococcus	ct/100mL	,	0 0				1	
			-					

MRL = Method Reporting Limit INC = Incomplete AD = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration Comment:

APPROVAL;

Tim McCooeye QC Manager

28 Concourse Gate, Unit 1

Nepean, ON K2E 7T7

INVOICE: Paterson Group Inc.

Attention: Mr. Robert Passmore

Report Number:

Report Numb

2801841 2008-01-30

Date Submitted:

2008-01-25

Project:

PH0482

110402

P.O. Number:

5758 Water

						P.O. Municer:		5/56	
				T		Matrix:			
_				ļ. <u></u>	<b></b>	<u> </u>	₽	GUIDELINE	
		2008-01-24				1	1		
Sa	imple 10:	TWI-	TW5 WS2					ODWSOG	
UNITS	MRL		<del>                                     </del>		<del>                                     </del>		TYPE	LIMIT	UNITS
rng/L	5	398	399,	<del>                                     </del>	1	1	OG		mg/L
mg/L	1 1			<b>§</b>	i .				mg/L
του	2	26		<u> </u>			41	1	TCU
uS/cm	5	1090		}		Ţ	,	1	
. mg/L	0.5	14.8			ļ		AO	5	mg/L
mg/L	0.10	<0.10				ľ	EI .		mg/L
mg/L	0.01	0.01	0.01						mg/L
mg/L	0.02	0.77	0.76	Į			1		
mg/L	0.10	<0.10	<0.10		1		MAC	1.0	mg/L
mg/L	0.10	<0.10	<0.10	•					mg/L
		7.95	7.95			Į.	AO		
mg/L	0.001	<0.001			1	ł			
mg/L	1	202	200				AO	500	mg/L
mg/L	0.1	1.0	1,1		]				
mg/L	5	708	`708		İ		AO	500	mg/L
mg/L	0.10	1.29	1.23		l		Ŋ		-
UTN	0.1	26.5	27.6		· ·	ł	AO	1,0	NTU
mg/L	1	635	649		į		≎G	100	mg/L
	0.01	1.05	1.07						
mg/L	1 1	175	179					1	i ·
mg/L	1	48	49		1				
mg/L	1	2	2					1	
mg/L	2	13	13		]		AO	20	mg/L
mg/L	0.03	4.78	4.73		1	] ]	AO	0.3	mg/L
mg/L	0.01	0.30	0.30		1		AO	0.05	mg/L
			VI.02				70	n.oct	111
	UNITS  mg/L	mg/L 5 mg/L 1 TCU 2 uS/cm 5 mg/L 0.5 mg/L 0.5 mg/L 0.01 mg/L 0.02 mg/L 0.10 mg/L 0.10 mg/L 0.10 mg/L 0.10 mg/L 0.10 mg/L 0.10 mg/L 1 mg/L 0.1 mg/L 1 mg/L 5 mg/L 0.1 mg/L 5 mg/L 1 mg/L 1 mg/L 1 mg/L 1 mg/L 1 mg/L 1 mg/L 1 mg/L 1 mg/L 1 mg/L 1 mg/L 1 mg/L 1 mg/L 1 mg/L 1 mg/L 1 mg/L 1 mg/L 1 mg/L 1 mg/L 1	Sample Date: Sample ID:    UNITS   MRL	UNITS   MRL   TW5 WS1   TW5 WS2 Tw1   TW5 WS2 Tw1   Tw5 WS2 Tw1   Tw5 WS2 Tw1   Tw5 WS2 Tw1   Tw5 WS2 Tw1   Tw5 WS2 Tw1   Tw5 WS2 Tw1   Tw1   Tw5 WS2 Tw1   Tw1   Tw5 WS2 Tw1   Tw1   Tw5 WS2 Tw1   Tw1   Tw5 WS2 Tw1   Tw1   Tw5 WS2 Tw1   Tw1   Tw5 WS2 Tw1   Tw1   Tw5 WS2 Tw1   Tw1   Tw5 WS2 Tw1	Sample Date:   2008-01-24   2008-01-24   TW5 WS2   TW5	Sample Date:   2008-01-24   2008-01-24     TW5 WS2   T	LAB ID:   600605   600606	LAB ID:	LAB ID:   600605   800606

MRL = Method Reporting Limit INC = Incomplete AO = Assisted Objective OG = Operational Guidetine MAC = Maximum Atlowable Concentration (MAC = Interim Maximum Atlowable Concentration Comment:

APPROVAL:

Ewali-McRobbie Inorganic Lab Supervisor

1 of 1

#### EAUVA ACCUTES!

### REPURT OF ANAL (SIS



Client: Paterson Group

28 Concourse Gate, Unit 1

Nepean, ON K2E 7T7

Attention: Mr. Robert Passmore

Report Number:

2929266 2009-11-30

Date: Date Submitted:

2009-11-27

Project:

PH04B2

P.O. Number:

INVOICE: Paterson Group Inc. Chain of Custody Number: 105053				P.O. Number: Matrix:		8378 Water	
Chain of Custody (Author). 199093	LAB JD:	763514	763515	111001101		GUIDELINE	
	Sample Date:	2009-11-27	2009-11-27				-
	Sample ID:	TW7-WS1-09		_		ODWSOG	
PARAMETER	UNITS MRL				TYPE	LIMIT	UNITS
Total Coliforms	CFU/100mL	0	0		MAC	0	CFU/100m
Escherichia Coli	CFU/100mL	0	0		MAC	0	CFU/100m
Heterotrophic Plate Count	CFU/1mL	1	3	[ [			1
Faecal Coliforms	CFU/100mL	0	0	1 1		1	
Faecal Streptococcus	CFU/100mL	0	0	] ]			

MRL = Method Reporting Limit INC = Incomplete AC = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration Comment:

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$\Delta$ r	F 1 1	•	,,,	

Dragana Dzeletovic Microbiology Analyst



Client: Paterson Group

28 Concourse Gate, Unit 1

**Nepean**, ON K2E 717

Attention: Mr. Robert Passmore

Report Number: Date:

2929267 2009-12-03

Date Submitted:

2009-11-27

Project:

PH04B2

INVOICE: Paterson Group Inc.

Chain of Custody Number: 105053

P.O. Number: Matrix:

8378 Water

	ain of Custody Number: 105053					Matrix:		VVater	
		LAB ID:	763516	763517				GUIDELINE	
	Sam	ple Date:	2009-11-27	2009-11-27					
	Sa	ample ID:	TW7- WS1-09	TW7- WS2-09				ODWSOG	
PARAMETER	UNITS	MRL					TYPE	LIMIT	UNITS
Alkalinity as CaCO3	mg/L	5	382	384			OG	500	mg/L
Chloride	mg/L	1	16	16			AO	250	mg/L
Colour	TCU	2	19	21		İ	ΑÖ	5	TCU
Conductivity	uS/cm	5	938	941			l	1	
Dissolved Organic Carbon	mg/L	0,5	10.8	12.4			AO	5	mg/L
Fluoride	mg/L	0.1	0.14	0.14	1		MAC	1.5	mg/L
Hydrogen Sulphide	mg/L	0.01	<0.01	<0.01			AO	0.05	mg/L
N-NH3 (Ammonia)	mg/L	0.02	0.65	0,65				1	
N-NO2 (Nitrite)	mg/L	0,1	<0.10	<0.10	1		MAC	1.0	mg/L
N-NO3 (Nitrate)	mg/L	0.1	<0.10	<0.10			MAC	10.0	mg/L
pH			7,96	7.97		}	Ì	6.5-8.5	
Phenois	mg/L	0.001	<0.001	<0.001			II.		
Sulphate	mg/L	1	122	130			AO	500	mg/L
Tannin & Lignin	mg/L	0.1	0.8	0,8			#		
Total Dissolved Solids (COND - CALC)	mg/L	5	610	612			AO	500	mg/L
Total Kjeldahl Nitrogen	mg/L	0.1	0.72	0.64		[			
Turbidity	NTU	0,1	21.0	19.0			MAC	1.0	עדא
Hardness as CaCO3	mg/L	1	482	484			OG	100	mg/L
on Balance		0,01	0.97	0.96					
Calcium	mg/L	1	127	128	1				
Magnesium	mg/L	1	40	40					i
Potassium	mg/L	1	2	2					
Sodlum	mg/L	2	14	15			AO	200	mg/L
l	mg/L	0.03 0.01	3,39	3.33	1		AO AO	0.3 0.05	mg/L mg/L
Iron	mg/L		0.20	0.20					

MRL = Method Reporting Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration Comment:

APPROVAL:

Ewan McRobbie Inorganic Lab Supervisor

#### **REPORT OF ANALYSIS**



Client: Paterson Group

28 Concourse Gate, Unit 1

Nepean, ON K2E 7T7

Attention: Mr, Robert Passmore

Report Number:

1000576

Date:

2010-01-14

Date Submitted:

2010-01-12

Project:

PH0482

P.O. Number:

INVOICE: Paterson Group Inc.

Chain of Custody Number: 106392

Matrix:

Water

Chain of Custody Number: 108392				 		Matrix:		Water	
		.AB ID:	770701		Į.			GUIDELINE	
	Sample	e Date:	2010-01-12				]		
	Sam	ple ID:	WS Jan 12/10					opwsog	
						i		05,1000	
		MRL	_	 			TYPE	LIMIT	UNITS
Total Coliforms CFU	Ų/100mL		0		!		MAC	0	CFU/100mi
Escherichia Coli CFU	U/100mL		0				MAC	0	CFU/100ml
Heterotrophic Plata Count CF	FU/1mL		5			Ì	A		
Faecal Coliforms CFU	U/100mL		0				1	1	
Faecal Streptococcus CFU	W/100mL		٥	ł			<b>(</b> '		i
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MRL = Method Reporting Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration Comment:

**Drinking Water Coordinator** 

#### **REPORT OF ANALYSIS**



Client: Paterson Group

28 Concourse Gate, Unit 1

Nepean, ON K2E 7T7

INVOICE: Paterson Group Inc.

Attention: Mr. Robert Passmore

Report Number:

1000596

Date:

2010-01-20

Date Submitted:

2010-01-12

Project:

PH0482

P.O. Number:

Chain of Custody Number: 106392   LAB ID: 770726	Matrix:	TYPE	Water GUIDELINE ODWSOG	
Sample Date:   2010-01-12			ODWSOG	
Sample (D: WS JAN 12/10  PARAMETER UNITS MRL			ODWSOG	
PARAMETER UNITS MRL				
PARAMETER UNITS MRL				
			1 (150)	
			1.15.410	
Alkalinity as CaCO3   mg/L   5   337			LIMIT	UNITS
· · · · · · · · · · · · · · · · · · ·		OG	500	mg/L
Chloride         mg/L         1         15	J.	AO	250	mg/L
Colour TCU 2 18		AO	5	[ TCU
Conductivity uS/cm 5 821				l
Dissolved Organic Carbon mg/L 0.5 7.8		∥ AO	5	mg/L
Fluoride   mg/L   0.1   0.22	1	MAC	1.5	mg/L
Hydrogen Sulphide mg/L 0.01 <0.01		AO	0.05	mg/L
N-NH3 (Ammonia) mg/L 0.02 0.54		ļ		i
N-NO2 (Nitrite) mg/L 0.1 <0.10		MAC	1.0	mg/L
N-NO3 (Nitrate) mg/L 0.1 <0.10		MAC	10.0	mg/L
pH 7.85			6.5-8.5	
Phenois   mg/L   0.001   <0.001		- [		
Sulphate mg/L 1 112		AO	500	mg/L
Tannin & Lignin mg/L 0.1 0.5				
Total Dissolved Solids (COND - CALC) mg/L 5 534		AO.	500	mg/L
Total Kjeldahl Nitrogen mg/L 0.1 0.56		1	"	111914
Turbidity NTU 0.1 7.0		MAC	1.0	NTU
Hardness as CaCO3 mg/L 1 372		OG	100	mg/L
on Balance 0,01 0,92			1	mg. L
Calcium   mg/L   1   93		ľ		
Magnesium mg/L 1 34		i i	<u> </u>	
Potassium mg/L 1 3			1	
Sodium mg/L 2 27		AO	200	
fron mg/L 0.03 1.70		EI .		mg/L
Manganese mg/L 0.01 0.10		AO AO	0.3	mg/L
martyanese mg/L 0.01 0.10	}	AC	0.05	mg/L
	1			
		_!!		

MRL = Method Reporting Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration Comment:

APPROVAL

Ewan McRobbie Inorganic Lab Supervisor

#### **REPORT OF ANALYSIS**



Client: Paterson Group

28 Concourse Gate, Unit 1

Nepean, ON K2E 7T7

INVOICE: Paterson Group Inc.

Attention: Mr. Robert Passmore

Report Number:

Date:

1001869 2010-02-01 2010-01-29

Date Submitted:

Project:

PH0482

P.O. Number:

7886

Chain of Custody Number: 106397					P.O. Number:	T.	7886		
Chair of Castody (California 10038)	77					<del></del>	Water GUIDELINE		
			<del>  </del>			<b>∮</b>	<u>:                                    </u>		
	Sample D Sample	ate: 2010-01-29 ID: W\$1-29-10 2	<del>,</del>			4			
	эвпърс	ID:   44.9  -59-10.5	<b>'</b>				ODWSOG		
				İ	1				
PARAMETER	UNITS MI	₹E.	<del> </del>		<del>-  </del>	TYPE	LIMIT	UNITS	
Colour	TÇU 2	7				AO	5	TCU	
Turbidily	NTU 0.	1 3.4				MAC	1.0	NTU	
Iron	mg/L 0.	0.87			}	AO	0.3	mg/L	
		<b>I</b>			i			,g	
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MRL = Method Reporting Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration Comment:

APPROVÁL

#### **REPORT OF ANALYSIS**



Client: Paterson Group

28 Concourse Gate, Unit 1

Nepean, ON K2E 7T7

INVOICE: Paterson Group Inc.

Attention: Mr. Robert Passmore

Report Number:

1022585

Date: Date Submitted: 2010-09-20 2010-09-17

Project:

PH0482

P.O. Number:

7892

INVOICE: Paterson Group Inc. Chain of Custody Number: 129684						P.O. Number: Matrix:		7892 Water		
	LAB ID:	829312						GUIDELIN	E	
	Sample	le Date: 🗌	2010-09-17		1	1				
Sample ID:			TW8-W\$2					ODWSOG		
PARAMETER	UNITS	MRL						TYPE	UNITS	
Total Colliforms	CFU/100mL	MICAL	1				1	MAC	LIMIT 0	CFU/100m
Escherichia Coli	CFU/100mL		ò					MAC	0	CFU/100m
leterotrophic Plate Count	CFU/1mL		88		l				ľ	O/ 1001
aecat Collforms	CFU/100mL		0			Ĭ		4		1
Faecal Streptococcus	CFU/100mL	i	ŏ	i		1		1		†
	[5.5]	1	-			ļ		1	1	
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MRL = Method Reporting Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration BMAC = Interim Maximum Allowable Concentration Comment:

APPROVAL:

Jennilec Mitchell
Microbiology Lab Supervisor

#### **REPORT OF ANALYSIS**



Client: Paterson Group

28 Concourse Gate, Unit 1

Nepean, ON K2E 7T7

Attention: Mr. Robert Passmore

INVOICE: Paterson Group Inc.

Report Number:

Date:

1022567 2010-09-21

Date Submitted:

2010-09-17

Project:

PH0482

P.O. Number:

7892

Chain of Custody Number: 106399				Matrix:		Water			
		LAB ID:	829275 2010-09-16					GUIDELINE	
	Sample Date:								
	s	ampie ID:	TW8-WS1					ODWSOG	
PARAMETER	етіиш	MRL				<del>                                     </del>	TYPE	LIMIT	UNITS
Alkatinity as CeCO3	mg/L	5	294				OG	500	mg/L
Chloride	mg/L	] 1	13	ł I		1	AO	250	mg/L
Colour	TCU	2	13				AO	5	TCU
Conductivity	uS/cm	5	711				1		1
Dissolved Organic Caroon	mg/L	0.5	5.0				AO	5	mg/L
Fluoride	mg/L	0.1	0.41				MAC	1.5	mg/L
Hydrogen Sulphide	mg/L	0.01	<0.01			}	AO	0.05	mg/L
N-NH3 (Ammonia)	mg/L	0.02	0.21	]			A .		•
N-NO2 (Nitrite)	mg/L	0.1	<0.10	ľ			[ MAC	1.0	mg/L
N-NO3 (Nitrate)	mg/L	0.1	<0.10				MAC	10.0	mg/L
pH	1	ļ	8.16		ľ	1		6.5-8.5	
Phenois	mg/L	0.001	<0.001	}			ľ		
Sulphate	mg/L	1	76				AO	500	mg/L
Tannin & Lignin	mg/L	0.1	0.2					!	
Total Dissolved Solids (COND - CALC)	mg/L	5	462			1	AO	500	mg/L
Total Kjeldahi Nitrogen	mg/L	0.1	0.53	<b>(</b>					
Turbidity	NTU	0.1	0.9				MAC	1.0	NTU
Hardness as CaCO3	mg/L	1	248				06	100	mg/L
Ion Balance		0.01	0.94						_
Calcium	mg/L	1	50				] ]		
Megnesium	mg/L	1	30				[ [		
Potassium	mg/L	1	6				1	J	
Sodium	mg/L	2	51				AO	200	mg/L
Iron .	mg/L	0.03	0.44	İ			AO	0.3	mg/L
Manganese .	mg/L	0.01	0.03		i		AO	0.05	mg/L
			,						

MRL = Method Reporting Limit INC = Incomplete AO - Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration Comment:

APPROVA

Ewan McRobbie Inorganic Lab Supervisor

#### **REPORT OF ANALYSIS**



Client: Paterson Group

28 Concourse Gate, Unit 1

Nepean, ON K2E 7T7

Attention: Mr. Robert Passmore

Report Number:

Date:

1022614 2010-09-21

Date Submitted:

2010-09-17

Project:

PH0482

INVOICE: Paterson Group Inc. Chain of Custody Number: 129684						P.O. Number: Matrix:		7892 Water	
*		LAB ID:	829452		<del></del>	mauta,	·	GUIDELINE	
	Sar	nple Date:	2010-09-17	<del>-</del>	<del>- ·  </del>			GOIDEFIA	
	Sample ID:								
		-			1			ODWSOG	
PARAMETER	UNITS	MRL			-		TYPE	LIMIT	UNITS
Alkalinity as CeCO3	mg/L	5	286			1	OG	500	mg/L
Chloride	mg/L	1	13	- 1			AO	250	mg/L
Colour	TCU	2	12		ĺ		AO	5	TCU
Conductivity	uS/cm	5	693		ł	[ ]		1 ~	1 .50
Dissolved Organic Carbon	mg/L	0.5	4.9	· ·			AO	5	mg/L
Fluoride	mg/L	0.1	0.41	f	ŀ		MAC	1.5	mg/L
Hydrogen Sulphide	mg/L	0.01	<0.01				AO	0.05	mg/L
N-NH3 (Ammonia)	mg/L	0.02	0.21	j		i	70	0.00	ilig/L
V-NO2 (Nitrite)	mg/L	0.1	<0.10	i			MAC	1.0	mg/L
V-NO3 (Nitrate)	mg/L	0.1	<0.10				MAC	10.0	mg/L
pH	-		8.18				IVIAO	6.5-8.5	nigre
Phenois	mg/L	0.001	<0.001	1				0.0-0.5	ľ
Sulphate	mg/L	1 1	70				AO	500	mg/L
Fannin & Lignin	mg/L	0.1	0.2	- 1	1		70	300	mg/L
Total Dissolved Solids (COND - CALC)	mg/L	5	450	ł			AO	500	
Total Kjeldahl Nilrogen	mg/L	0.1	0.73		ĺ	1 #	70	350	mg/L
Furbidity	NTU	0.1	0.7			l l	MAC	1.0	NTU
fardness as CaCO3	mg/L	1 1	233				DG	100	_
on Balance	1113.5	0.01	0.90		ĺ	i II	O.G	'00	mg/L
Calcium	mg/L,	1	47		1	l li			
Magnesium	mg/L	1	28		1			<b>]</b>	
Potassium	mg/L	1 1	5			ſ			
Sodlum	mg/L	2	46				ΑÓ	200	
Numinum	mg/L	0.01	<0.01		ļ		OG		rng/L
intimony	mg/L	0.0005	<0.0005					0.1	mg/L
rsenic	mg/L	0.000	<0.001			į i	IMAC IMAC	0.006	mg/L
arlum .	mg/L	0.001	0.34	j		[		0.025	mg/L
eryllium	mg/L	0.001	<0.001	1	ļ		MAC	1.0	mg/L
oron	mg/L	0.001	0.16		J	i	1144.0	5.0	
admium	mg/L	0.0001	<0.0001	İ	ļ		IMAC MAC	5.0 0.005	mg/L mg/L

MRL = Method Reporting Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration Comment:

Inorganic Lab Supervisor

### **REPORT OF ANALYSIS**



Client: Paterson Group

28 Concourse Gate, Unit 1

Nepean, ON K2E 7T7

Attention: Mr. Robert Passmore

INVOICE: Paterson Group Inc.

Report Number: Date:

Date Submitted:

1022614 2010-09-21 2010-09-17

Project:

PH0482

P.O. Number:

7892

Obstant Control of the control of th							P.O. NOINDE	•	7032	
Chain of Custody Number: 129684							Matrix:		Water	
		LAS IQ:	829452		ļ			<u> </u>	GUIDELINE	
		nple Date:	2010-09-17	_						
	S	ample ID:	TW8-WS2		]		1	1	ODWSOG	
						ŀ	1	ŀ	ODWIGOG	
	<del></del>	r					_[			
PARAMETER	UNITS	MRL				1		TYPE	LIMIT	UNITS
Chromium	mg/L	0.001	0.002				İ	MAC	0.05	mg/L
Cobalt	mg/L	0.0002	<0.0002						Ì	
Copper	mg/L	0.001	<0.001				1	AO	1.0	mg/L
lron	∱ mg/L	0.03	0.41			1		AO	0.3	mg/L
Lead	mg/L	0.001	<0.001					MAC	0.010	mg/L
Manganese	mg/L	0.01	0.03			i	1	AO	0.05	mg/L
Mercury	mg/L	0.0001	<0.0001					MAC	0.001	mg/L
Molybdenum	mg/L	0.005	<0.005		}					
Nickel	mg/L	0.005	<0.005							İ
Selenium	mg/L	0.001	<0.001		l	}		MAC	0.01	mg/L
Sillcon	mg/L	0.1	6.7							""
Silver	mg/L	0.0001	<0.0001		1			j	ľ '	
Strontium	mg/L	0.001	1.76					1		ļ
Thallium	mg/L	0.0001	<0.0001						1	
Titanlum	mg/L	0.01	<0.01					íl –		
Vanadlum	mg/L	0.001	0.002					l}		
Zin¢	mg/L	0.01	<0.01			1	1 1	AO	5.0	mg/L
-··· <b>·</b>	""9"2	Ų.V.	-0.01		ļ			_~~	3.0	myr.
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MRL = Method Reporting Limit | INC = Incomplete | AC = Aesthetic Objective | OG = Operational Guideline | MAC = Maximum Allowable Concentration | IMAC = Interim Maximum Allowable Concentration Comment:

APPROVAL:

Inorganic Lab Supervisor

Ewan McRobbi

#### **REPORT OF ANALYSIS**



Client: Paterson Group

28 Concourse Gate, Unit 1

Nepean, ON K2E 7T7

Attention: Mr. Robert Passmore

Report Number: Date:

1022614 2010-09-21

Date Submitted:

2010-09-17

Project:

PH0482

INVOICE: Paterson Group Inc. Chain of Custody Number: 129884							P.O. Number: Matrix:		7892 Waler	
	<u> </u>	LAB ID:	829452			I		T	GUIDELINE	
	San	nple Date:	2010-09-17	-	1	1				
	S	ample ID:	TW8-WS2							
									ODWSOG	
PARAMETER	UNITS	MRL				<del> </del>		TYPE	LIMIT	UNIT
TRIAZINE & RELATED HERBICIDES							-		1	
Atrazine	ug/L	0.2	<0.2				1			•
De-ethylated atrazine	ug/L	0.5	<0.5				1		ł	
Cyanazine	ug/L	1	<1					IMAC	10	ug/L
Metolachior	ug/L	0.5	<0.5		!	1		IMAC	50	ug/L
Prometryne	ug/L	0.25	<0.25				l li	IMAC	1 1	ug/L
Simazine	ug/L	1 1	<1		İ	i	1	IMAC	10	ug/l
							:			
							! <u> </u>			
	l i				1	l				

MRL = Method Reporting Limit INC = Incomplete AQ = Aesthelic Objective QG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration Comment:

Organic Leb Team Leader



e Gale, Unit 1

obert Passmore

ŝΤ

Report Number: Date:

1022429

Date Submitted:

2010-09-20 2010-09-15

PH0482

Project:

. 3on Group Inc. Chain o. dy Number: 129682					P.O. Number: Matrix:		7892 Water	
	LAB ID:	828874	828875				GUIDELIN	E
	Sample Date:	2010-09-15	2010-09-15				<del>-</del>	
	Sample ID:	WS1-TW9	W\$2-TW9				opwsog	;
PARAMETER	UNITS MRL		<u> </u>			TYPE	LIMIT	UNITS
Total Coliforns	CFU/100mL	89	68			MAC	0	CFU/100mL
Escherichia Coli	CFU/100mL	O C	0	l l		MAC	0	CFU/100mL
Heterotrophic Plate Count	CFU/1mL	107	46			· ·	1	
Faecal Coliforms	CFU/100mL	0	0		1			1
Faecal Streptococcus	CFU/100mL	0	Ō					

MRL = Method Reporting Limit INC = incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration Comment:

### **REPORT OF ANALYSIS**



Client: Paterson Group

28 Concourse Gate, Unit 1

Nepean, ON

K2E 7T7

Attention: Mr. Robert Passmore

Report Number:

Date:

1022441

Date Submitted:

2010-09-21 2010-09-15

Project:

PH0452

P.O. Number:

7892

INVOICE: Paterson Group Inc.

Alkalinity as CaCO3 n Chloride n Colour T Conductivity us Dissolved Organic Carbon n Fluoride n Hydrogen Sulphide n		LAB ID: ple Date: tample ID: MRL 5 1	828919 2010-09-15 WS1-TW9 201 56	828920 2010-09-15 WS2-TW9			TYPE	GUIDELINE ODWSOG	
Alkalinity as CaCO3 n Chloride n Colour T Conductivity us Dissolved Organic Carbon n Fluoride n Hydrogen Sulphide n	INITS mg/L mg/L TCU iS/cm	MRL 5	WS1-TW9	WS2-TW9					
Alkalinity as CaCO3 n Chloride n Colour 7 Conductivity us Dissolved Organic Carbon n Fluoride n Hydrogen Sulphide n	INITS mg/L mg/L TCU iS/cm	<b>MRL</b> 5	201	204					
Alkalinity as CaCO3 n Chloride n Colour T Conductivity us Dissolved Organic Carbon n Fluoride n Hydrogen Sulphide n	mg/L mg/L TCU iS/cm	5 1	1					LIMIT	UNITS
Chloride no Colour 17 Conductivity us Dissolved Organic Carbon Fluoride no Hydrogen Sulphide no Colour no	mg/L TCU IS/cm	1	1						
Colour T Conductivity us Dissolved Organic Carbon m Fluoride m Hydrogen Sulphide m	TCU iS/cm	•	56			l l	ll og	500	mg/L
Conductivity us Dissolved Organic Carbon ri Fluoride ri Hydrogen Sulphide ri	5/cm	2		55			AO	250	mg/L
Dissolved Organic Carbon n Fluoride n Hydrogen Sulphide n			<b>&lt;</b> 2	<2			AO	5	TCU
Fluoride m Hydrogen Sulphide m	mg/L	5	662	657	!				
Fluoride m Hydrogen Sulphide m		0.5	1.5	1.7			AO	5	mg/L
	mg/L	0.1	0.37	0.37			MAC	1.5	mg/L
	mg/L	0.01	<0.1	<0.01			AQ	0.05	mg/L
N-NH3 (Ammonia)	mg/L	0.02	0.05	0.04		ĺ	'		"""
· · · · · · · · · · · · · · · · · · ·	mg/L	0.1	<0.10	<0.10			l MAC	1.0	mg/L
N-NO3 (Nitrate)	mg/L	0.1	<0.10	<0.10			MAC	10.0	mg/L
рн .	•		8.04	8.12	i			6.5-8.5	
Phenois n	ng/L	0.001	<0.001	<0.001	1				ĺ
Sulphate n	ng/L	1	54	50		İ	i ao	500	mg/L
	ng/L	0.1	<0.1	<0.1					/··· <b>g-</b> -
Fotal Dissolved Solids (COND - CALC) π	ng/L	5	430	427	]		AO I	500	mg/L
Total Kjeldahl Nitrogen m	ng/L	0.1	0.21	0.32	ĺ				
	NTU	0.1	13.1	2.5			MAC	1.0	NTU
Herdness as CaCO3 m	ng/L	1	231	229			OG	100	mg/L
on Balance	1	0.01	0.92	0.92				•	
Dalcium m	ng/L	1	48	47					
	ng/L	1	27	27	ľ				
	ng/L	1	5	5				- 1	
_	ng/L	2	34	34			AO	200	mg/L
	ng/L	0.03	0.47	0.13			AO	0.3	mg/L
t t	ng/L	0.01	0.03	0.02			AO	0.05	mg/L

MRL = Method Reporting Limit INC = Incomplete AD = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration Comment:

628919: H2S MRL elevated due to sample turbidity.

APPROVAL

Ewan McRobbie Inorganic Lab Supervisor

### **REPORT OF ANALYSIS**



Client: Paterson Group

28 Concourse Gate, Unit 1

Napean, ON

K2E 7T7

Attention: Mr. Robert Passmore

INVOICE: Paterson Group Inc.

Report Number:

1023312

Date:

**Date Submitted:** 

2010-09-27 2010-09-24

Project:

PH0482

P.O. Number:

Chain of Custody Number: 129698							P.Q. Number	r:		
		LAB ID;	831312	<del>-</del>	<del></del>	-,	Matrix:		Water	
	Cam	ple Date:	001012		<del>-</del>	<u> </u>	<u> </u>		GUIDELIN	E
			2010-09-23		<del></del>	<del></del>		_]ļ		
	98	imple ID:	TW9-WS3 23-				1	j	ODWSOG	
			09-10			1	1		ODWSOG	,
PARAMETER	UNITS	MRL			<del> </del>			<u> </u>		
Total Coliforms	CFU/100mL	MICLE	Ō		<del> </del> _	<del> </del>		TYPE	LIMIT	UNITS
Escherichia Coll	CFU/100mL					į.		MAC	0	CFU/100m
Helerotrophic Plate Count	CFU/1mL		0					MAC	0	CFU/100m
Faecal Coliforms			6		1				1	ĺ
Faecal Streptococcus	CFU/100mL		0			1		Į.		
	CFU/100mL		0		1	1	1		1	1
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RI = Method Reporting Limit INC - become take A.C. A. (1)	<u>i_</u>			_ 1				. 1	i	

MRL = Method Reporting Limit INC = Incomplete AO = Aesthelic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration Comment:

APPROVAL:

# **REPORT OF ANALYSIS**



Client: Paterson Group

28 Concourse Gate, Unit 1

Nepean, ON K2E 7T7

Attention: Mr. Robert Passmore

INVOICE: Paterson Group Inc.

Report Number:

1023306

Date:

Date Submitted:

2010-09-30 2010-09-24

Project:

PH0462

P.O. Number:

Chain of Cuetody Number: 129698					Matrix:	•	Water	
	· · · · · · · · · · · · · · · · · · ·	LAB ID:	831305			i -	GUIDELIN	
	San	iple Date:	2010-09-23		<del>-   -  </del>	╂───	2010ELII4	<del>-</del>
	S	ample ID:	TW9-WS3-		<u> </u>	1		
			23/09/10			Į	ODWSOG	;
PARAMETER	UNITS	MRL	<del></del>					
Alkalinity as CaCO3	mg/L	5	202			TYPE	LIMIT	UNIT
Chloride	mg/L	1 1		}	J	og	500	mg/L
Colour	TCU	2	59		1	I AO	250	mg/L
Conductivity	uS/cm	5	2 642			[] AO	5	TCU
Dissolved Organic Carbon	mg/L	0.5	1.4	J		i		
Fluoride	mg/L	0.5 0.1	0.36		1 1	AO	5	mg/L
Hydrogen Sulphide	mg/L	0.01	<0.01			MAC	1.5	d mg/L
N-NH3 (Ammonia)	mg/L	0.02	0.09		[	AO	0.05	mg/L
4-NO2 (Nitrite)	mg/L	0.02	<0.10	ľ	1 1		ł	
I-NO3 (Nitrate)	mg/L	0.1	<0.10			MAC	1.0	mg/L
iH	'"9/L	U. 1	8.02			MAC	10.0	mg/L
Phenois	mg/L	0.001	<0.001	1	1		6.5-8.5	]
Sulphate	mg/L	1	48					
annin & Lignin	mg/L	0.1	<0.1			AO	500	mg/L
otal Dissolved Solids (COND - CALC)	mg/L	5	417		] }			J
otal Kjeldahi Nitrogen	mg/L	0.1	<0.10	1		AO	500	mg/L
urbidity	NTU	0.1	1.2			<b></b> _		
lardness as CaCO3	mg/L	1	227			MAC	1.0	NTU
on Belance	[ ""," ]	0.01	0.92		1 1	OG	100	mg/L
alcium	mg/L	1	48					
legnesium	mg/L	ì	26					
ōtassium .	mg/L	ìl	5		] [			
odium	mg/L	2	35	ļ			l	
on	mg/L	0.03	0.16			AO	200	mg/L
langanese	mg/L	0.01	0.02			AO	0.3	mg/L
	""ਰ"	2,51	0.02		j	AO	0.05	mg/L
	]	i		}				
	]		ļ			i	l	
			1			I		

MRL = Method Reporting Limit INC = Incomplete AC = Aesthetic Objective CG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration Comment:

**APPROVA** 

-Ewan McRobble

Inorganic Lab Supervisor

## **REPORT OF ANALYSIS**

Client: Paterson Group

28 Concourse Gale, Unit 1

Nepean, ON K2E 7T7

Attention: Mr. Robert Passmore

INVOICE: Paterson Group Inc.

Report Number: Date:

Date Submitted:

1027490 2010-11-10 2010-11-09

Project:

PH0482

P.O. Number:

10041

Chain of Custody Number: 127884					P.O. Number: Matrix:		10041 Water	
	LABIC		843640	843641			GUIDELINE	
	Sample Date	2010-11-08	2010-11-08	2010-11-08		<del>                                     </del>	-01025111	
	Sample ID	: MW1-10	MW2-10	MW8-10		l		
	<u> </u>							
PARAMETER	UNITS MRL			<del>                                     </del>		TYPE	LIMIT	UNITS
N-NO2 (Nitrile)	mg/L 0.1	< 0.10	<0.10	<0.10		<del></del>		UNITS
N-NÖ3 (Nitrate)	mg/L 0.1	0.16	0.16	0.16	1 1	1		l
NO2 + NO3 as N	mg/L 0.1	0.16	0.16	0.16				
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MRL = Method Reporting Limit INC = Incomplete AO = Aesthelia Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interfin Maximum Allowable Concentration Comment:

Inorganic Lab Supervisor



# **APPENDIX 4**

# Aquifer Analysis Data

Graphical Summary of Field Water Quality Data for Test wells

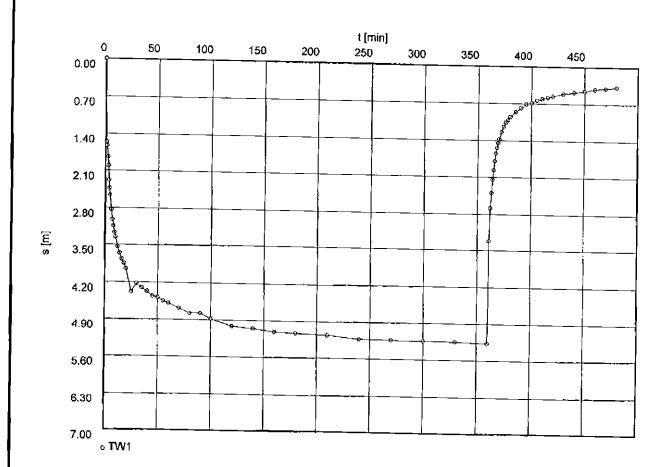
Figure - A4 – 1 - Potential Well Interference Model 1 (Cumulative Drawdown)

Figure - A4 – 2 - Potential Well Interference Model 2 (Individual Drawdown)

**Detailed Nitrate Impact Assessment Data** 



Paterson Group Ltd. 1-28 Concourse Gate	Pumping test analys Time-Drawdown plo	sis		none, Page 1
Nepeaл, ON K2E 7T7			Project: PH0482	
			Evaluated by: RAP	
Pumping Test No. 1		Test conducted on	n: Feb. 14/07	
TW1				
Discharge 0.40 l/s		<del> </del>	<u> </u>	
		1		



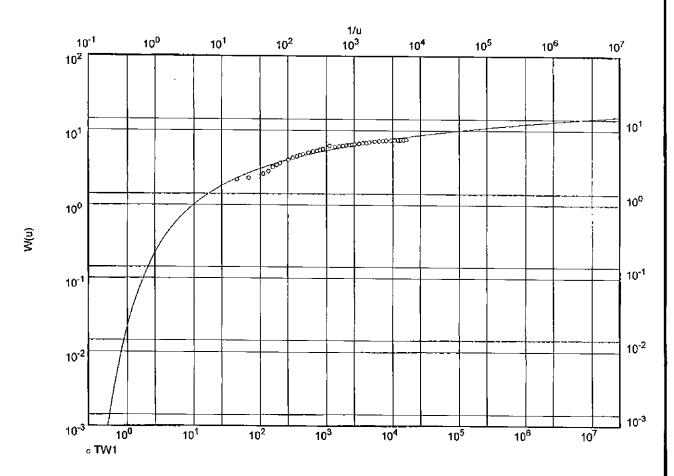
Pate	rson Group Ltd.	Pumping test analysis	<del></del>	Date: 25.04.2007	Toons Dans O
1-28 (	Concourse Gate	Time-Drawdown plot	•	<u> </u>	none, Page 2
Nepear	n, ON K2E 7T7	,		Project: PH0482	
				Evaluated by: RAP	
Pump	ing Test No. 1		Test conducted on: F	eb. 14/07	
TW1			TW1		
Disch	arge 0.40 l/s		Distance from the pu	mping well 0.150 m	<del></del>
Static	water level: 3.930 m below datum				
	Pumping test duration	Water level	Drawdov	vn i	
	[min]	[m]	(m)		
1	0.00	3.930		0.000	
2 3	1.00	5.490		1.560	
4	2.50	5.560 5.780		1.630	
5	3.00	5.940	<del></del>	1.850 2.010	
6	3.50	6.210	<del></del>	2.280	
7	4.00	6.360		2.430	
8	4.50	6,490		2.560	
9	6.00	6.760		2.830	
10 11	7.00	6.950		3.020	
12	9.00	7.070		3.140	
13	10.00	7.200 7.290		3.270	
14	12.00	7.470		3.360 3.540	
15	14.00	7.590		3.660	
16	16.00	7.700		3.770	
17	18.00	7.780		3.850	
18	20.00	7.880		3.950	
19 20	25.00	8.305		4.375	
21	30.00 35.00	8.150 8.225		4.220	
22	40.00	8.290	· <del> </del>	4.295 4.360	
23	45.00	8.380		4.450	
24	50.00	8.400		4.470	<del></del>
25	55.00	8.465		4.535	
26	60.00	8.505		4.575	
27 28	70.00	8.600		4.670	
29	80.00 90.00	8.700 8.700		4.770	
30	100.00	8.810		4.770 4.880	
31	120.00	8.950		5.020	
32	140.00	8.990		5.060	
33	160.00	9.050		5.120	
34	180.00	9.070		5.140	
35	210.00	9.095		5.165	
36 37	240.00 270.00	9.160		5.230	
38	300.00	9.170 9.180		5.240	
39	330.00	9.190		5.250 5.260	
40	360.00	9.210		5.280	
41	361.00	7.250		3.320	
42	362.00	6.620		2.690	
43	363.00	6.330		2.400	
44	364.00	6.080		2.150	
45 46	365.00	5.900		1.970	
46	366.00 367.00	5.730		1.800	
48	368.00	5.580 5.470		1.650	
49	369.00	5.380	<del>-</del>	1.450	
50	370.00	5.300		1.370	

Pater	rson Group Ltd.	Pumping test analysis	<del></del>	Date: 25.04.2007	поле, Раде 3
1-28 (	Concourse Gate	Time-Drawdown plot	-	Project: PH0482	
Nepear	n, ON K2E 717			Evaluated by: RAP	
Pump	ing Test No. 1		Test conducted on: I		
TW1			<del></del> -	-eb. 14/07 	
	nama 0 40 1/a		TW1		
	arge 0.40 l/s		Distance from the pu	Imping well 0.150 m	
Static	water level: 3.930 m below datum				
	Pumping test duration	Water level	Drawdo	٧n	
	(min)	[m]	[m]		
51	372.00	5.170		1.240	· · · · · · · · · · · · · · · · · · ·
52	374.00	5.070		1.140	
53	376.00	4.990		1.060	· · · · · · · · · · · · · · · · · · ·
54	378.00	4.940		1.010	
55	380.00	4.880		0.950	
56 57	385.00 390.00	4.790		0.860	
58	395.00	4.710 4.640		0.780	<u> </u>
59	400.00	4.615		0.710 0.685	
60	405.00	4.570		0.640	
61	410.00	4.540		0.610	
62	415.00	4.510		0.580	
63	420.00	4.490		0.560	
64	430.00	4.440		0.510	
65	440.00	4.410		0.480	
66	450.00	4.389		0.459	
67 68	460.00 470.00	4.350		0.420	
69	480.00	4.330 4.310		0.400 0.380	
	300.00	7.510		0.360	
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nping test analysis	Date: 25.04.2007   none, Page 1	
ns analysis method Ifined aquifer	Project: PH0482	
	Evaluated by: RAP	
Test conduc	ted on: Feb. 14/07	
		Ifined aquifer Project: PH0482

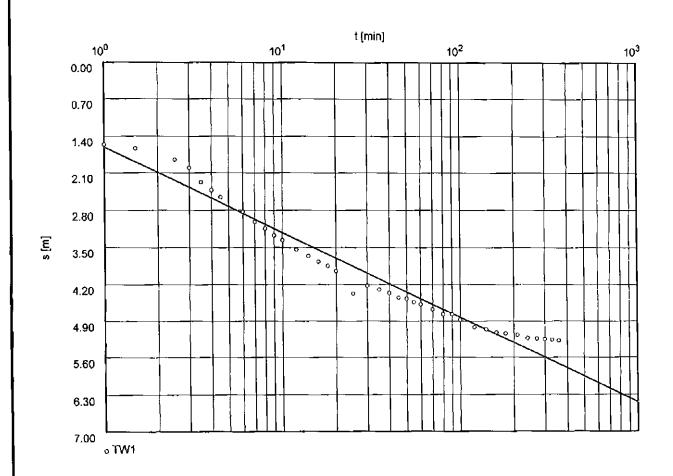


Transmissivity [m²/min]:  $2.70 \times 10^{-3}$ 

Storativity: 2.82 x 10<sup>-2</sup>

		Pumping test analysis		Date: 25.04.2007	none, Page 2
	ncourse Gate On K2E 717	Theis analysis method Confined aquifer	í	Project: PH0482	<u> </u>
opean, c	, , , , , , , , , , , , , , , , , , ,	Seminos aquinor		Evaluated by: RAP	
umping	g Test No. 1		Test conducted on:		
W1					<del></del>
			TW1		
Discharq ——	ge 0.40 l/s		Distance from the p	umping well 0.150 m	
Static w	ater level: 3.930 m below datum				
	Pumping test duration	Water level	Drawdo	wn	
	(min)	[m]	[m]		
2	1.00	5.490		1.560	
3	1.50	5.560	<del> </del>	1.630	
4	2.50	5.780		1.850	
5	3.00	5.940		2.010	
6	3.50	6.210		2.280	
7	4.00	6.360	_	2.430	
8	4.50 6.00	6.490 6.760	_	2.560	
10	7.00	6.950	<del></del>	3.020	
11	8.00	7.070	<del></del>	3.140	
12	9.00	7.200		3.270	
13	10.00	7.290		3.360	
14	12.00	7.470		3.540	
15	14.00	7.590		3.660	
16	16.00	7.700	<del>_</del>	3.770	
17 18	18.00 20.00	7.780 7.880		3.850 3.950	
19	25.00	8.305		4.375	
20	30.00	8.150	<del></del>	4.220	
21	35.00	8.225	<del></del>	4.295	
22	40.00	8.290		4.360	
23	45.00	8.380		4.450	
24	50.00	8.400	<u>-  </u>	4.470	
25 26	55.00 60.00	8.465 8.505		4.535 4.575	
27	70.00	8.600		4.670	
28	80.00	8.700		4.770	
29	90.00	8.700		4.770	
30	100.00	8.810		4.880	
31	120.00	8.950		5.020	
32	140.00	8.990		5.060	
33	160.00	9.050		5.120	
34	180.00 210.00	9.070 9.095		5.140 5.165	
36	240.00	9.160		5.230	
37	270.00	9.170		5.240	<del></del>
38	300.00	9.180	) <u> </u>	5,250	
39	330.00	9.190		5.260	
40	360.00	9.210		5.280	
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Paterson Group Ltd. 1-28 Concourse Gate	Pumping test analysis	Date: 25.04.2007 none, Page 1	
Nepean, ON K2E 7T7	Time-Drawdown-method after COOPER & JACOB	Project: PH0482	
	Confined aquifer	Evaluated by: RAP	
Pumping Test No. 1	Test conduc	oted on: Feb. 14/07	
TW1			
Discharge 0.40 Vs		· · · · · · · · · · · · · · · · · · ·	

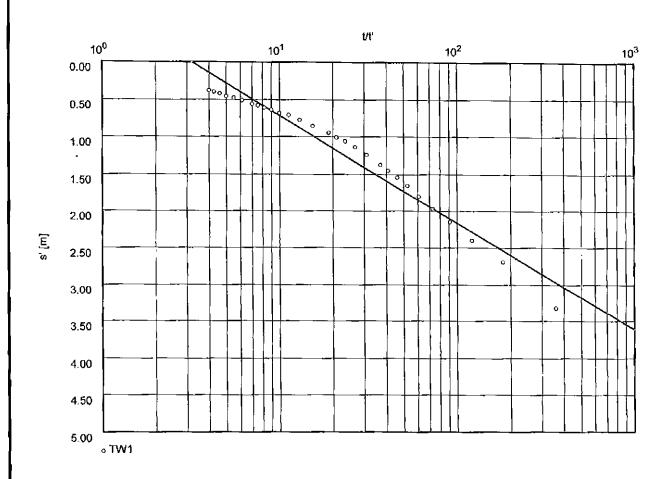


Transmissivity [m²/min]: 2.72 x 10<sup>-3</sup>

Storativity: 2.74 x 10<sup>-2</sup>

Date: 25.04.2007 none, Page 2 Paterson Group Ltd. Pumping test analysis 1-28 Concourse Gate Time-Drawdown-method after Project: PH0482 **COOPER & JACOB** Nepean, ON K2E 717 Confined aquifer Evaluated by: RAP Pumping Test No. 1 Test conducted on: Feb. 14/07 **TW1** TW1 Discharge 0.40 l/s Distance from the pumping well 0.150 m Static water level: 3.930 m below datum Pumping test duration Water level Drawdown [min] [m] [m] 2 1.00 5.490 1.560 3 1.50 5.560 1.630 2.50 4 5.780 1.850 5 3.00 5.940 2.010 6 3.50 6.210 2.280 7 4.00 6.360 2.430 8 4.50 6.490 2.560 6.00 6.760 9 2.830 10 7.00 6.950 3.020 11 8.00 7.070 3,140 12 9.00 7.200 3.270 13 10.00 7.290 3.360 7.470 12.00 3.540 14 14.00 7.590 3.660 15 16 16.00 7.700 3.770 7.780 17 18.00 3.850 20.00 7.880 3.950 18 4.375 19 25.00 8.305 8.150 4.220 20 30.00 4.295 21 35.00 B.225 22 40.00 8.290 4.360 23 45.00 8.380 4.450 50.00 8.400 4.470 24 55.00 8.465 4.535 25 8.505 4.575 60.00 26 4.670 8.600 27 70.00 4.770 80.00 8.700 28 8.700 4.770 90.00 29 4.880 8.810 30 100.00 120.00 8.950 5.020 31 5.060 8.990 140.00 32 5.120 9.050 33 160.00 5.140 34 180.00 9.070 9.095 5.165 210.00 35 9.160 5.230 36 240.00 9.170 5.240 270.00 37 5.250 9.180 300.00 38 5.260 330.00 9.190 39 360.00 9.210 5.280 40

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 717	Pumping test analysis Recovery method after THEIS & JACOB		Date: 25.04.2007 none, Page 1 Project: PH0482	
	Confined aquifer		Evaluated by: RAP	
Pumping Test No. 1		Test conducted on: Feb. 14/07		
TW1		-		
Discharge 0.40 l/s				
		Pumping test durat	lion: 360.00 min	

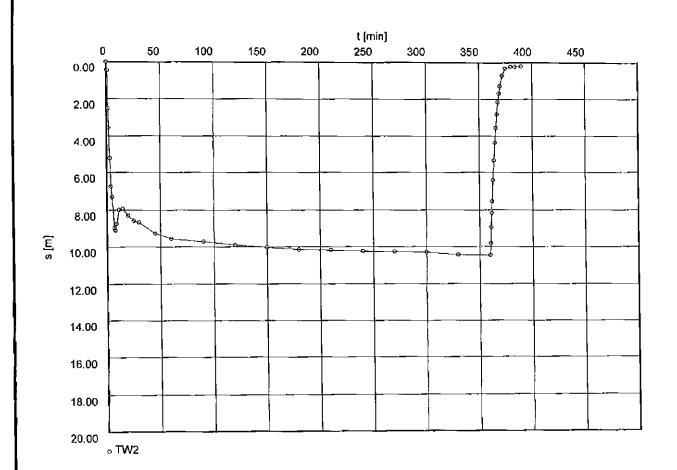


Transmissivity [m²/min]: 3.03 x 10<sup>-3</sup>

1-28 (	rson Group Ltd. Concourse Gate 1, ONK2E 717	Pumping test analysi Recovery method aft THEIS & JACOB	s er	Date: 25.04.2007 Project: PH0482	none, Page 2
		Confined aquifer		Evaluated by: RAP	
Pump	ing Test No. 1		Test conducted on: I	eb. 14/07	
TW1			TW1		
Disch	arge 0.40 l/s		Distance from the pu	mping well 0 160 m	
Static	water level; 3,930 m below datum				
<b>—</b> - Ţ	Time from	Water level	Pumping test duratio		
	end of pumping	Angrét renel	Residua drawdov		
	[min]	[m]		vn	
1	1.00	7.250	[m)	3.320	
2	2.00	6.620		2.690	
3	3.00	6.330		2.400	
4	4.00	6.080		2.150	
5	5.00	5.900		1.970	
6 7	6.00 7.00	5.730		1.800	
8	8.00	5.580 5.470	_	1.650	
9	9.00	5.380		1.540 1.450	
10	10.00	5.300	<del></del>	1.370	
11	12.00	5.170		1.240	
12	14.00	5.070		1.140	
13	16.00	4.990		1.060	
14 15	18.00	4.940		1.010	
16	20.00	4.880		0.950	
17	30.00	4.790 4.710		0.860	
18	35.00	4.640		0.780 0.710	
19	40.00	4.615	<del></del>	0.685	
20	45.00	4.570		0.640	<del></del>
21	50.00	4.540		0.610	<del></del>
22	55.00	4.510		0.580	
23	60.00	4.490		0.560	
25	70.00 80.00	4.440 4.410	<del> </del>	0.510	
26	90.00	4.389	<del>-</del>	0.480 0.459	
27	100.00	4.350	<del>-  </del>	0.420	
28	110.00	4.330		0.400	
29	120.00	4.310		0.380	
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Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot	Date: 25.04.2007 none, Page 1  Project: PH0482
	<u></u> .	Evaluated by: RAP
Pumping Test No. 2	Test conducted o	n: Mar. 12/07
TW2		
Discharge 0.60 l/s		

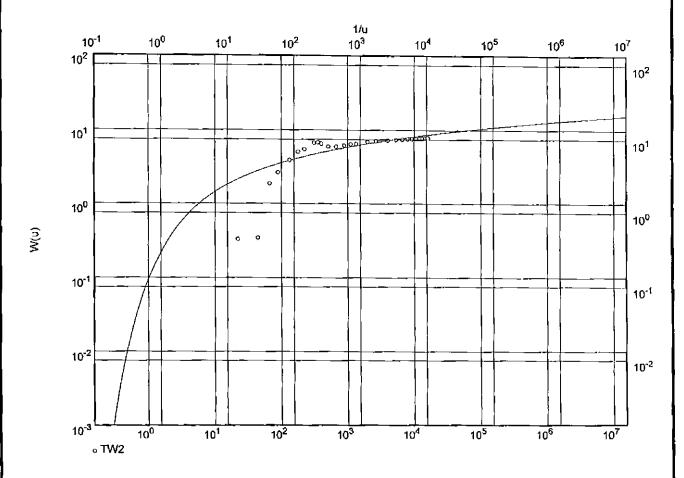


	son Group Ltd.	Pumping test analysis	[	Date: 25.04.2007	none, Page 2
	oncourse Gate ON K2E 717	Time-Drawdown plot	7	Project: PH0482	
•			Ī	Evaluated by: RAF	<u> </u>
Pumpir	ng Test No. 2		Test conducted on: Ma	ar. 12/07	<del></del>
TW2			TW2		<del></del>
 Discha	rge 0.60 l/s		Distance from the pumping well 0.150 m		
Static v	water level: 1.670 m below datum				
	Pumping test duration	Water level	Drawdown		
	[min]	[m]	[m]		
1	0.00	1.670		0.000	
2	0.50	2.110		0.440	
3	1.00	2.130		0.460	
4	1.50	4.190		2.520	
5	2.00	5.230		3.560	
6	3.00	6.900		5.230	
7	4.00	8.440		6.770	
8	5.00	8.970		7.300	
9	7.00	10.620		8.950	

ı	Pumping test duration	Water level	Drawdown	
	[min]	[m]	[m]	
1	0.00	1.670	0.000	
2	0.50	2.110	0.440	
3	1.00	2.130	0.460	
4	1.50	4.190	2.520	
5	2.00	5.230	3.560	
6	3.00	6.900	5.230	
7	4.00	8.440	6.770	
8	5.00	8.970	7.300	<del></del>
9	7.00		8.950	
10	8.00	10.750	9.080	
11	9.00	10.400	8.730	
12	11.50	9.650	7.980	
13	15.00	9.600	7.930	
14	20.00	9,960	8.290	<del></del>
15	25.00	10.240	8.570	
16	30.00	10.310	8.640	
17	45.00	10.930	9.260	<u> </u>
	60.00	11.210	9.540	
18	90.00	11.380	9.710	
19	120.00	11.570	9,900	<del></del>
20	150.00	11.700	10.030	
21	180.00	11.830	10.160	
22	210.00	11.860	10.190	
23		11.910	10.240	
24	240.00 270.00	11.940	10.270	
25	1	11.960	10.290	<del> </del>
26	300.00 330.00	12.100	10.430	
27	360.00	12.130	10.460	
28	360.50	11.480	9.810	<u> </u>
29		10.580	8.910	
30	361.00	9,630	8.160	<del></del>
31	361.50	9.650	7.550	
32	362.00	8,100	6.430	
33	363.00	7.020	5.350	
34	364.00		4.370	
35	365.00	6.040 5.230	3.560	
36	366.00			<del></del>
37	367.00	4.490	2.820 2.170	
38	368.00	3.840	1.700	
39	369.00	3.370	1.300	
40	370.00	2,970	0.730	
41	372.00	2.400	0.330	
42	375.00	2.000		<del> </del>
43	380.00	1.900	0.230 0.230	<del></del>
44	384.00	1.900		<del></del>
45	390.00	1.880	0.210	<del>                                     </del>
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Paterson Group Ltd. 1-28 Concourse Gate	Pumping test analysis Theis analysis method	Date: 25.04.2007 none, Page 1
Nepean, ON K2E 717	Confined aquifer	Project: PH0482
		Evaluated by: RAP
Pumping Test No. 2	Test condu	ucted on: Mar. 12/07
TW2		
Discharge 0.60 1/s		1



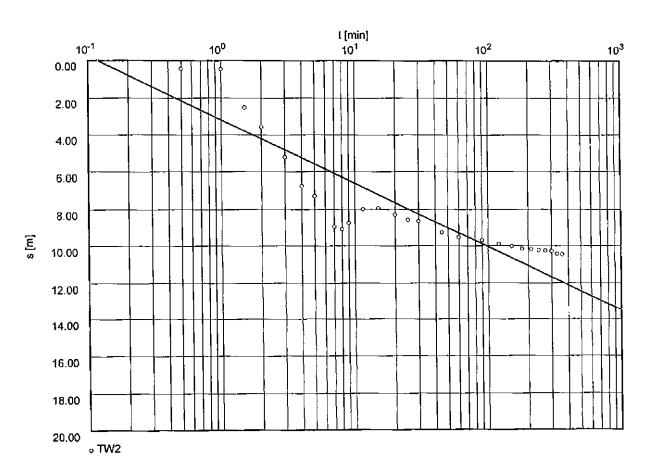
Transmissivity [m²/min]: 2.14 x 10<sup>-3</sup>

Storativity:  $1.32 \times 10^{-2}$ 

Paters	son Group Ltd.	Pumping test analysis		Date: 25.04.2007	none, Page 2	
1-28 Concourse Gate Nepean, ON K2E 7T7		Theis analysis metho Confined aquifer	d	Project: PH0482		
recpcari,	OHIZETI	Commod aquitor			Evaluated by: RAP	
Pumping Test No. 2		Test conducted				
				OII. II. II. II. II. II. II. II. II. II.		
TW2			TW2			
Discha	rge 0.60 l/s		Distance from the	ne pumping well 0.150 r	π	
Static	water level; 1.670 m below datum					
	Pumping test duration	Water level	Dra	wdown		
	[min]	[m]	_	[m]		
2	0.50	2.110		0.440		
3	1.00	2.130		0.460		
4	1.50	4.190		2.520		
5	2.00	5.230		3.560		
6	3.00	6.900		5.230		
7 8	4.00 5.00	8.440 8.970		6.770 7.300		
9	7.00	10.620		8.950	<del></del>	
10	8.00	10.750		9.080		
11	9.00	10.400		8.730		
12	11.50	9.650		7.980 7.930		
13 14	15.00 20.00	9.600 9.960		8.290		
15	25.00	10.240		8.570		
16	30.00	10.310		8.640		
17	45.00	10.930		9.260		
18	60.00	11.210		9.540 9.710		
19 20	90.00 120.00	11.380 11.570		9,900		
21	150.00	11.700		10.030		
22	180.00	11.830	0	10.160		
23	210.00	11.860		10.190		
24	240.00	11.910 11.940		10.240 10.270		
25 26	270.00 300.00	11.96		10.290		
27	330.00	12.10		10.430		
28	360.00	12.13	0	10.460		
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Paterson Group Ltd. 1-28 Concourse Gate	Pumping test analysis Time-Drawdown-method after	Date: 25.04.2007 none, Page 1
Nepean, ON K2E 7T7	COOPER & JACOB	Project: PH0482
	Confined aquifer	Evaluated by: RAP
Pumping Test No. 2	Test	conducted on: Mar. 12/07
TW2		
Discharge 0.60 l/s		



Transmissivity [m²/min]: 1.92 x 10<sup>-3</sup>

Storativity: 2.27 x 10<sup>-2</sup>

raters 1-28 Co	on Group Ltd. Incourse Gate	Pumping test analysis	3	Date: 25.04.2007	none, Page 2
Nepean, ON K2E 7T7		Time-Drawdown-method after COOPER & JACOB		Project: PH0482	
		Confined aquifer	Evaluated by: RAP		
Pumping Test No. 2		Test conducted or	: Mar. 12/07		
TW2			TW2		
Dischar	ge 0.60 l/s		Distance from the	pumping well 0.150 m	
Static w	rater level: 1.670 m below datum				
T	Pumping test duration	Water level	Drawo	lown	
	F-11.3				
-	[min]	<u>[m]</u>	[m	J	
2	0.50	2.110	<del>                                     </del>	0.440	
3	1.00	2.130		0.460	
5	1.50	4.190		2.520	
6	2.00 3.00	5.230 6.900		3.560	
7	4.00	8,440	<del></del>	5.230 6.770	
8	5.00	8.970	_ <del> </del>	7.300	
9	7.00	10.620		8.950	
10	8.00	10.750		9.080	
11	9.00	10.400		8.730	
12 13	11.50 15.00	9.650		7.980	
14	20.00	9.600 9.960		7.930 B.290	
15	25.00	10.240	<del> </del>	8.570	<del></del>
16	30.00	10.310	<del></del>	8.640	<del></del>
17	45.00	10.930		9.260	
18	60.00	11.210		9.540	
19 20	90.00	11.380		9.710	
21	120.00 150.00	11.570 11.700		9.900 10.030	
22	180.00	11.830		10.160	
23	210.00	11.860		10.190	
24	240.00	11.910		10.240	
25	270.00	11.940		10.270	
26	300.00	11.960		10.290	
27 28	330.00 360.00	12.100 12.130	<del></del>	10.430 10.460	
20	300.00	12,100		10.400	
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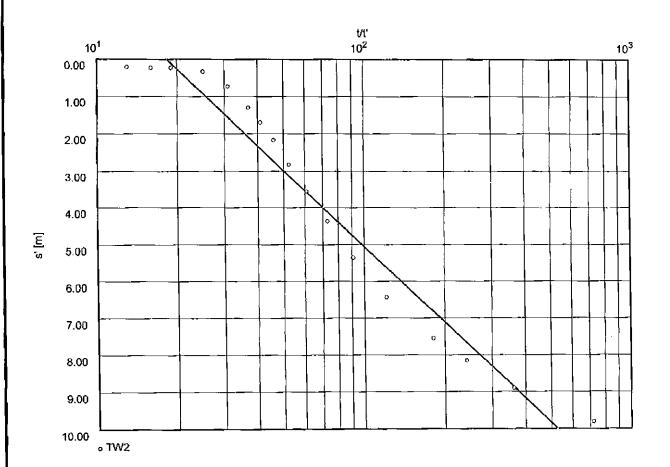
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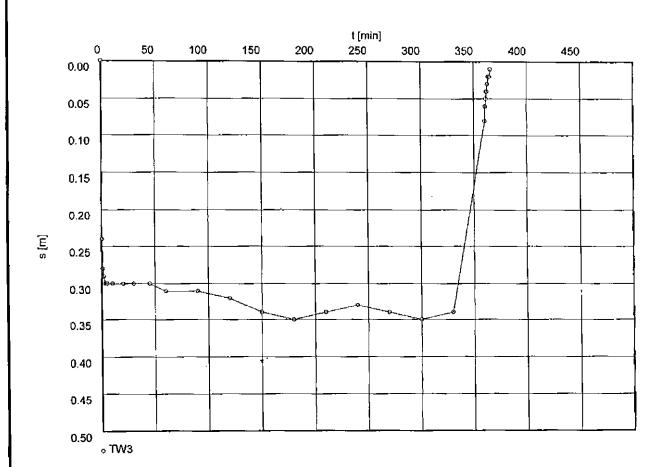
Paterson Group Ltd. 1-28 Concourse Gate	Pumping test analysi Recovery method aft	er <del></del>
Nepean, ON K2E 717	THEIS & JACOB	Project: PH0482
	Confined aquifer	Evaluated by: RAP
Pumping Test No. 2		Test conducted on: Mar. 12/07
TW2		
Discharge 0.60 l/s		
		Pumping test duration: 360 00 min



Transmissivity [m²/min]: 9.61 x 10<sup>-4</sup>

Date: 25.04.2007 none, Page 2 Paterson Group Ltd. Pumping test analysis 1-28 Concourse Gate Recovery method after Project: PH0482 THEIS & JACOB Nepean, ON K2E 717 Confined aquifer Evaluated by: RAP Pumping Test No. 2 Test conducted on: Mar. 12/07 TW2 TW2 Distance from the pumping well 0.150 m Discharge 0.60 l/s Static water level: 1.670 m below datum Pumping test duration: 360.00 min Water level Residua! Time from drawdown end of pumping [min] [m][m] 11.480 9.810 1 0.50 10.580 8.910 1.00 2 8.160 9.830 3 1.50 9.220 7.550 2.00 4 6.430 8.100 5 3.00 5.350 7.020 4.00 6 6.040 4.370 7 5.00 3.560 5.230 8 6.00 2.820 7.00 4,490 9 3.840 2.170 10 8.00 1.700 3.370 11 9.00 1.300 10.00 2.970 12 0.730 2.400 12.00 13 0.330 2.000 15,00 14 0.230 20.00 1.900 15 0.230 1.900 16 24.00 0.210 30.00 1.880 17

Paterson Group Ltd. 1-28 Concourse Gate	Pumping test analysis	Date: 25.04.2007 none, Page 1
Nepean, ON K2E 777	Time-Drawdown plot	Project: PH0482
		Evaluated by: RAP
Pumping Test No. 1	Test condu	ucted on: Mar. 1/07
TW3		
Discharge 1.90 l/s		



		Pumping test analysis	<del> </del>	Date: 25.04.2007	none, Page 2	
	oncourse Gate ON K2E 7T7	Time-Drawdown plot		Project: PH0482	Project: PH0482	
			Evaluated by: RAP			
Pumping Test No. 1			Test conducted of	on: Mar. 1/07		
TW3			TW3	,		
Discha	arge 1.90 l/s		Distance from the pumping well 0.150 m			
Static	water level: 6.610 m below datum					
Pumping test duration		Water level	Drawdown			
	[min]	[m]	ſ	m)		
1	0.00	6.610		0.000		
2	0.50	6.850		0.240		
3	1.00	6.890		0.280		
_ 4	1.50	6.900		0.290		
5	2.00	6.900		0.290		
6	3.00 4.00	6.910 6.910	<del></del>	0.300		
8	5.00	6.910		0.300		
9	10.00	6.910		0.300		
10	20.00	6.910		0.300	<u> </u>	
11	30.00	6.910		0.300		
12	45.00	6.910		0.300		
13	60.00	6.920		0.310		
14	90.00	6.920		0.310		
15 16	120.00 150.00	6.930 6.950		0.320 0.340		
17	180.00	6.960		0.350		
18	210.00	6.950		0.340		
19	240.00	6.940		0.330	<del></del>	
20	270.00	6.950		0.340		
21	300.00	6.960		0.350		
22	330.00	6.950	)	0.340		
23	360.50	6.690	_	0.080		
24	361.00	6.670 6.660		0.060 0.050		
25 26	361.50 362.00	6.650		0.040	<u> </u>	
27	362.50	6.650		0.040		
28	363.00	6.640		0.030	_ <del></del>	
29	364.00	6.630		0.020		
30	365.00	6.630		0.020		
31	366.00	6.620		0.010	<u> </u>	
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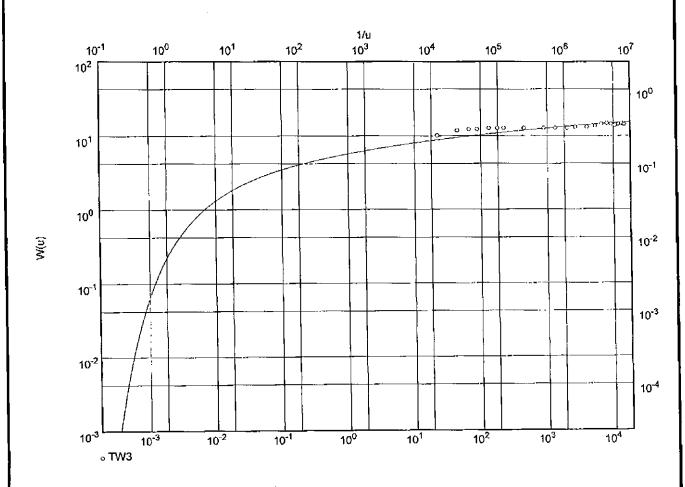
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Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 717	Pumping test analysis Theis analysis method Confined aquifer	Date: 25.04.2007 none, Page 1 Project: PH0482	
		Evaluated by: RAP	
Pumping Test No. 1	Test conducted	on: Mar. 1/07	
TW3			
Discharge 1.90 l/s			



Transmissivity [m²/min]: 3.81 x 10<sup>-1</sup>

Storativity: 2.75 x 10<sup>-3</sup>

1-28 Concourse Gate T		Pumping test analysis Theis analysis method Confined aquifer		Date: 25.04.200	7 none, Page 2
				Project: PH0482	
				Evaluated by: RAP	
Pumping Test No. 1			Test conducted on: Mar. 1/07		
TW3			T <b>w</b> 3	<u> </u>	
Discha	arge 1.90 l/s	-	Distance from the p	numping well 0.150	m
Static	water level: 6.610 m below datum				
	Pumping test duration	Water level	Drawdo	own	
	[min]	[m]	[m]		
2	0.50	6.850		0.240	
3	1.00 1.50	6.890 6.900		0.280 0.290	
5	2.00	6.900		0.290	
- 6	3.00	6.910		0.300	
7	4.00	6.910	,	0.300	_
8	5.00	6.910		0.300	
9	10.00	6.910		0.300	
10	20.00	6.910		0.300	
11	30.00 45.00	6.910 6.910		0.300	
13	60.00	6.920		0.310	
14	90.00	6.920		0.310	
15	120.00	6.930	)	0.320	
16	150.00	6.950		0.340	
17	180.00	6.960		0.350	
18	210.00	6.950 6.940		0.340 0.330	
19 20	240.00 270.00	6.950		0.340	
21	300.00	6.960		0.350	
22	330.00	6.950		0.340	
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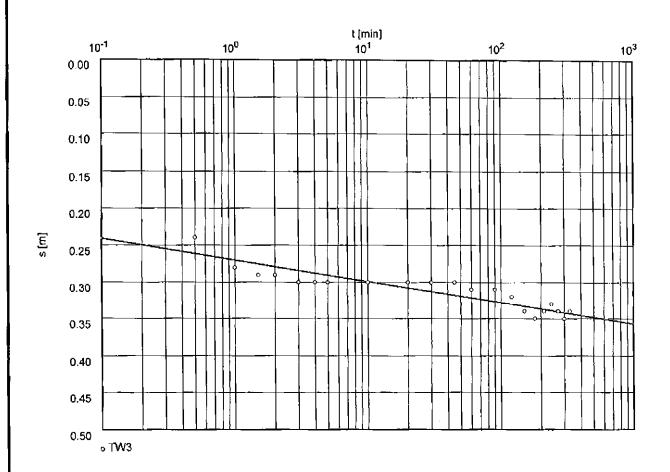
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Paterson Group Ltd. 1-28 Concourse Gate	Pumping test analysis	Date: 25.04.2007   none, Page 1	
Nepean, ON K2E 717	Time-Drawdown-method after COOPER & JACOB	Project: PH0482	
	Confined aquifer	Evaluated by: RAP	
Pumping Test No. 1	Test conduct	ted on: Mar. 1/07	
TW3			
Discharge 1.90 l/s			

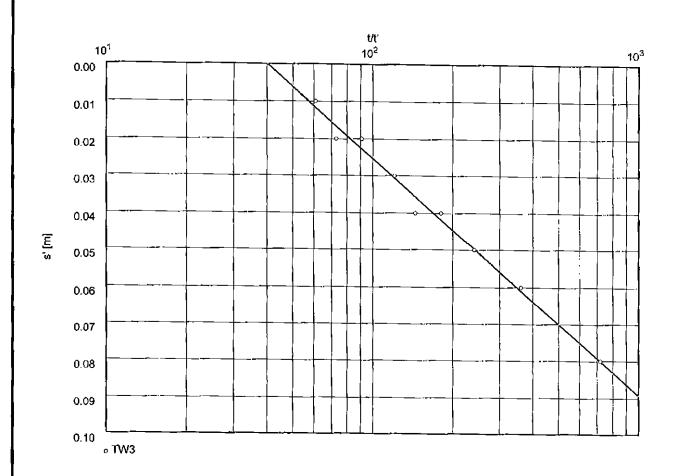


Transmissivity [m²/min]: 7.18 x 10<sup>-1</sup>

Storativity: 3.64 x 10<sup>-8</sup>

Paterson Group Ltd. Date: 25.04.2007 Pumping test analysis none, Page 2 1-28 Concourse Gate Time-Drawdown-method after Project: PH0482 Nepean, ON K2E 7T7 **COOPER & JACOB** Confined aquifer Evaluated by: RAP Pumping Test No. 1 Test conducted on: Mar. 1/07 TW3 TW3 Discharge 1.90 l/s Distance from the pumping well 0.150 m Static water level: 6.610 m below datum Pumping test duration Water level Drawdown [min] [m][m] 2 0.50 6.850 0.240 3 1.00 6.890 0.280 4 1.50 6.900 0.290 5 2.00 6.900 0.290 6 3.00 6.910 0.300 7 4.00 6.910 0.300 8 5.00 6.910 0.300 9 10.00 6.910 0.300 10 20.00 6.910 0.300 11 30.00 6.910 0.300 45.00 12 6.910 0.300 13 60.00 6.920 0.310 14 90.00 6.920 0.310 15 120.00 6.930 0.320 16 150.00 6.950 0.340 17 180.00 6.960 0.350 18 210.00 6.950 0.340 19 240.00 6.940 0.330 20 270.00 6.950 0.340 21 300.00 6.960 0.350 22 330.00 6.950 0.340

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7 Pumping test Recovery m THEIS & JA			Date: 25.04.2007   none, Page 1  Project: PH0482  Evaluated by: RAP	
mapada, ott rez 111	Confined aquifer			
Pumping Test No. 1		Test conducted on: Mar. 1/07		
TW3				
Discharge 1.90 l/s				
		Pumping test dura	ation: 360.00 min	



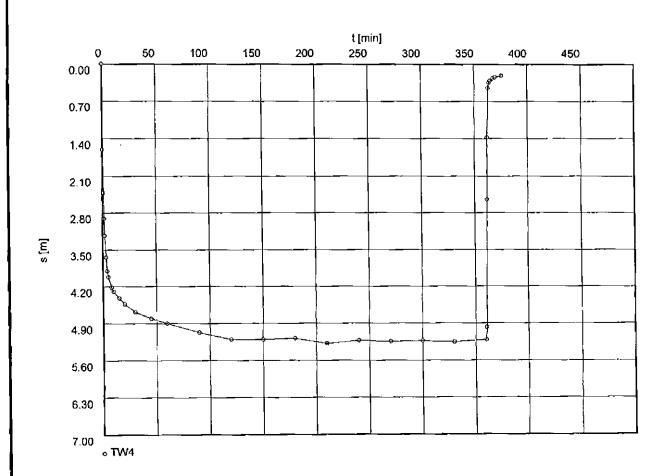
Transmissivity [m<sup>2</sup>/min]:  $3.26 \times 10^{-1}$ 

Pate 1-28	Paterson Group Ltd. 1-28 Concourse Gate Pumping test analys Recovery method at		3	Dale: 25.04.2007	none, Page 2
Nepean, ON K2E 717 THEIS & JACOB		THEIS & JACOB	er 	Project: PH0482	
<u> </u>	Confined aquifer		Evaluated by: RAP		
	ping Test No. 1	Test conducted on: N	Mar. 1/07		
TW3		_	TW3		
Disc	narge 1.90 l/s		Distance from the pu	mping well 0.150 m	
Statio	water level: 6.610 m below datum		Pumping test duratio		
	Time from	Water level	Residua		
	end of pumping		drawdow	/n	
1	[min] 0.50	[m]	[m]		
2	1.00	6.690 6.670		0.080	
3	1.50	6.660		0.050	
4	2.00	6.650		0.040	
5 6	2.50 3.00	6.650		0.040	
7	4.00	6.640 6.630	<del></del>	0.030	
8	5.00	6.630		0.020	
9	6.00	6.620		0.010	
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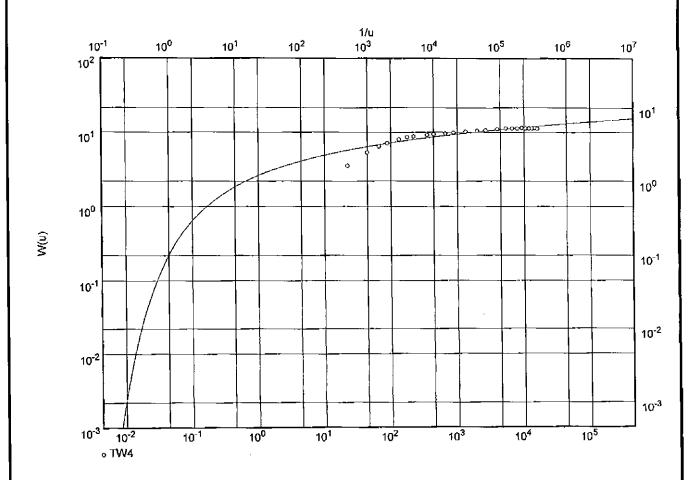
Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown plot	Date: 25.04.2007 none, Page 1 Project: PH0482	
		Evaluated by: RAP	
Pumping Test No. 1	Test conduc	cted on: Mar. 2/07	
TW4			
Discharge 1.90 l/s			



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Paterson Group Ltd. 1-28 Concourse Gate Pumping test analys Time-Drawdown plot		8	Date: 25,04,2007	none, Page 2	
Nepean, ON K2E 717			Project: PH0482		
				Evaluated by: RAP	
Pumping Test No. 1 Test conducted on: Mar. 2/07					
TW4			TW4		
Disch	Discharge 1.90 l/s Distance from the pumping well 0.150 m				
Static	water level: 1.640 m below datum				
Pumping test duration Water level		Water level	Drawdoy	wn	
1	[min] 0.00	[m]	[m]		
2	0.50	1.640 3.240		0.000 1.600	
3	1.00	4.060	<del>-</del>	2.420	
4	1.50	4.550		2.910	
5	2.00	4.870		3.230	
6	3.00	5.280		3.640	
7	4.00	5.540		3.900	
8	5.00	5.660		4.020	
9	8.00	5.860		4.220	
11	10.00 15.00	5.940 6.060		4.300	<del></del>
12	20.00	6.170		4.420 4.530	<del></del>
13	30.00	6.330		4.690	
14	45.00	6.450		4.810	
15	60.00	6.540		4.900	
16	90.00	6.710		5.070	
17	120.00	6.840		5.200	
18	150.00	6.840	<del></del>	5.200	
19 20	180.00 210.00	6.820 6.920		5.180	
21	240.00	6.860		5.280 5.220	<del></del>
22	270,00	6.880		5.240	
23	300.00	6.870		5.230	
24	330.00	6.890		5.250	
25	360.00	6.850		5.210	
26	360.50	6.620		4.980	
27	361,50	4.190		2.550	
28 29	362.00 363.00	3.020 2.080		1.380	
30	364.00	1.980		0.440 0.340	
31	365.00	1.950		0.310	
32	367.50	1.900		0.260	<del>-, , , , , , , , , , , , , , , , , , , </del>
33	370.00	1.880		0.240	
34	376.00	1.850		0.210	
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Paterson Group Ltd. 1-28 Concourse Gate	Pumping test analysis	
Nepean, ON K2E 7T7	Theis analysis metho Confined aquifer	Project: PH0482
		Evaluated by: RAP
Pumping Test No. 1		Test conducted on: Mar. 2/07
TW4		
Discharge 1.90 l/s		

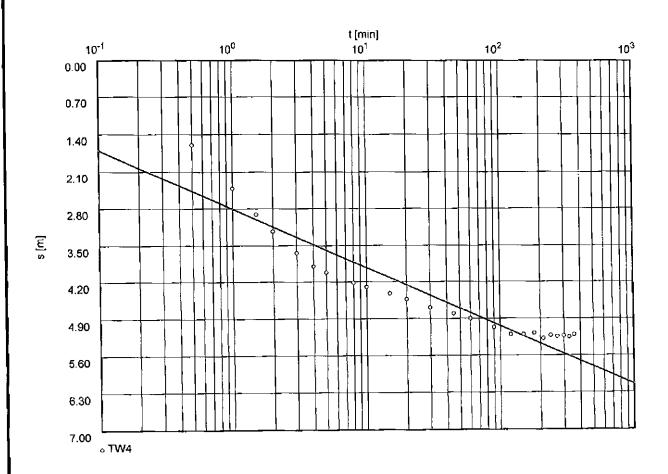


Transmissivity [m²/min]:  $1.97 \times 10^{-2}$ 

Storativity: 3.48 x 10<sup>-3</sup>

Paterson Group Ltd. 1-28 Concourse Gate		Pumping test analysis		Date: 25.04.2007	none, Page 2
Nepean, ON K2E 7T7		Theis analysis methor Confined aquifer	Project: PH04		
				Evaluated by: RAP	
umping	Test No. 1		Test conducted on:	Mar. 2/07	<del></del>
ΓW4			TW4		
Discharg	e 1.90 l/s		Distance from the p	umping well 0.150 m	
Static wa	der level: 1.640 m below datum				
	Pumping test duration	Water level	Drawdo	wn	<del></del>
	[min]	[m]	[m]		
2	0.50	3.240		1.600	
3	1.00	4.060		2.420	
4	1.50	4.550		2.910	
5	2.00	4.870		3.230	
6	3.00	5.280		3.640	
7 8	4.00 5.00	5.540 5.660		3.900 4.020	
9	8.00	5.860		4.020	
10	10.00	5.940		4.300	
11	15.00	6.060		4.420	<del></del>
12	20.00	6.170		4.530	
13	30.00	6.330		4.690	
14	45.00	6.450		4.810	
15 16	60.00 90.00	6.540 6.710		4.900 5.070	
17	120.00	6.840		5.200	
18	150.00	6.840		5.200	
19	180.00	6.820		5.180	
20	210.00	6.920		5.280	
21	240.00	6,860		5.220	
22 23	270.00 300.00	6.880 6.870		5.240 5.230	
24	330.00	6.890		5.250	
25	360.00	6.850		5.210	
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Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 717	Pumping test analysis Time-Drawdown-method after COOPER & JACOB	Date: 25.04.2007 none, Page 1 Project: PH0482	
	Confined aquifer	Evaluated by: RAP	
Pumping Test No. 1	Test conduct	ed on: Mar. 2/07	
TW4			
Discharge 1.90 l/s			

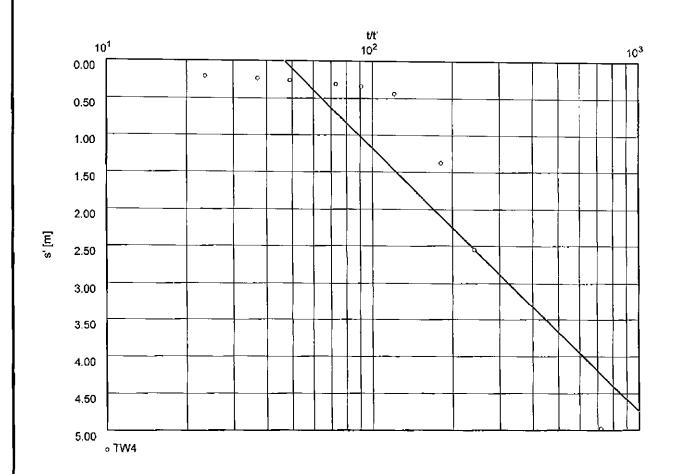


Transmissivity [m²/min]: 1.87 x 10<sup>-2</sup>

Storativity: 5.62 x 10<sup>-3</sup>

Paterson Group Ltd. Pumping st 1-28 Concourse Gate Pime-Dray		Pumping test analysis	S bad atta	Date: 25.04.2007	none, Page 2
Nepean, ON K2E 7T7		Time-Drawdown-metil COOPER & JACOB	COOPER & JACOB		
		Confined aquifer		Evaluated by: RAI	P
	g Test No. 1		Test conducted	on: Mar. 2/07	
₩4 ———			TW4		
	ge 1.90 l/s		Distance from ti	ne pumping well 0.150 m	1
Static w	ater level: 1.640 m below datum				
	Pumping test duration	Water level	Dra	wdown	· · · · · · · · · · · · · · · · · · ·
	[min]	[m]		[m]	
2	0.50	2.040			
3	1.00	3.240		1.600	
4	1.50	4.060		2.420	
5	2.00	4.550 4.870		2.910	
6	3.00	5.280		3.230 3.640	- ·
7	4.00	5.540	_	3.900	
8	5.00	5.660		4.020	
9	8.00	5.860		4.220	
10	10.00	5.940	·	4.300	
11	15.00	6.060		4.420	
12	20.00	6.170		4.530	
13	30.00	6.330		4.690	
14	45.00	6.450		4.810	
15	60.00	6.540		4.900	
16	90.00	6.710		5.070	
17 18	120.00	6.840		5.200	
19	150.00 180.00	6.840		5.200	
20	210.00	6.820 6.920	_ <del>  _</del>	5.180 5.280	<u> </u>
21	240.00	6.860	<del></del>	5.220	
22	270.00	6.880		5.240	
23	300.00	6.870		5.230	
24	330.00	6.890		5.250	
25	360.00	6.850		5.210	
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Paterson Group Ltd. 1-28 Concourse Gate	Pumping test analysis Recovery method after THEIS & JACOB		Date: 25.04.2007 попе, Page 1	
Nepean, ON K2E 7T7			Project: PH0482	
	Confined aquifer		Evaluated by: RAP	
Pumping Test No. 1		Test conducted on: Mar. 2/07		
TW4				
Discharge 1.90 l/s				
		Pumping test dura	tion: 360.00 min	



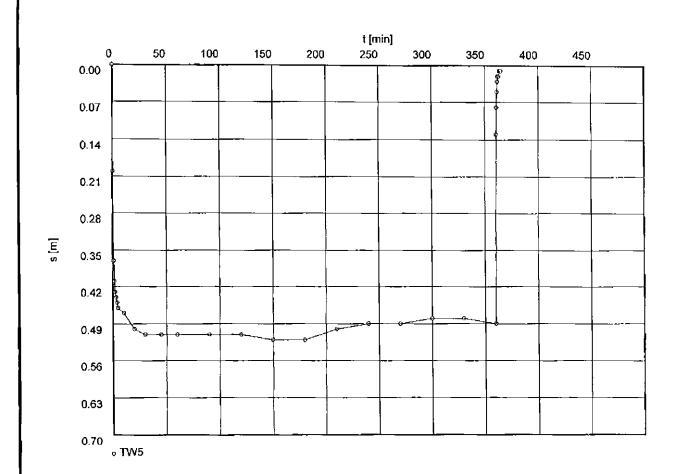
Transmissivity [m<sup>2</sup>/min]:  $5.84 \times 10^{-3}$ 

Pater	Paterson Group Ltd. Pumping test a 1-28 Concourse Gate Recovery meth		S	Date: 25.04.2007	none, Page 2
	i, ON K2E 7T7	Recovery method aft THEIS & JACOB	er	Project: PH0482	
		Confined aquifer	Evaluated by: RAP		,
Pumpi	Pumping Test No. 1		Test conducted on:	Mar. 2/07	
TW4		TW4			
Discha	Discharge 1.90 l/s		Distance from the pu	mping well 0.150 m	
Static	water level: 1.640 m below datum		Pumping test duration		
	Time from	Water level	Residua		
	end of pumping		drawdov	1	
	[min]	[m]	[m]		
1	0.50	6.620		4.980	
3	1.50 2.00	4.190 3.020		2.550 1.380	
4	3.00	2.080		0.440	
5	4.00	1.980		0.340	-
6	5.00	1.950		0.310	
7 8	7.50	1.900		0.260	
9	10.00 16.00	1.880 1.850		0.240 0.210	
	10.00	1.000		0.210	
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Paterson Group Ltd. 1-28 Concourse Gate	Pumping lest analysis	Date: 25.04.2007 none, Page 1		
Nepean, ON K2E 7T7	Time-Drawdown plot	Project: PH0482		
		Evaluated by: RAP		
Pumping Test No. 1	Test condi	fucted on: March 13/07		
TW5				
Discharge 0.70 l/s				

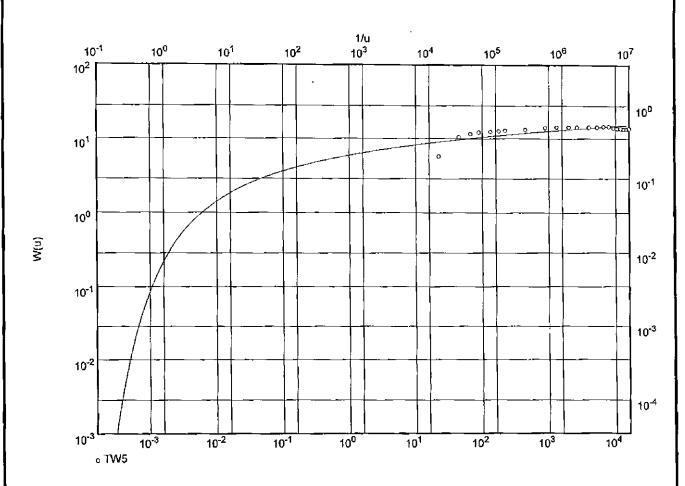


1-28 Concourse Gate Nepean, ON K2E 777	Time-Drawdown plot		
		Project: PH0482	
		Evaluated by: RAP	
Pumping Test No. 1	Test condu	Test conducted on: March 13/07	
TW5	TW5	TW5	
Discharge 0.70 l/s	Distance fro	Distance from the pumping well 0.150 m	

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	Pumping test duration	Water level	Drawdown	
	[min]	[m]	[m]	
1	0.00	5.730	0.000	
2	0.50	5.930	0.200	
3	1.00	6.100	0.370	
4	1.50	6.140	0.410	
5	2.00	6.160	0.430	<del>_</del>
6	3.00	6.170	0.440	
7	4.00	6.180	0.450	
8	5.00	6.190	0.460	-
9	10.00	6.200	0.470	
10	20.00	6.230	0.500	
11	30.00	6.240	0.510	
12	45.00	6.240	0.510	
13	60.00	6.240	0.510	
14	90.00	6.240	0.510	
15	120.00	6.240	0.510	
16	150.00	6.250	0.520	
17	180.00	6.250	0.520	<del></del>
18	210.00	6.230	0.500	
19	240.00	6.220	0.490	
20	270.00	6.220	0.490	<u>-</u>
21	300.00	6.210	0.480	
22	330.00	6.210	0.480	
23	360.00	6.220	0.490	<del></del>
24	360.50	5.860	0.130	
25	361.00	5.810	0.080	
26	361.50	5.780	0.050	
27	362.00	5.760	0.030	
28	362.50	5.750	0.020	
29	363.00	5.750	0.020	
30	364.00	5.740	0.010	
31	365.00	5.740	0.010	
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Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 777	Gate Theis analysis me		Date: 25.04.2007   none, Page 1 Project: PH0482	
			Evaluated by: RAP	
Pumping Test No. 1		Test conduc	cled on: March 13/07	
TW5			-	
Discharge 0.70 1/s		<del></del>		



Transmissivity [m²/min]: 9.46 x 10<sup>-2</sup>

Storativity: 6.05 x 10-4

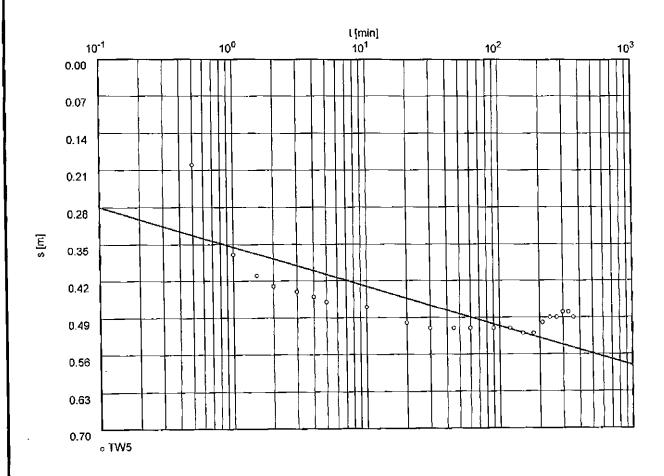
Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 717		ourse Gate Theis analysis method		Date: 25.04.2007	none, Page 2
				Project: PH0482	
		,		Evaluated by: RAF	
Pumpii	ng Test No. 1		Test conducted on: March 13/07		
TW5			TW5		
Discha	arge 0.70 Vs		Distance from the	pumping well 0.150 m	· · · · · · · · · · · · · · · · · · ·
Static	water level: 5.730 m below datum		l		
	Pumping test duration	Water level	Drawo	nwol	
	[min]	[m]	[[r	ı]	
2	0.50	5.930		0.200	
3	1.00	6.100		0.370	
4	1.50	6.140 6.160		0.410 0.430	
5	2.00 3.00	6.170		0.440	
7	4.00	6.180		0.450	
8	5.00	6.190	)	0.460	
9	10.00	6.200		0.470	
10	20.00	6.230		0.500	
11	30.00	6.240		0.510	
12	45.00 60.00	6.240 6.240		0.510 0.510	
13 14	90.00	6.24		0.510	
15	120.00	6.24		0.510	
16	150.00	6.25		0.520	
17	180.00	6,25		0.520	
18	210.00	6.23		0.500 0.490	
19	240.00 270.00	6.22 6.22		0.490	
20 21	300.00	6.21		0.480	
22	330.00	6.21		0.480	
23	360.00	6.22	0	0.490	
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Paterson Group Ltd. 1-28 Concourse Gate	Pumping test analysis	Date: 25.04.2007 none, Page 1	
Nepean, ON K2E 717	Time-Drawdown-method after COOPER & JACOB	Project: PH0482 Evaluated by: RAP	
	Confined aquifer		
Pumping Test No. 1	Test conduct	ed on: March 13/07	
TW5			
Discharge 0.70 l/s			

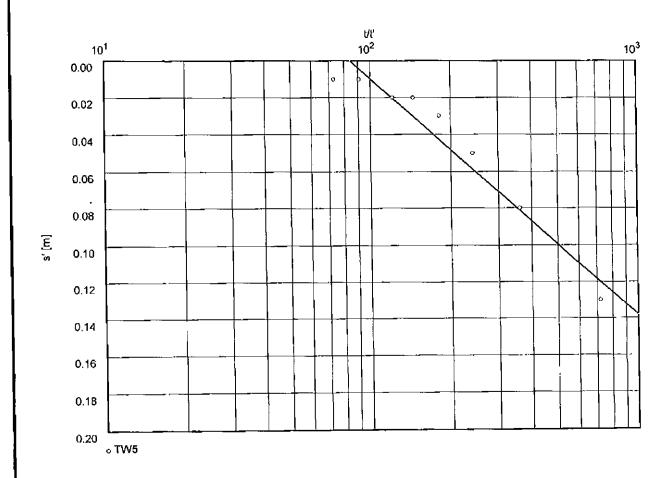


Transmissivity [m²/min]: 1.01 x 10<sup>-1</sup>

Storativity: 1.97 x 10<sup>-4</sup>

Paterson Group Ltd. Date: 25.04.2007 Pumping test analysis none, Page 2 1-28 Concourse Gate Time-Drawdown-method after Project: PH0482 Nepean, ON K2E 7T7 **COOPER & JACOB** Confined aquifer Evaluated by: RAP Pumping Test No. 1 Test conducted on: March 13/07 TW5 TW5 Discharge 0.70 l/s Distance from the pumping well 0.150 m Static water level: 5.730 m below datum Pumping test duration Water level Drawdown [min] [m] [m] 0.50 5.930 2 0.200 3 1.00 6.100 0.370 1.50 6.140 0.410 4 5 6.160 2.00 0.430 6 3.00 6.170 0.440 4.00 6.180 0.450 7 8 5.00 6.190 0.460 9 10.00 6.200 0.470 10 20.00 6.230 0.500 6.240 11 30.00 0.510 12 45.00 6.240 0.510 6.240 0.510 13 60.00 6.240 0.510 14 90.00 6.240 0.510 15 120.00 6.250 0.520 150.00 16 0.520 6.250 17 180.00 210.00 6.230 0.500 18 6.220 0.490 240.00 19 0.490 6.220 20 270.00 6.210 0.480 21 300.00 0.460 330.00 6.210 22 0.490 6.220 360.00 23

Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Gate Recovery method after THEIS & JACOB		Date: 25.04.2007 none, Page 1 Project: PH0482
	Confined aquifer		Evaluated by: RAP
Purnping Test No. 1		Test conducted on	March 13/07
TW5			
Discharge 0.70 Vs			
		Pumping test dura	ion; 360.00 min

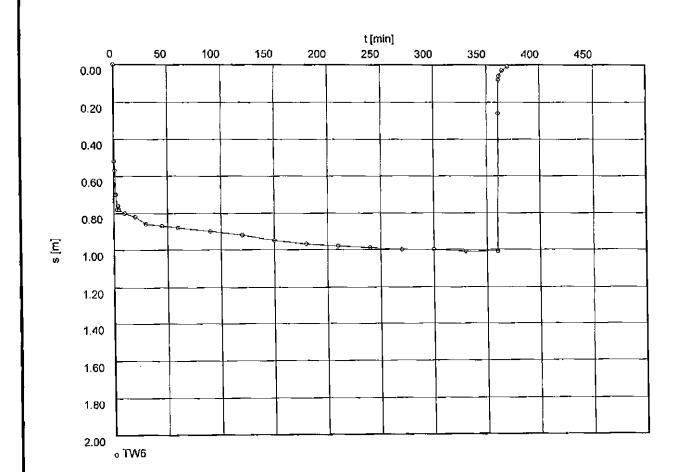


Transmissivity [m²/min]: 5.98 x 10<sup>-2</sup>

Paterson Group Ltd. 1-28 Concourse Gate Re		Pumping test analysi	Pumping test analysis		none, Page 2
	ON K2E 7T7	Recovery method after THEIS & JACOB		Project: PH0482	
		Confined aquifer		Evaluated by: RAP	
Pumpin	ng Test No. 1		Test conducted on: i	March 13/07	
TW5			TW5		
Discha	rge 0.70 l/s		Distance from the pr	umping well 0.150 m	
Static v	vater level: 5.730 m below datum		Pumping test duration	on: 360.00 min	
	Time from	Water level	Residu	al	
	end of pumping		drawdo	wn	
1	[min] 0.50	{[m]}5.860	[m]	0.130	
2	1.00	5.810		0.080	
3	1.50	5.780		0.050	
4 5	2.00 2.50	5.760 5.750		0.030	
6	3.00	5.750		0.020	
7	4.00	5.740		0.010	
8	5.00	5.740		0.010	
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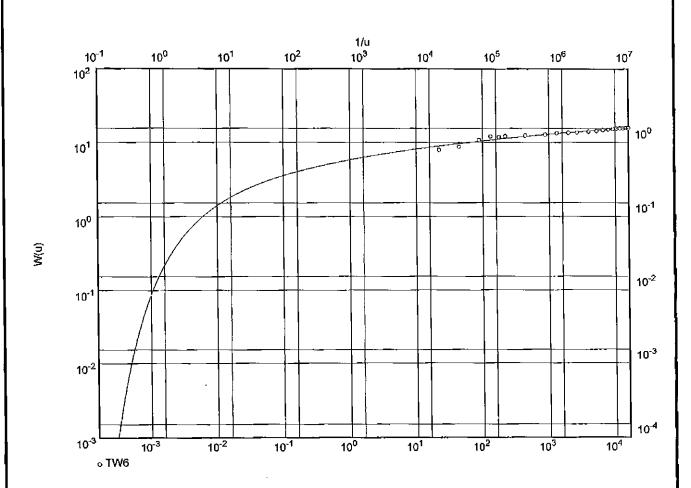
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Paterson Group Ltd.	Pumping test analysis	Date: 25.04.2007   none, Page 1
1-28 Concourse Gate Nepean, ON K2E 7T7	Time-Drawdown plot	Project: PH0482
		Evaluated by: RAP
Pumping Test No. 1	Test cond	lucted on: Mar 21/07
TW6		
Discharge 0.73 l/s		



Paterson Group Ltd.		Pumping test analysis		Date: 25.04.2007	none, Page 2	
1-28 C	oncourse Gate ON K2E 717	Time-Drawdown plot		Project: PH0482	1	
(Topodii,	VIII LE I			Evaluated by: RAP		
Pumpir	ng Test No. 1		Test conducted on: Mar 21/07			
TW6			TW6			
	rge 0.73 l/s			oumping well 0.150 m	·	
			Distance from the	Joinping Well 0, 100 III		
Static	water level: 2.320 m below datum	Materia	Drawd			
	Pumping test duration	Water level	Drawo	own		
	[min]	[m]	[m	ı <u> </u>	_	
1	0.00	2.320		0.000		
_ 2	0.50	2.840		0.520		
3	1,00	2.890		0.570		
4	2.00	3.020		0.700		
5	3.00	3.100		0.780		
6	4,00 5.00	3.080 3.100	<del></del>	0.780		
8	10.00	3,100	<del></del>	0.800		
9	20.00	3.140	<del> </del>	0.820		
10	30.00	3.180	<del>-  </del>	0.860		
11	45.00	3.190		0.870		
12	60.00	3.200		0.880		
13	90.00	3.220		0.900		
14	120.00	3.240		0.920		
15	150.00	3.270		0.950		
16	180.00	3.290 3.300		0.970		
17	210.00 240.00	3.310		0.990		
18 19	270.00	3.320		1.000	<del></del>	
20	300.00	3.320		1.000		
21	330.00	3.330		1.010		
22	360.00	3,330		1.010		
23	361.00	2.580		0.260		
24	361.50	2.400		0.080	- <del></del> -	
25	362.00	2.380		0.060		
26	365.00 370.00	2.350 2.330		0.010		
27	370.00	2,000	<u>'</u>	- 0.010		
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Paterson Group Ltd.	Pumping test analysis	Date: 25.04.2007 none, Page 1
1-28 Concourse Gate Nepean, ON K2E 717	Theis analysis method  Confined aquifer	Project: PH0482
		Evaluated by: RAP
Pumping Test No. 1	Test conducte	ed on: Mar 21/07
TW6		
Discharge 0.73 l/s		

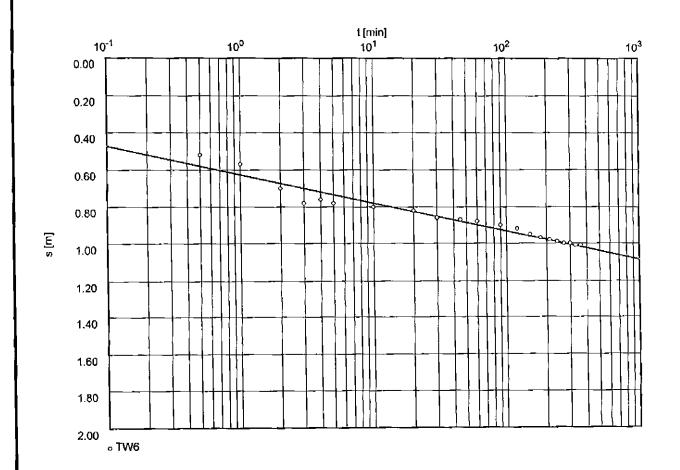


Transmissivity [m²/min]:  $5.33 \times 10^{-2}$ 

Storativity, 3.41 x 10<sup>-4</sup>

Paterson Group Ltd. 1-28 Concourse Gate		son Group Ltd.  Pumping test analysis oncourse Gate  Pumping test analysis method		Date: 25.04.2007	none, Page 2
	ON K2E 717	Confined aquifer		Project: PH0482 Evaluated by: RAP	
			·		
<sup>2</sup> umpin	g Test No. 1		Test conducted on: Mar 21/07		
W6			TW6		
Dischan	ge 0.73 l/s		Distance from the pu	mping well 0.150 m	
static w	eter level: 2.320 m below datum			••	
	Pumping test duration	Water level	Drawdov	vn	
	[min]	[m]	[m]		
2	0.50	2.840	_	0.520	
3	1.00	2.890		0.570	
4	2.00	3.020	<del></del>	0.700	
5	3.00	3.100	<del></del>	0.780	
6	4.00	3.080		0.760	
7	5.00	3.100		0.780	
8	10.00	3.120 3.140		0.800	
10	30.00	3.140	<del></del>	0.820 0.860	
11	45.00	3.190		0.870	
12	60.00	3.200	<del></del>	0.880	
13	90.00	3.220		0.900	
14	120.00	3.240		0.920	
15	150.00	3.270		0.950	
16 17	180.00 210.00	3.290 3.300		0.970 0.980	
18	240.00	3.310		0.980	· · · · · · · · · · · · · · · · · · ·
19	270.00	3.320	<del></del>	1.000	
20	300.00	3.320	<del></del>	1.000	· · · · · · · · · · · · · · · · · · ·
21	330.00	3.330		1.010	
22	360.00	3.330		1.010	
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Paterson Group Ltd. 1-28 Concourse Gate Nepean, ON K2E 7T7	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Date: 25.04.2007 none, Page 1 Project: PH0482 Evaluated by: RAP		
Pumping Test No. 1	Test conducted	Test conducted on: Mar 21/07		
TW6				
Discharge 0.73 l/s				

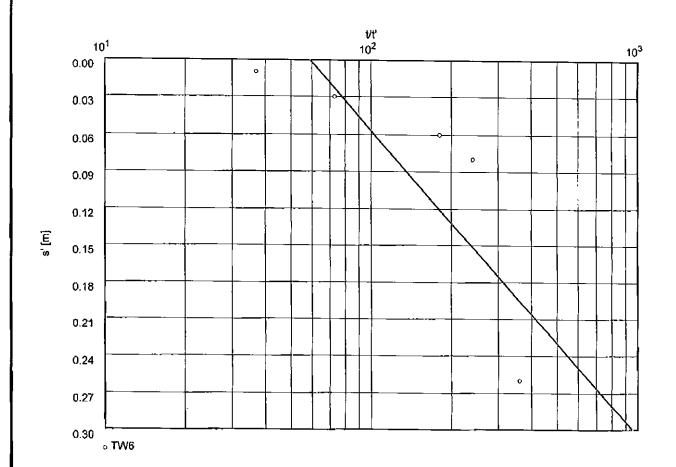


Transmissivity [m²/min]: 5.22 x 10<sup>-2</sup>

Storativity: 4.32 x 10<sup>-4</sup>

Paterson Group Ltd. Pumping test analysis Date: 25.04.2007 none, Page 2 1-28 Concourse Gate Time-Drawdown-method after Project: PH0482 Nepean, ON K2E 717 **COOPER & JACOB** Confined aquifer Evaluated by: RAP Pumping Test No. 1 Test conducted on: Mar 21/07 TW6 **TW**6 Discharge 0.73 l/s Distance from the pumping well 0.150 m Static water level: 2.320 m below datum Pumping test duration Water level Drawdown [min] [m] [m] 2 0.50 2.840 0.520 3 1.00 2.890 0.570 4 2.00 3.020 0.700 5 3.00 3.100 0.780 6 4.00 3.080 0.760 7 5.00 3.100 0.780 8 10.00 3.120 0.800 9 20.00 3.140 0.820 10 30.00 3.180 0.860 11 45.00 3.190 0.870 12 60.00 3.200 0.880 13 90.00 3.220 0.900 14 120.00 3,240 0.920 15 150.00 3.270 0.950 16 180.00 3.290 0.970 17 210.00 3.300 0.980 3.310 18 240.00 0.990 19 270.00 3.320 1.000 20 300.00 3.320 1.000 330.00 3.330 1.010 21 22 360.00 3.330 1.010

Paterson Group Ltd. 1-28 Concourse Gate	Pumping lest analy Recovery method		Date: 25.04.2007 none, Page 1	
Nepean, ON K2E 7T7	THEIS & JACOB		Project: PH0482	
	Confined aquifer		Evaluated by: RAP	
Pumping Test No. 1		Test conducted on: Mar 21/07		
TW6				
Discharge 0.73 l/s				
	<u> </u>	Pumping test du	ration: 360.00 min	



Transmissivity [m²/min]: 3.23 x 10<sup>-2</sup>

Paterson Group Ltd. 1-28 Concourse Gate		Pumping test analysis Recovery method after	Ua	te: 25.04.2007	none, Page 2
	N K2E 717	THEIS & JACOB	<del> </del>	pject: PH0482	
		Confined aquifer	——— <u>—</u> —	aluated by: RAP	
	Test No. 1		conducted on: Mar 2	21/07	
W6		TWe			
	e 0.73 l/s	Dist	ance from the pumpir	ng well 0.150 m	
Static wa	iter level: 2.320 m below datum	<del></del> ·	ping test duration: 36		
	Time from	Water level	Residual		
	end of pumping [min]	I1	drawdown		
1	1,00	[m] 2.580	[m]	0.260	
2	1.50	2,400		0.080	
3 4	2.00	2.380		0.060	
5	5.00 10.00	2.350 2.330		0.030	
		2,000		0.010	
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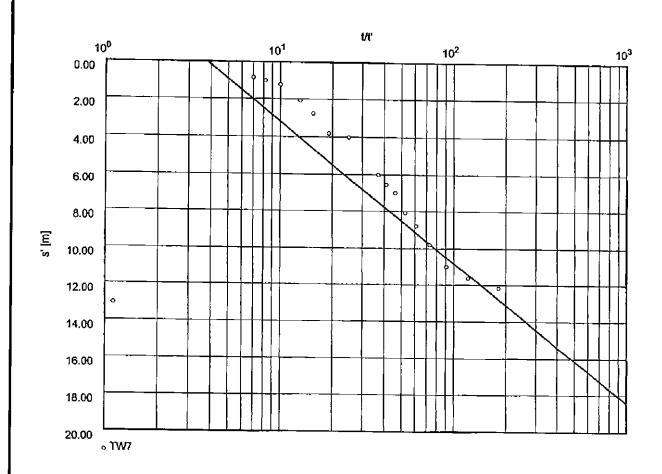
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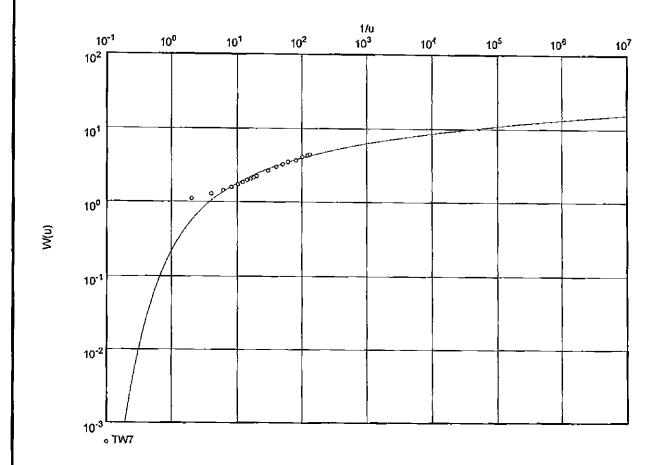
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Waterloo Hydrogeologic 180 Columbia St. W.	Pumping test analy Recovery method a		Date:	Page 1	
Waterloo,Ontario,Canada	THEIS & JACOB			0482	
ph.(519)746-1798	Confined aquifer		Evaluated by	у:	
Pumping Test No. 2		Test conducted on: Nov. 27, 2009			
TW7 (RETEST)		+			
Discharge 0.38 l/s		-			
		Pumping tes	at duration: 360 00 min		



Transmissivity [m²/min]: 5.48 x 10<sup>-4</sup>

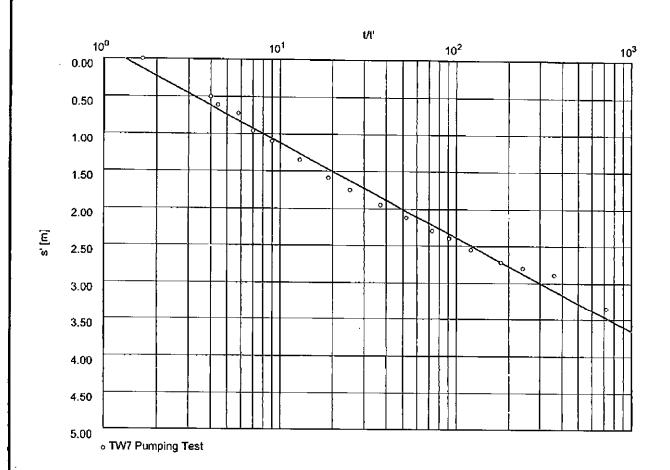
Waterloo Hydrogeologic 180 Columbia St. W.	Pumping test analysis Theis analysis method	Date:	Page 1	
Waterloo,Ontario,Canada	Confined aquifer	Project: PH0482		
ph.(519)746-1798		Evaluated by	Evaluated by:	
Pumping Test No. 2	Test condu	Test conducted on: Nov. 27, 2009		
TW7 (RETEST)			<u> </u>	
Discharge 0.38 l/s				



Transmissivity [m²/min]: 1.93 x 10<sup>-4</sup>

Storativity: 4.23 x 10<sup>-3</sup>

Paterson Group Ltd. 1-28 Concourse Gale Pumping test analysis Recovery method a			Date:	none, Page 1
Nepean, ON K2E 7T7	THEIS & JACOB	mer	Project: PH04	182
	Confined aquifer		Evaluated by	: RAP
Pumping Test No.	-	Test conducted of	on: January 24, 20	08
TW7				
Discharge 0.76 l/s		<del> </del>	<del></del>	
		Pumping test dur	ation: 360.00 min	



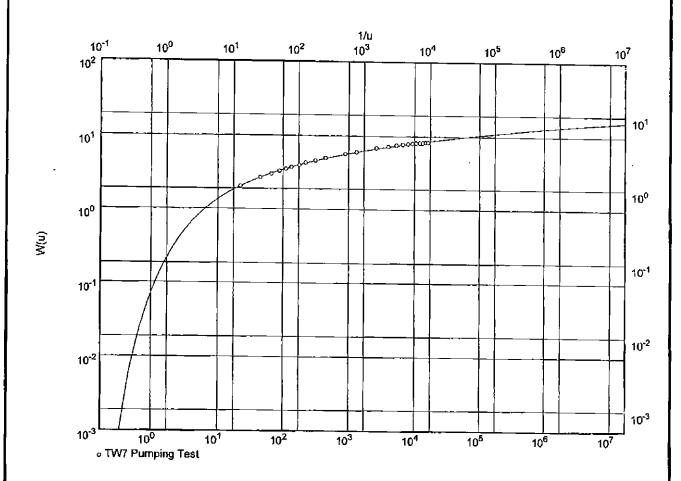
Transmissivity [m²/min]:  $6.56 \times 10^{-3}$ 

Pate	rson Group Ltd.	Pumping test analysis		Date:	none, Page 2
	Concourse Gaile	Recovery method aff THEIS & JACOB	er	Project: PH0482	
Nepead	1, ON RZE 717	Confined aquifer		· <u> </u>	
Pump	ping Test No.	<u> </u>	<del></del>	Evaluated by: RAF	<u> </u>
	mg roat no.		Test conducted on: January 24, 2008		
TW7		!	TW7 Pumping Test	<u> </u>	
	earge 0.76 l/s		Distance from the pu	mping well 0.150 m	 
Static	v.ater level: 2.350 m below datum		Pumping test duration		•
	Time from	Water level	Residua		
	end of pumping [min]	[m]	drawdov	vn	
1	0.50	5.700	[m]	3.350	
2	1.00	5.240		2.890	
3	1.50	5.150	(	2.800	
5	2.00 3.00	5.070		2.720	
6	4.00	4.900 4.750		2.550 2.400	
7	5.00	4.650		2.300	
8	7.00	4,470		2.120	
9	10.00 15.00	4.300 4.100		1.950	
11	20.00	3.940		1.750 1.590	
12	30.00	3.700		1.350	
13	45.00	3.450		1.100	
14 15	60.00 75.00	3.310 3.070		0.960	
16	105.00	2,960		0.720 0.610	
17	120.00	2.850		0.500	<u> </u>
13	540.00	2.350		0.000	
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Paterson Group Ltd. 1-28 Concourse Gate	Pumping test analysis Theis analysis method		Date:	none, Page 1	
Nepean, ON K2E 7T7	Confined aquiler		Project: PH0482 Evaluated by: RAP		
Pumping Test No. TW7		Test conducted on: January 24, 2008			
				<u> </u>	
Discharge 0.76 l/s			<del></del>		
Discharge 0.76 l/s					

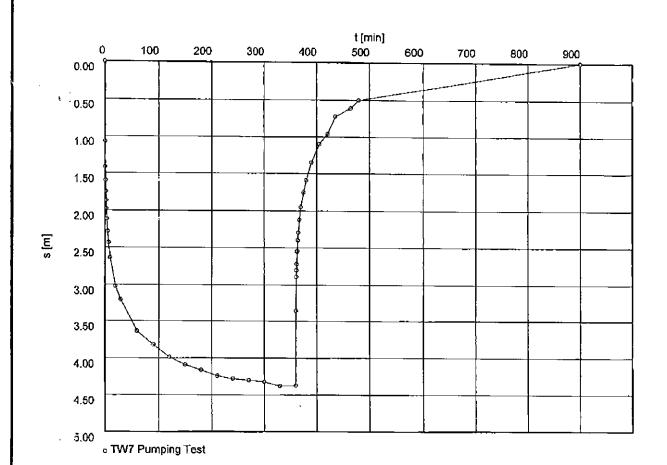


Transmissivity (m²/min):  $6.88 \times 10^{-3}$ 

Storativity: 4.76 x 10<sup>-2</sup>

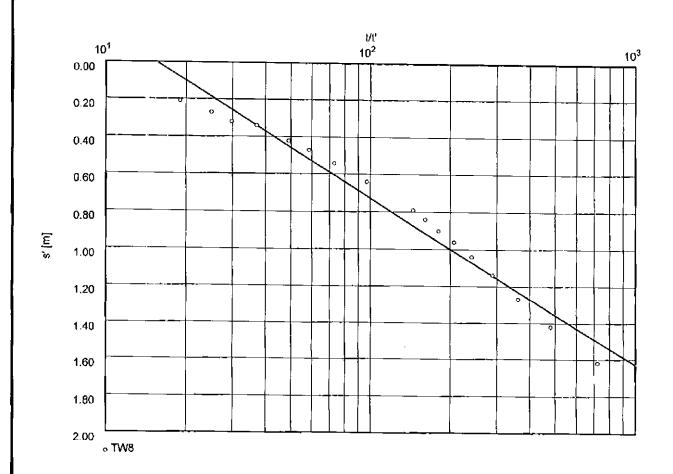
1-28 C	son Group Ltd. oncourse Gate	Pumping test analysis Theis analysis metho	\$ d	Date:	none, Page 2	
	ON K2E 717	Confined aquifer	<b>u</b>	Project: PH0482		
			Evaluated by: RAP			
	ng Test No.		Test conducted on: January 24, 2008			
TW7			TW7 Pumping Test			
Discha	rge 0.76 Vs		Distance from the pu	mping well 0.150 m		
Static v	vater level: 2,350 m below datum					
	Pumping test duration	Water level	Drawdov	vn		
	[min]	[m]	[m]			
2	0.50	3.420		1.070		
3	1.00	3.770		1.420	· · · · · · · · · · · · · · · · · · ·	
4	1.50	3.950		1.600		
5	2.00	4.100		1.750		
6	2.50	4.220		1.870		
7	3.00	4.330		1.980		
8	4.00	4.470	<del></del>	2,120		
10	5.00 7.00	4.640	<u> </u>	2,290	<del></del>	
11	10.00	4.790 4.990		2.440		
12	20.00	5.370		2.640 3.020		
13	30.00	5.550	-	3.200	<u> </u>	
14	60.00	5.990	<del>-</del>	3.640		
15	90.00	6.170	<u> </u>	3.820		
16	120.00	6.340		3.990		
17	150.00	6.440		4.090		
18	180.00	6.510		4.160		
19	210.00	6.590		4.240		
20	240.00	6.630		4.280	<del></del>	
21	270.00 300.00	6.650 6.670		4.300		
23	330.00	6.730	<del></del>	4.320 4.380		
24	360.00	6.720		4.370		
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	Pumping test analysis Time-Drawdown plot		none, Page 1		
tillie-prawdown biot			482		
		Evaluated by	RAP		
	Test conducted		ed on: January 24, 2008		
	·				
	·				
		Time-Drawdown plot			



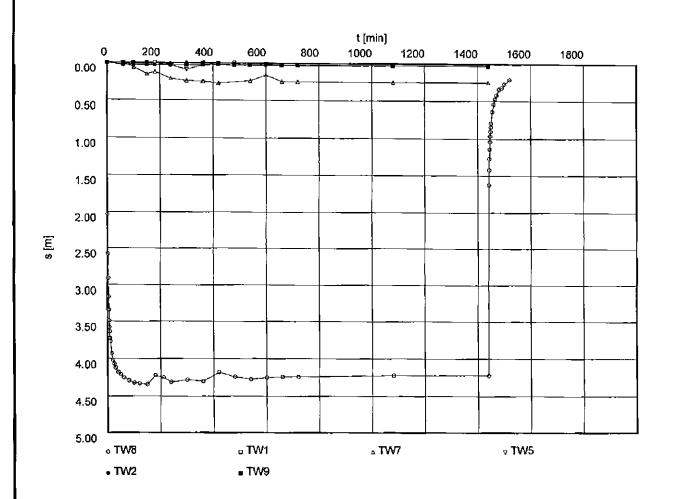
Paterson Group Ltd. 1-28 Concourse Gate		Pumping test analysis	s	Date:	none, Page 2	
Vepean, ON )		Time-Drawdown plot	l	Project: PH0482		
			ł	Evaluated by:		
Pumping T	est No.	<del>-                                    </del>	Test conducted on: J.			
W7				anuary 24, 2001	* · · · · · · · · · · · · · · · · · · ·	
	0.76 (/-	·	TW7 Pumping Test	······································		
Discharge (			Distance from the pur	mping well 0.15	0 m	
Static wate	r level: 2.350 m below datum					
	umping test duration	Imping test duration Water level D		m		
	funial					
1 -	[min] 0.00	[m]	[m]			
2	0.50	2.350 3.420		0.000		
3	1.00	3.420	<del></del>	1.070 1.420		
4	1.50	3.950		1.600		
5	2.00	4.100		1.750		
7	2.50	4.220		1.870		
8	3.00	4.330		1.980	<del></del>	
9	4.00 5.00	4.470		2,120		
10	7.00	4.640 4.790	<del></del>	2.290		
11	10.00	4.990		2.440 2.640		
12	20.00	5.370		3.020		
13	30.00	5.550		3.200		
14 15	60.00	5.990		3.640		
16	90.00	6.170		3.820		
17	120.00 150.00	6.340		3.990		
18	180.00	6.440 6.510		4.090		
19	210.00	6.590		4.160 4.240		
20 ,	240.00	6.630		4.240		
21	270.00	6.650		4.300		
22 23	300.00	6.670		4.320		
24	330.00	6.730		4.380		
25	360.00 360.50	5.720		4.370		
26	361.00	5.700 5.240	<del></del>	3.350		
27	361.50	5.150	<del> </del>	2.890 2.800		
28	362.00	5.070		2.720		
29	363.00	4.900		2.550		
30 31	364.00	4.750		2.400		
31	365.00 367.00	4.650		2.300		
33	370.00	4.470 4.300	<del></del>	2.120		
34	375.00	4.100	<del></del>	1.950 1.750		
35	380.00	3.940	<del>                                     </del>	1.750	<del></del>	
36	390.00	3.700		1.350		
37	405.00	3.450		1.100		
38 39	420.00	3.310		0.960		
10	435.00 465.00	3.070	<del></del>	0.720		
11	480.00	2.960		0.610		
12	900.00	2.850	<del> </del>	0.500		
1		2.300	<del> </del>	0.000		
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		Date:	none, Page 1	
THEIS & JACOB	ner	Project: PH0482		
Confined aquifer		Evaluated by	<i>f</i> :	
	Test conducted on:			
			<u> </u>	
	<u> </u>			
	Recovery method a THEIS & JACOB	Confined aquifer  Test conducted on:	Recovery method after THEIS & JACOB Confined aquifer  Project: PHO Evaluated by	



Transmissivity [m²/min]:  $9.26 \times 10^{-3}$ 

Waterloo Hydrogeologic 180 Columbia St. W.	Pumping test analysis		Date:	none, Page 1	
Waterloo, Onlario, Canada	Time-Drawdown plot		Project: PH0482		
ph.(519)746-1798			Evaluated by:		
Pumping Test No. 24 hour		Test conducted on:			
TW8		-			
Discharge 0.76 Vs			<del></del> -		
		<del></del>			



Water	<b>100 Hydrogeologic</b> Iumbia St. W.	Pumping test analysis	Date:	none, Pag
	Jumbia 51, W., ,Ontario,Canada	Time-Drawdown plot	Proje	ed: PH0482
	746-1798		<del></del>	Jated by:
umpir	ng Test No. 24 hour		Test conducted on:	
V8			TW8	
ischai	rge 0.76 l/s			
	<u> </u>			·
italic v	vater level; 4.830 m below datum			
	Pumping test duration	Water level	Drawdown	
	[min]	[m]	[m]	
1	0.00	4.830		000
2	1.00	6.860		030
3	2.00	7.410		580
4	3.00	7.740	<del></del>	910
5	4.00	7.990	<del></del>	160
6	5.00	8.170		340
7	6.00	8.320		490
9	7.00 8.00	8.410		580
10	9.00	8.470 8.560		640
11	10.00	8.600		730 770
12	15.00	8.760		930
13	20.00	8.850	·	020
14	25.00	8.900	<del></del>	070
15	30.00	8.950		120
16	40.00	9.010	<del></del>	180
17	50.00	9.040	<del></del>	210
18	60.00	9.080	4.2	250
19	80.00	9.120	4.2	290
20	100.00	9.150		320
21	120.00	9.160	<del>_</del>	330
22	150.00	9.170		340
23	180.00	9.050	<del></del>	220
25	210.00 240.00	9.080 9.140		250 310
26	300.00	9.140		280
27	360.00	9.130		300
28	420,00	9.010		180
29	480.00	9.070		240
30	540.00	9.100		270
31	600.00	9.080		250
32	660.00	9.070		240
33	720.00	9.070		240
34	1080.00	9.050		220
35	1440.00	9.050	_1	220
36	1442.00	6.450		620
37 38	1443.00	6.250		420
39	1444.00 1445.00	6.100 5.970		270 140
40	1446.00	5.870		040
41	1447.00	5,790		960
42	1447.00	5.730		900
43	1449.00	5.670		840
44	1450.00	5.620		790
45	1455.00	5.470	<del></del>	640
46	1460.00	5.370		540
47	1465.00	5.300	_	470
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0.320

5.250 5.170 5.150

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1470.00

1480.00

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180 C	erloo Hydrogeologic Columbia St. W.	Pumping lest analys Time-Drawdown plo	iis '	Date:	none, Page 3		
Waterk	00,Ontario,Canada 9)746-1798	Time-Drawdown pio	Time Stavious plot				
<b>-</b>			Evaluated by:				
	oing Test No. 24 hour		Test conducted on:				
TW8			TW8				
Disch	arge 0.76 l/s						
Static	water level; 4.830 m below datum						
	Pumping test duration	Water level	Drawdov	wn			
	[min]	[m]	[m]				
51	1500.00	5.100	) [[11]	0.270			
52	1520.00	5.040		0.210			
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Wate	rloo Hydrogeologic olumbia St. W.	Pumping test analysis Time-Drawdown plot	s	Date;	none, Page 4	
Waterlo	o,Ontario,Canada	Talle-Diawdown plot		Project: PH0482		
ph.(519	)746-1798			Evaluated by:		
Pumpi	ing Test No. 24 hour		Test conducted on:	<u> </u>	<del></del>	
TW8			TW1			
Discha	arge 0.76 l/s		Distance from the pu	mping well 353.	 000 m	
Static	water level: 2.230 m below datum					
	Pumping test duration	Water level	Drawdov	٧n		
	[min]	[m]	[m]			
1	0.00	2.230		0.000		
2	60.00	2.230		0.000		
3	100.00	2.230		0.000		
4	150.00	2.230		0.000		
5	180.00	2.200		-0.030		
7	240.00 300.00	2.190 2.190		-0.040		
8	360.00	2.190		-0.040		
9	363.00	2.200		-0.040 -0.030		
10	420.00	2.190	<del>-,</del>	-0.030		
11	540.00	2.190		-0.040		
12	600.00	2.190		-0.040		
13	660.00	2.190		-0.040		
14	720.00	2.160		-0.070		
15	1080.00	2.160		-0.070		
16	1440.00	2.150	<del> </del>	-0.080		
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Waterloo Hydrogeologic 180 Columbia St. W.		geologic Pumping test analysis V. Time-Drawdown plot		Date:	none, Page 5	
	Ontario,Canada	ļ		Project: PH0482		
	g Test No. 24 hour		Evaluated by:			
	g Test No. 24 nour		Test conducted on:			
TW8	<del></del>		TW7			
	ge 0.76 l/s		Distance from the pu	mping well 72.000	m	
Static w	vater level: 6.890 m below datum					
	Pumping test duration	Water level	Drawdov	vr)		
	[min]	[m]	[m]			
1	0.00	6.890	[]	0.000		
2	60.00	6.890		0.000	· ·_ ·_	
3	100.00	6.950		0.060	<u> </u>	
4	150.00	7.040		0.150		
5	180.00	7.010		0.120		
6	240.00	7.100	_	0.210		
8	300.00 360.00	7.130 7.140		0.240		
9	363.00	7.140		0.250 0.250	<u>-</u>	
10	420.00	7.160		0.270		
11	540.00	7.130	<del></del>	0.240		
12	600.00	7.050		0.160		
13	660.00	7.140		0.250	<u> </u>	
14	720.00	7.140		0.250		
15	1080.00	7.140		0.250		
16	1440.00	7.140		0.250		
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Water 180 Co	rioo Hydrogeologic olumbia St. W.	Pumping test analysis	3	Date:	none, Page 6	
Waterloo	o,Ontario,Canada	Time-Drawdown plot		Project: PH0482		
ρh.(519)	746-1798			Evaluated by:		
Pumpi	ng Test No. 24 hour		Test conducted on:			
TW8			TW5			
Discha	arge 0.76 l/s		Distance from the pu	mping well 134.000	m	
Static	water level: 5.880 m below datum					
Pumping test duration Water level		Drawdov	vn			
	[min]	<b>5—3</b>				
1	0.00	[m] 5.880	[m]	0.000		
2	60.00	5.880		0.000	<del></del>	
3	100.00	5.910	<del></del>	0.030		
4	180.00	5.880		0.000		
5	240.00	5.910		0.030		
6	300.00	5.970		0.090		
7	360.00	5.910		0.030		
8	363.00	5.880		0.000		
9 10	420.00	5.880		0.000		
11	480.00 540.00	5.880		0.000		
12	600.00	5.860 5.850		-0.020 -0.030		
13	660.00	5.850	<del></del>	-0.030		
14	720.00	5.850		-0.030		
15	1080.00	5.850		-0.030		
16	1440.00	5.850		-0.030		
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Wate	Waterloo Hydrogeologic Pumping tes 180 Columbia St. W. Pumping tes Time-Drawd		<u> </u>	Date:	none, Page 7	
	columbia St. W. co,Ontario,Canada	Time-Drawdown plot		Project: PH0482	ct: PH0482	
	0)746-1798			Evaluated by:		
Pump	ing Test No. 24 hour		Test conducted on:			
TW8			TW2			
Disch	arge 0.76 l/s		Distance from the pu	umping well 167.000	m	
Static	water level: 4.420 m below datum					
	Pumping test duration	Water level	Drawdo	wn		
	[min]	[m]	[m]			
1	0.00	4.420	,	0.000		
2	60.00	4.420		0.000		
3	100.00	4.430		0.010		
4	150.00	4.420		0.000		
5	180.00	4,450		0.030		
6	240.00	4,430		0.010		
7	300.00	4.420		0.000	·	
8	360.00 363.00	4.420		0.000		
10	420.00	4.450 4.420	-	0.030		
11	480.00	4,430		0.010		
12	540.00	4.450	<del>-  </del>	0.030	<del></del>	
13	600.00	4.450		0.030		
14	660.00	4.450		0.030		
15	720.00	4.450	-	0.030		
16	1080.00	4.450		0.030		
17	1440.00	4.450		0.030		
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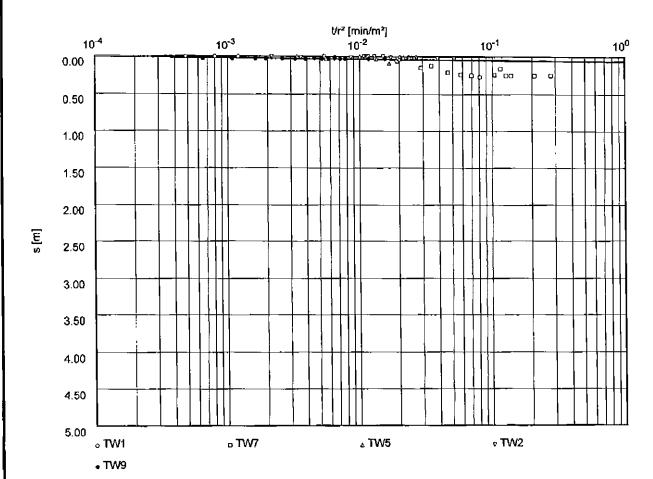
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vaterio	o Hydrogeologic πbia St. W.	Pumping test analysi	S	Date:	none, Page 8
	ntario,Canada	Time-Drawdown plot		Project: PH0482	
h.(619)746	-1798	<u></u>	_	Evaluated by:	
umping	Test No. 24 hour		Test conducted on:		
W8			TW9		
)ischarge	e 0.76 l/s		Distance from the	pumping well 304.0	00 m
Static wal	ter level: 2.930 m below datum				
	Pumping test duration	Water level	Draw	down	
	[min]	[m]	[r	n]	
1	0.00	2.930		0.000	
2	60.00	2.960		0.030	
3	100.00	2.960		0.030	<del></del>
4	150.00	2.960		0.030	<del>_</del>
5	180.00	2.960		0.030	
6	240.00	2.960		0.030	<del></del>
7	300.00	2.960		0.030	<del> </del>
8	360.00	2.960		0.030	
9	420.00	2.950		0.020	.,,,
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_	480.00	2.960		0.030	
11	540.00	2.960		0.030	<del>_</del>
12	600.00	2.940		0.010	
13	660.00	2.960		0.030	
14	720.00	2.960		0.030	
15	1080.00	2.960		0.030	
16	1440.00	2.960		0.030	
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Waterloo Hydrogeologic 180 Columbia St. W. Walerloo,Ontario,Canada	Pumping test analysis Distance-Time-Drawdown-method after COOPER & JACOB		Date: Project: PH048	none, Page 1	
ph.(619)746-1798	Confined aquifer		Evaluated by:		
Pumping Test No. 24 hour		Test conducted on:	on:		
TW8			<del> </del>		
Discharge 0.76 l/s			····		



Transmissivity [m²/min]: 5,67 x 10<sup>-1</sup>

Storativity: 6.15 x 10<sup>-5</sup>

Waterloo Hydrogeologic 180 Columbia St. W.
Waterloo,Ontario,Canada
nh (519)746-1798

Pumping test analysis
Distance-Time-Drawdown-method
after COOPER & JACOB
Confined aquifer

•			
	Date:	none, Page 2	
	Project: PH0482		_
	Evaluated by:		_

	Evolution by:
Pumping Test No. 24 hour	Test conducted on:
TW8	TW8
Discharge 0.76 l/s	

	Pumping test duration	Water level	Drawdown	
	[min]	[m]	[m]	
<del> -</del>	1		[irij	
2	1.00	6.860	2.030	
3	2.00	7,410	2.580	
4	3.00	7.740	2.910	
5	4.00	7.990	3.160	
6	5.00	8.170	3.340	<del>_</del>
7	6.00	8.320	3.490	
8	7.00	8.410	3.580	
9	8.00	8.470	3.640	
10	9.00	8.560	3.730	
11	10.00	8.600	3.770	
12	15.00	8.760	3.930	
13	20.00	8.850	4.020	
14	25.00	8.900	4.070	
15	30.00	8.950	4.120	
16	40.00	9.010	4.180	
17	50.00	9.040	4.210	
18	60.00	9.080	4.250	
19	80.00	9.120	4.290	
20	100.00	9.150	4.320	
21	120.00	9.160	4.330	
22	150.00	9.170	4.340	
23	180.00	9.050	4.220	
24	210.00	9.080	4.250	
25	240.00	9.140	4.310	
26	300.00	9.110	4.280	
27	360.00	9.130	4.300	
28	420.00	9.010	4.180	
29	480.00	9.070	4.240	
30	540.00	9.100	4.270	
31	600.00	9.080	4.250	
32	660.00	9.070	4.240	
33	720.00	9.070	4.240	
34	1080.00	9.050	4.220	
35	1440.00	9.050	4.220	
36	1442.00	6.450	1.620	
37	1443.00	6.250	1.420	
38	1444.00	6.100	1.270	
39	1445.00	5.970	1.140	
40	1446.00	5.870	1.040	
41	1447.00	5.790	0.960	
42	1448.00	5.730	0.900	
43	1449.00	5.670	0.840	
44	1450.00	5.620	0.790	
45	1455.00	5.470	0.640	
46	1460.00	5.370	0.540	
47	1465.00	5.300	0.470	
48	1470.00	5.250 5.170	0.420	
49 50	1480.00 1490.00	5.150	0.340 0.320	

Waterloo	<b>Hydrogeologic</b> ia Sl. W.	Pumping test analys	sis	Date:	none, Page 3	
Waterloo,Ontar		Distance-Time-Drav		Project: PH0482		
ph (519)746-17	98	Confined aquifer	Confined aquifer		Evaluated by:	
Pumping Te	st No. 24 hour		Test conducted (	on:		
TW8			TW8			
Discharge 0	.76 l/s	<u>.</u>				
	level: 4.830 m below datum	<u> </u>			<u> </u>	
	umping test duration	Water level	Dray	vdown		
	and the second second	770101701		Joon		
54	[min]	[m]		m]		
51 52	1500.00 1520.00	5.10 5.04		0.270 0.210	<del></del>	
- JZ	1320.00	3.04	<u> </u>	0.210		
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### Waterloo Hydrogeologic Pumping test analysis Date: none, Page 4 180 Columbia St. W. Distance-Time-Drawdown-method Project: PH0482 Waterloo,Ontario,Canada after COOPER & JACOB ph.(519)746-1798 Confined aquifer Evaluated by: Pumping Test No. 24 hour Test conducted on: TW8 TW<sub>1</sub> Discharge 0.76 l/s Distance from the pumping well 353,000 m Static water level: 2.230 m below datum Pumping test duration Water level Drawdown [min] [m][m] 2 60.00 2.230 0.000 3 100.00 2.230 0.000 4 150.00 2.230 0.000 5 180.00 2.200 -0.030 6 240.00 2.190 -0.040 7 300.00 2.190 -0.040 8 360.00 2.190 -0.040 9 363.00 2.200 -0.030 10 420.00 2.190 -0.040 11 540.00 2.190 -0.040 12 600.00 2.190 -0.04013 660.00 2.190 -0.040 14 720.00 2.160 -0.070 15 1080.00 2.160 -0.070 16 1440.00 2.150 -0.080

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180 C	erioo Hydrogeologic Columbia St. W.	Pumping test analysis	S	Date:	none, Page 5	
Wateri	oo,Ontario,Canada	Distance-Time-Drawd	down-method COB	Project: PH0482		
├──	9)746-1798	Confined aquifer		Evaluated by:	·	
	ing Test No. 24 hour		Test conducted on:			
8WT			TW7			
Disch	arge 0.76 l/s		Distance from the p	umping well 72.000	m	
Static	water level; 6.890 m below datum	_				
	Pumping test duration	Water level	Drawdo	wn		
	[min]	[m]	[m]			
2	60.00	6.890		0.000		
3	100.00	6.950		0.060		
4 5	150.00	7.040		0.150		
6	180.00 240.00	7.010		0.120		
7	300.00	7.100 7.130		0.210 0.240		
8	360.00	7.140	<del>-</del>	0.240		
9	363.00	7.140		0.250		
10	420.00	7.160		0.270		
11	540.00	7.130		0.240		
12	600.00	7.050		0.160		
13 14	660.00	7.140		0.250		
15	720.00 1080.00	7.140 7.140		0.250		
16	1440.00	7.140		0.250 0.250		
		7,140		0.250		
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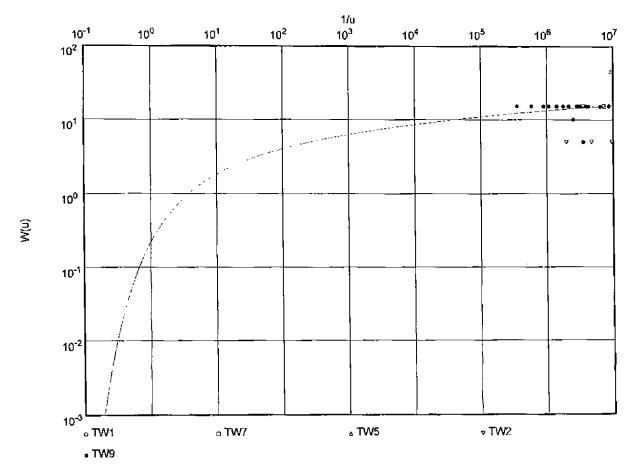
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### Waterloo Hydrogeologic Date: Pumping test analysis none, Page 6 180 Columbia St. W. Distance-Time-Drawdown-method Project: PH0482 Waterloo,Ontario,Canada after COOPER & JACOB ph.(519)746-1798 Confined aquifer Evaluated by: Pumping Test No. 24 hour Test conducted on: TW8 TW5 Discharge 0.76 l/s Distance from the pumping well 134,000 m Static water level: 5.880 m below datum Pumping test duration Water level Drawdown [min] [m] [m] 2 60.00 5.880 0.000 3 100.00 5.910 0.030 4 180.00 5.880 0.000 5 240.00 5.910 0.030 6 300.00 5.970 0.090 7 360.00 5.910 0.030 8 363.00 5.880 0.000 9 420.00 5.880 0.000 10 480.00 5.880 0.000 11 540.00 5.860 -0.020 12 600.00 5.850 -0.030 13 660.00 5.850 -0.030 14 720.00 5.850 -0.030 15 1080,00 5.850 -0.030 16 1440.00 5.850 -0.030

#### Waterloo Hydrogeologic Date: Pumping test analysis none, Page 7 180 Columbia St. W. Distance-Time-Drawdown-method Project: PH0482 Waterloo, Ontario, Canada after COOPER & JACOB ph.(519)746-1798 Confined aquifer Evaluated by: Pumping Test No. 24 hour Test conducted on: TW8 TW2 Discharge 0.76 l/s Distance from the pumping well 167,000 m Static water level: 4.420 m below datum Pumping test duration Water level Drawdown [min] [m] [m] 2 60.00 4.420 0.000 3 100.00 4.430 0.010 4 150.00 4.420 0.000 5 180.00 4.450 0.030 6 240.00 4.430 0.010 7 300.00 4.420 0.000 8 360.00 4.420 0.000 9 363.00 4.450 0.030 10 420.00 4.420 0.000 11 480.00 4.430 0.010 12 540.00 4.450 0.030 13 600.00 4.450 0.030 14 660.00 4.450 0.030 15 720.00 4.450 0.030 16 1080.00 4.450 0.030 17 1440.00 4.450 0.030

### Waterloo Hydrogeologic Pumping test analysis Dale: none, Page 8 180 Columbia St. W. Distance-Time-Drawdown-method Project: PH0482 Waterloo, Ontario, Canada after COOPER & JACOB ph.(519)746-1798 Confined aquifer Evaluated by: Pumping Test No. 24 hour Test conducted on: TW8 TW9 Discharge 0.76 l/s Distance from the pumping well 304,000 m Static water level: 2,930 m below datum Pumping test duration Water level Drawdown [min] [m] [m] 2 60.00 2.960 0.030 3 100.00 2.960 0.030 4 150.00 2.960 0.030 5 180.00 2.960 0.030 6 240.00 2.960 0.030 7 300.00 2.960 0.030 8 360.00 2.960 0.030 9 420.00 2.950 0.020 10 480.00 2.960 0.030 11 540.00 2.960 0.030 12 600.00 2.940 0.010 13 660.00 2.960 0.030 14 720.00 2.960 0.030 15 1080.00 2.960 0.030 16 1440.00 2.960 0.030

Waterloo Hydrogeologic 180 Columbia St. W.	Pumping test analysis Theis analysis method	Date:	none, Page 1	
Waterloo, Ontario, Canada	Confined aquifer	Project: PH0	1482	
ph.(519)746-1798		Evaluated by	Evaluated by:	
Pumping Test No. 24 hour		onducted on:		
TW8				
Discharge 0.76 l/s				



Transmissivity [m²/min]: 1.82 x 10<sup>0</sup>

Storativity:  $1.32 \times 10^{-8}$ 

Water 180 Co	r <b>loo Hydrogeologic</b> olumbía St. W.	Pumping test analysis Theis analysis method	Dale:	none, Page 2	
	o,Onlario,Canada	Confined aquifer	Project: PH0482	<u> </u>	
ph (519)	746-1798 		Evaluated by:		
Pumpii	ng Test No. 24 hour	Test	Test conducted on:		
TW8		TW8			
Discha	arge 0.76 l/s				
Static v	water level: 4.830 m below daturn				
	Pumping test duration	Waler level	Drawdown		
	[min]	[m]	[m]		
2	1.00	6.860			
3	2.00	7.410	2.030		
4	3.00	7.740	2.910		
5	4.00	7.990	3.160		
6	5.00	8.170	3.340		
7	6.00	8.320	3.490		
8	7.00	8.410	3.580		
9	8.00	8.470	3.640		
10	9.00	8.560	3.730		
11	10,00	8.600	3.770		
12	15.00	8.760	3.930		
13 14	20.00 25.00	8.850 8,900	4.020 4.070		
15	30.00	8.950	4.070		
16	40.00	9,010	4.180		
17	50.00	9.040	4.210		
18	60.00	9.080	4.250		
19	80.00	9.120	4.290		
20	100.00	9.150	4.320		
21	120.00	9,160	4.330		
22	150.00	9.170	4.340		
23	180.00	9.050	4.220		
2 <del>4</del> 25	210.00 240.00	9.080 9.140	4,250 4,310		
26 26	300.00	9.110	4.280		
27	360.00	9.130	4.300		
28	420.00	9.010	4.180		
29	480.00	9.070	4.240		
30	540.00	9.100	4.270		
31	600.00	9.080	4.250		
32	660.00	9.070	4.240		
33	720.00	9.070	4.240		
34	1080.00	9.050	4.220		
35	1440.00 1442.00	9.050 6.450	4.220 1.620		
36 37	1443.00	6.250	1.420		
38	1444.00	6.100	1.270		
39	1445.00	5.970	1.140		
40	1446.00	5.870	1.040		
41	1447.00	5.790	0.960		
42	1448.00	5.730	0.900		
43	1449.00	5.670	0.840		
44	1450.00	5.620	0.790		
45	1455.00	5.470	0.640		
46	1460.00	5.370	0.540		
47	1465.00	5.300	0.470 0.420		
48	1470.00	5.250	0.420		
49	1480.00	5.170	บเอนบ		

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Water	rloo Hydrogeologic olumbia St. W.	Pumping test analysis		Date:	none, Page 3	
	o,Ontario,Canada	Theis analysis metho Confined aquifer	ođ	Project: PH0482	<u> </u>	
	748-1798		Evaluated b		<del></del>	
Pumpi	ng Test No. 24 hour		Test conducted on:			
TW8			TW8			
Discha	rge 0.76 l/s			<del></del>		
	water level: 4.830 m below datum					
	Pumping test duration	Water level	Drawdov	tm -	·	
		TTUICH ICTCI	Diawdoy	<b>~</b> "		
	[min]	[m]	[m]			
51 52	1500.00 1520.00	5.100 5.040		0.270 0.210	· · · · · · · · · · · · · · · · · · ·	
	1020.00	3.040		0.210		
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Waterloo Hydrogeologic 180 Columbia St. W. Waterloo,Ontario,Canada		Pumping test analysis Theis analysis method Confined aquifer		Date:	none, Page 4	
				Project: PH0482		
ph.(519)746-	1798		Evaluated by:			
Pumping T	est No. 24 hour		Test conducted on:			
TW8			TW1			
Discharge	0.76 l/s		Distance from the pumping well 353,000 m			
Static water	er level: 2.230 m below datum					
	umping lest duration	Water level	Drav	vdown		
	[min]	[m]	[	m]		
2	60.00	2,230		0.000	· <u>-</u>	
3	100.00	2.230	-	0.000		
<del>4</del>	150.00	2.230		0.000		
6	180.00 240.00	2,200 2,190		-0.030	······································	
7	300.00	2.190		-0.040 -0.040		
8	360.00	2.190		-0.040		
9	363.00	2.200		-0.030		
10	420.00	2.190		-0.040		
11 12	540.00 600.00	2.190 2.190		-0.040		
13	660.00	2.190		-0.040 -0.040	·	
14	720.00	2.160		-0.070		
15	1080.00	2.160		-0.070		
16	1440.00	2.150		-0.080		
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180 Col	oo Hydrogeologic umbia St. W.	Pumping test analysis Theis analysis metho	o d	Date:	none, Page 5
/aterioo,	Ontario, Canada	Confined aquifer	Project: PH0482		
h.(519)74	46-1798 			Evaluated by:	
umping	g Test No. 24 hour		Test conducted on:		
W8			TW7		
Dischar	ge 0.76 l/s		Distance from the p	umping well 72.000	) m
Static w	ater level: 6.890 m below datum	······································		<del></del>	
	Pumping test duration	Water level	Drawdo	wn	
	[min]	[m]	[m]		
2	60.00	6.890		0.000	
3	100.00	6.950		0.060	
4	150.00	7.040		0.150	
5	180.00	7.010		0.120	
6	240.00	7.100		0.210	
7	300.00	7.130		0.240	
8	360.00 363.00	7,140 7,140		0.250 0.250	
10	420.00	7.140		0.250	<del></del>
11	540.00	7.130		0.240	· · · · · · · · · · · · · · · · · · ·
12	600.00	7.050		0.160	
13	660.00	7.140		0.250	
14	720.00	7.140		0.250	
15	1080.00	7.140		0.250	
16	1440.00	7.140		0.250	
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Waterloo Hydrogeologic 180 Columbia St. W. Waterloo,Ontario,Canada		Pumping test analysis		Date:	none, Page 6		
		Theis analysis methor Confined aquifer	Theis analysis method Confined aquifer		2		
ph.(519)	746-1798			Evaluated by:	Evaluated by:		
Pumpi	ng Test No. 24 hour		Test conducted on:				
TW8			TW5				
Discha	arge 0.76 l/s		Distance from the	pumping well 134.0	000 m		
Static	water level: 5.880 m below datum						
	Pumping test duration	Water level	Drawo	down			
	[min]	[m]		ı <u>]                                    </u>			
2	60.00	5.880		0.000			
3	100.00	5.910		0.030			
4	180.00	5.880		0.000			
5 6	240.00 300.00	5.910		0.030			
7	360.00	5.970 5.910		0.090			
8	363.00	5.880		0.000			
9	420.00	5.880		0.000			
10	480.00	5.880		0.000			
11	540.00 600.00	5.860 5.850		-0.020			
13	660.00	5.850		-0.030 -0.030			
14	720.00	5.850		-0.030			
15	1080.00	5.850	1 -	-0.030			
16	1440.00	5.850		-0.030			
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Waterloo Hydrogeologic Pumping test analysi 180 Columbia St. W. Pumping test analysis methologic Pumping test analysis methologic			Date:	none, Page 7		
	olumbia St. W. o,Ontario,Canada	Theis analysis methor Confined aquifer	d	Project: PH0482		
	746-1798		Evaluated by:			
Pumpir	ng Test No. 24 hour		Test conducted on:			
TW8			TW2			
Discha	rge 0.76 l/s		Distance from the pu	umping well 167.000	m	
Static v	water level: 4.420 m below datum			·		
	Pumping test duration	Water level	Drawdo	wn j		
	(min)	[m]	[m]			
2	60.00	4.420		0.000		
$-\frac{2}{3}$	100.00	4.430		0.000		
4	150.00	4.420		0.000		
5	180.00	4.450		0.030		
6	240.00	4.430		0.010		
7	300.00	4.420		0.000		
8	360.00	4.420		0.000		
9	363.00 420.00	4.450 4.420		0.030		
11	480.00	4.430	<del>-</del>	0.010	<del></del>	
12	540.00	4.450	<u> </u>	0.030	<del></del>	
13	600.00	4.450		0.030		
14	660.00	4.450		0.030		
15	720.00	4,450		0.030		
16	1080.00	4.450		0.030		
17	1440.00	4.450		0.030	<del></del>	
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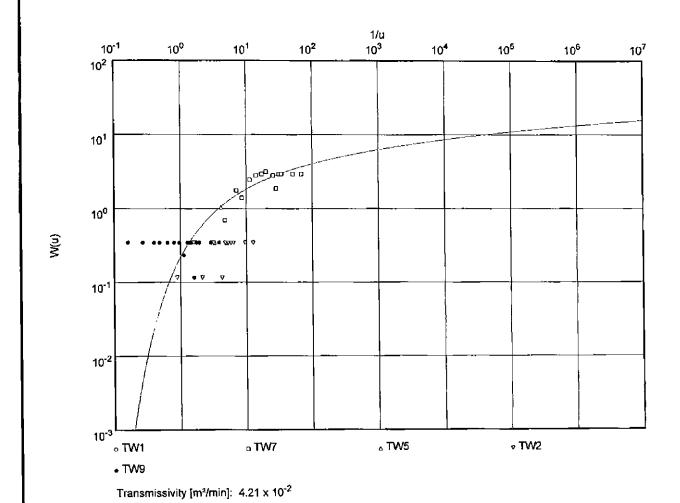
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Vateri	oo Hydrogeologic	Pumping test analysis		Date:	none, Page 8
	umbia St. W.	Theis analysis method Confined aquifer		Project: PH0482	
vatenco, h.(519)7	Ontario,Canada 46-1798	- Commed addition	Evaluated by:		
umpin	g Test No. 24 hour	<del></del>	Test conducted on:		
Γ <b>W</b> 8	<u> </u>	-	TW9		
 Dischar	ge 0.76 l/s		Distance from the p	umping well 304.00	00 m
Static w	rater level: 2.930 m below datum				
	Pumping test duration	Water level	Drawdo	ıwn .	
	[min]	[m]	[m]		
2	60.00	2.960		0.030	
3	100.00	2.960		0.030	
4	150.00	2.960		0.030	
5	180.00	2.960		0.030	·
6	240.00	2.960		0.030	
7	300.00	2.960	-	0.030 0.030	
8	360.00 420.00	2.960 2.950		0.030	<del></del>
10	480.00	2.960	<del></del>	0.030	
11	540.00	2.960		0.030	
12	600.00	2.940		0.010	
13	660.00	2.960		0.030	
14	720.00	2.960		0.030	
15	1080.00	2.960		0.030	
16	1440.00	2.960		0.030	
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Waterioo Hydrogeologic 180 Columbia St. W. Waterioo,Onlario,Canada		Pumping test analysis Theis analysis method Confined aquifer		none, Page 1
ph.(519)746-1798			Evaluated by:	
Pumping Test No. 24 hour	Test conducted on:	•		
TW8				
Discharge 0.76 l/s			· · · · · ·	
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Storativity: 6.82 x 10<sup>-4</sup>

# Waterloo Hydrogeologic 180 Columbia St. W. Waterloo,Ontario,Canada ph.(519)746-1798

Pumping test analysis Thels analysis method Confined aquifer

Date:	none, Page 2
Project: PH0482	
Evaluated by	

	L valuateo by.
Pumping Test No. 24 hour	Test conducted on:
TW8	TW8
Discharge 0.76 l/s	

Static water level: 4.830 m below datum

	Pumping test duration	Water level	Drawdown	
	[min]	[m]	[m]	
2	1.00	6.860	2.030	
3	2.00	7.410	2.580	
4	3.00	7.740	2.910	
5	4.00	7.990	3.160	
6	5.00	8.170	3.340	
7	6.00	8.320	3.490	
8	7.00	8.410	3.580	
9	8.00	8.470	3.640	
10	9.00	8.560	3.730	
11	10.00	8.600	3.770	
12	15.00	8.760	3.930	
13	20.00	8.850	4.020	
14	25.00	B.900	4.070	
15	30.00	8.950	4.120	
16	40.00	9.010	4.180	
17	50.00	9.040	4.210	
18	60.00	9.080	4.250	
19	80.00	9.120	4.290	
20	100.00	9.150	4.320	
21	120.00	9.160	4.330	
22	150.00	9.170	4.340	
23	180.00	9.050	4.220	
24	210.00	9.080	4.250	
25	240.00	9.140	4.310	
26	300.00	9.110	4.280	
27	360.00	9.130	4.300	
28 29	420.00	9.010	4.180	
30	480.00	9.070	4.240	
	540.00	9.100	4.270	
31	600.00	9.080	4.250	
32	660.00	9.070	4.240	
33	720.00	9.070	4.240	
34 35	1080.00	9.050	4.220	
36	1440.00 1442.00	9.050 6.450	4.220	
37	1443.00	6.250	1.620	
38	1444.00		1.420 1.270	
39	1445.00	6.100 5.970		
40	1445.00	5.870	1,140	
41	1447.00	5.790	0.960	
42	1448.00	5.730	0.900	
43	1449.00	5.670	0.840	
43	1450.00	5.620	0.790	<u> </u>
45	1455.00	5.470	0.790	
46	1460.00	5.370	0.540	
47	1465.00	5.300	0.470	
48	1470.00	5.250	0.470	<del></del>
49	1480.00	5.170	0.420	
50	1490.00	5.150	0.320	<u> </u>
50	1490.00	5.150	0.320	

180 Columbia St. W. The		Pumping test analysi	Pumping test analysis		none, Page 3	
		Theis analysis method Confined aquifer		Project: PH0482	2	
ph.(519)7			Evaluated by:			
Pumpin	ng Test No. 24 hour		Test conducted on:			
TW8			TW8	****		
	rge 0.76 l/s					
	vater level: 4.830 m below datum					
Static v	Pumping test duration	Water level	Drawo	iown		
	t displing tool defailed	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,				
	[min]	[m] 5.100	[m	0.270		
51 52	1500.00 1520.00	5.040		0.210		
- 52	1020.00	0.040	<u> </u>			
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Wate 180 C	Waterloo Hydrogeologic 180 Columbia St. W.  Pumping test analys Theis analysis metho		s d	Date:	none, Page 4	
Waterlo	oo,Ontario,Canada	Confined aquifer	<b>.</b>	Project: PH0482		
ph.(519	3)746-1798	<u></u>	Evaluated by:			
Pump	ing Test No. 24 hour		Test conducted on:			
TW8			TW1			
Disch	arge 0.76 l/s		Distance from the pu	 imping well 353.00	00 m	
Static	water level: 2.230 m below datum			<u> </u>	<del></del>	
	Pumping test duration	Water level	Drawdo	wn T		
	[min]	[m]	[m]			
2	60.00	2.230		0.000	······································	
3	100.00 150.00	2.230		0.000		
5	180.00	2.230 2.200		0.000 -0.030		
6	240.00	2.190		-0.040		
7	300.00	2.190		-0.040		
8	360.00	2.190		-0.040		
9	363.00	2.200		-0.030		
10	420.00	2.190		-0.040		
11	540.00	2.190		-0.040		
12	600.00 660.00	2.190 2.190		-0.040 -0.040		
14	720.00	2.190		-0.040		
15	1080.00	2.160		-0.070		
16	1440.00	2.150		-0.080		
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Wate	Waterloo Hydrogeologic Pumping test analys 180 Columbia St. W. Pumping test analysis method			Date:	none, Page 5
	o,Onlario,Canada	Theis analysis metho Confined aquifer	Project: PH0482		
ph.(519)	)746-1798	· ·		Evaluated by:	
Pumpi	ing Test No. 24 hour		Test conducted on:		
TW8			TW7		
Discha	arge 0.76 l/s				
	water level: 6.890 m below datum	<u> </u>	Distance from the pu	mping weil 72.000	<u>m</u>
Otatio	Pumping test duration	144 ( )			
	r uniping test duration	Water level	Drawdov	wn	
	[min]	[m]	[m]		
2	60.00	0.000			
3	60.00 100.00	6.890 6.950		0.000	
4	150.00	7.040		0.060 0.150	
5	180.00	7.010		0.120	
6	240.00	7.100		0.210	
7	300.00	7,130		0.240	
8	360.00	7.140		0.250	
9 10	363.00	7.140		0.250	
11	420.00 540.00	7.160 7.130		0.270	
12	600.00	7.050	<del></del>	0.240 0.160	
13	660.00	7.140	<del></del>	0.250	
14	720.00	7.140		0.250	
15	1080.00	7.140	_	0.250	
16	1440.00	7.140		0.250	
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<b>Waterloo Hyd</b> 180 Columbia S	drogeologic	Pumping test analysis		Date:	none, Page 6
180 Columbia St. W. Theis analysis methologopathol		od	Project: PH048	2	
h (519)746-1798				Evaluated by:	
Pumping Test N	lo. 24 hour	<u> </u>	Test conducted on	<del></del>	<del></del> -
W8			TW5	<del></del>	
Discharge 0.76 l/s		Distance from the	pumping well 134.0	000 m	
	el: 5.880 m below datum				
	ing test duration	Water level	Drawd	own	
	[min]	[m]	[m	1	
2	60.00	5.880		0.000	
3	100.00	5.910		0.030	
4	180.00	5.880		0.000	
5	240.00	5.910		0 030	
6	300.00	5.970		0.090	
7	360.00	5.910		0.030	
8	363.00	5.880		0.000	
9	420.00	5.880		0.000	
10	480.00 540.00	5.880 5.860		0.000 -0.020	<del>-</del>
12	600.00	5.850		-0.030	
13	660.00	5.850		-0.030	
14	720.00	5.850		-0.030	
15	1080.00	5.850	)	-0.030	
16	1440.00	5.850	)	-0.030	
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Waterloo Hydrogeologic		Pumping test analysis		Date:	none, Page 7	
180 Columbia St. W. Waterloo, Ontario, Canada		Theis analysis metho Confined aquifer	od	Project: PH0482	2	
	)746-1798	•	Evaluated by:			
Pumpi	ng Test No. 24 hour		Test conducted on:			
TW8			TW2			
Discha	Discharge 0.76 l/s			pumping well 167.0	000 m	
	water level: 4,420 m below datum					
	Pumping test duration	Water level	Draw	down		
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-	[min]	[m]		n]		
2	60.00	4.420		0.000		
3	100.00	4.430		0.010		
4	150.00	4.420		0.000	·	
5	180.00 240.00	4.450 4.430		0.030		
7	300.00	4.420		0.010 0.000	<u> </u>	
8	360.00	4.420		0.000	<u> </u>	
9	363.00	4.450		0.030		
10	420.00	4.420		0.000		
11	480.00	4.430		0.010		
12	540.00	4.450		0.030		
13	600.00 660.00	4.450 4.450		0.030		
15	720.00	4.450		0.030	<del></del>	
16	1080.00	4.450		0.030		
17	1440.00	4.450		0.030		
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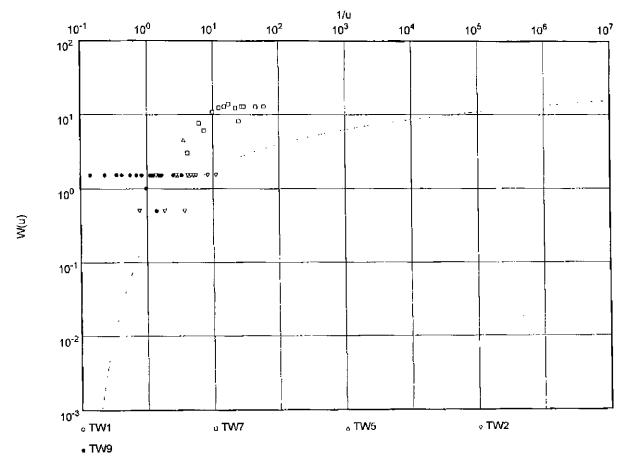
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## Date: Waterloo Hydrogeologic 180 Columbia St. W. none, Page 8 Pumping test analysis Theis analysis method Project: PH0482 Confined aquifer Waterloo,Ontario,Canada ph.(619)746-1798 Evaluated by: Pumping Test No. 24 hour Test conducted on: **TW8** TW9 Discharge 0.76 l/s Distance from the pumping well 304,000 m Static water level: 2.930 m below datum Water level Drawdown Pumping test duration [min] [m] [m] 60.00 2.960 0.030 2 3 100.00 2.960 0.030 0.030 4 150.00 2.960 5 180.00 2.960 0.030 0.030 240.00 2.960 6 300.00 0.030 7 2.960 360.00 2.960 0.030 8 420.00 2.950 0.020 9 2.960 0.030 480.00 10 540.00 2.960 0.030 11 0.010 2.940 12 600.00 0.030 13 660.00 2.960 0.030 720.00 2.960 14 0.030 2.960 1080.00 15 0.030 2.960 1440.00 16

Waterioo Hydrogeologic 180 Columbia St. W. Waterloo,Ontario,Canada	Pumping test analysi Theis analysis methol Confined aquifer		Date: Project: PH0482	none, Page 1
ph (519)746-1798			Evaluated by:	
Pumping Test No. 24 hour		Test conducted on:	<u> </u>	
TW8			· · · · · · · · · · · · · · · · · · ·	
Discharge 0.76 l/s		···	<b></b>	



Transmissivity [m²/min]: 1.84 x 10<sup>-1</sup>

Storativity: 3.46 x 10<sup>-3</sup>

		Pumping test analysis		Date:	none, Page 2
		Theis analysis method			2
ph.(519)746-1	·	a a man and and a		Evaluated by:	
Pumping T	est No. 24 hour		Test conducted on:		
TW8		-	TW8		
 Discharge	0.761/e				
	er level: 4.830 m below datum		<del></del>		
, F	Pumping test duration	Water level	Drav	vdown	
	[min]	[m]	,	m]	
2	1.00	6.860		2.030	
3	3.00	7.410		2.580	
5	4.00	7.740		2.910 3.160	
6	5.00	8.170	-	3.340	
7	6.00	8.320		3.490	
8	7.00	8.410		3.580	
9	8.00	8.470		3.640	
10	9.00	8.560 8.600		3.730 3.770	·
12	15.00	8.760		3.930	
13	20.00	8,850		4.020	
14	25.00	8.900		4.070	
15	30.00	8.950		4.120	
16	40.00	9.010			
17	50.00 60.00	9.040 9.080			
19	80.00	9.120			
20	100.00	9.150			
21	120.00	9.160		4.330	
22	150.00	9.170		4.340	
23	180.00 210.00	9.050 9.080	<del>-</del>	4.220 4.250	
24	240.00	9.140		4.310	· <u> </u>
26	300.00	9.110		4.280	
27	360.00	9.130		4.300	
28	420.00	9.010		4.180	
29	480.00	9.070		4.240 4.270	
30	540.00 600.00	9.100 9.080		4.250	
32	660.00	9.070		4.240	
33	720.00	9.070	1	4.240	
34	1080.00	9.050		4.220	
35	1440.00	9.050		4.220	
36	1442.00 1443.00	6.450 6.250		1.620 1.420	
37 38	1443.00	6.100		1.270	
39	1445.00	5.970		1.140	
40	1446.00	5.870		1.040	
41	1447.00	5.790		0.960	
42	1448.00 1449.00	5.730 5.670		0.900 0.840	
43	1449.00	5.620		0.790	<del></del>
45	1455.00	5.470		0.640	
46	1460.00	5.370	)	0.540	
47	1465.00	5.300		0.470	
48	1470.00	5.250		0.420 0.340	
49 50	1480.00 1490.00	5.170 5.150		0.340	

180 Columbia St. W. Theis analys Waterloo,Ontario,Canada Confined aqu		Pumping test analysis	s	Date:	none, Page 3	
		Theis analysis metho Confined aquifer	Confined aquifer			
ph.(519)746	-1798		Evaluated by:			
Pumping	Test No. 24 hour		Test conducted on:			
TW8			TW8			
Discharge	0.76 l/s					
Static wat	er level: 4.830 m below datum					
	Pumping test duration	Water level	Drawdo	wn		
	(min)	[m]	[m]			
51 52	1500.00 1520.00	5.100 5.040		0.270		
	1520.00	5.040		0.210	<del></del>	
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Wate	rloo Hydrogeologic olumbia St. W.	logic Pumping test analysi		Date:	none, Page 4	
	180 Columbia St, W. Theis analysis methor Waterloo, Ontario, Canada Confined aquifer		od	Project: PH0482	Project: PH0482	
ph (519	)746-1798 	•		Evaluated by:		
Pump	ing Test No. 24 hour		Test conducted on	<del></del> :		
TW8			TW1			
Disch	arge 0.76 l/s		Distance from the	pumping well 353.00	00 m	
Static	water level: 2.230 m below datum					
	Pumping test duration	Water level	Drawd	own		
	(min)	[m]	[m]	<u> </u>		
2	60.00	2.230		0.000		
3	100.00	2.230		0.000		
	150.00 180.00	2.230 2.200		0.000		
6	240.00	2.200		-0.030 -0.040		
7	300.00	2.190		-0.040		
8	360.00	2.190		-0.040		
9	363.00	2.200		-0.030		
10	420.00	2.190		-0.040		
11	540.00	2.190		-0.040		
12	600.00	2.190		-0.040		
13 14	660.00	2.190		-0.040		
15	720.00 1080.00	2.160 2.160		-0.070 -0.070		
16	1440.00	2.150		-0.080		
	7,10.00	2.100				
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Waterloo Hydrogeologic 180 Columbia St. W. Pumping test analysis meth		is	Date:	none, Page 5		
Waterloo,Ontario,Canada		Theis analysis methor Confined aquifer	od	Project: PH048	2	
	)746-1798	·	Evaluated by:			
Pumpi	ing Test No. 24 hour		Test conducted on:			
8WT			TW7			
Discha	arge 0.76 l/s		Distance from the	pumping well 72.00	00 m	
Static	water level: 6.890 m below datum				<del></del>	
	Pumping test duration	Water level	Draw	rdown		
_	[min]	[m]	[r	ոյ		
2	60.00	6.890	-	0.000		
3	100.00	6.950		0.060		
4	150.00	7.040		0.150		
5	180.00	7.010		0.120		
6 7	240.00 300.00	7.100 7.130		0.210 0.240		
В	360.00	7.140		0.250		
9	363.00	7.140		0.250		
10	420.00	7.160		0.270		
11	540.00	7.130		0.240		
12	600.00	7.050		0.160		
13	660.00	7.140		0.250		
14	720.00	7.140		0.250		
15 16	1080.00 1440.00	7.140 7.140		0.250 0.250		
	1440.00	7,140		0.250		
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Wate	rloo Hydrogeologic olumbia St. W.	Hydrogeologic Pumping test analysis		Date:	none, Page 6	
		Theis analysis methological Confined aquifer	od	Project: PH0482		
	)746-1798		Evaluated by:			
Pump	ing Test No. 24 hour		Test conducted on:	_ <del></del> :		
TW8			TW5			
Discha	arge 0.76 l/s		Distance from the p	oumping well 134.0		
_	water level: 5.880 m below datum					
	Pumping test duration	Water level	Drawd	own		
				-		
	[min]	[m]	[m]	<u> </u>		
2	60.00	5.880		0.000		
3	100.00	5.910		0.030		
<del>4</del>	180.00 240.00	5.880 5.910		0.000		
5 6	300.00	5.970		0.030		
7	360.00	5.910		0.030		
8	363.00	5.880		0.000		
9	420.00	5.880		0.000		
10	480.00	5.880		0.000		
11	540.00	5.860		-0.020		
12	600.00	5.850		-0.030		
13	660.00	5.850		-0.030		
14	720.00	5.850 5.850		-0.030 -0.030		
15 16	1080.00 1440.00	5.850		-0.030		
10	1440.00		<del>*  </del>		<del></del>	
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Waterloo Hydrogeologic Pumping test analysis 180 Columbia St. W. Pumping test analysis method		s	Date:	none, Page 7		
		Theis analysis methological Confined aquifer	od	Project: PH048	2	
ph.(519)74	16-1798	-	Evaluated by:			
Pumping	g Test No. 24 hour		Test conducted on:			
TW8			TW2			
Discharg	ge 0.76 l/s		Distance from th	e pumping well 167.0	000 m	
Static wa	ater level: 4.420 m below datum					
	Pumping test duration	Water level	Drav	vdown		
	[min]	(m)		[m]		
2	60.00	4.420		0.000		
3	100.00	4.430		0.010		
5	150.00 180.00	4.420		0.000	<del></del>	
6	240.00	4.450 4.430		0.030	····	
7	300.00	4.420		0.000	·	
8	360.00	4.420		0.000		
9	363.00	4.450	)	0.030		
10	420.00	4.420		0.000		
11	480.00	4.430		0.010		
12	540.00	4.450		0.030		
13	600.00	4.450 4.450		0.030 0.030		
15	720.00	4.450		0.030	<u>-</u>	
16	1080.00	4.450		0.030	<u> </u>	
17	1440.00	4.450		0.030		
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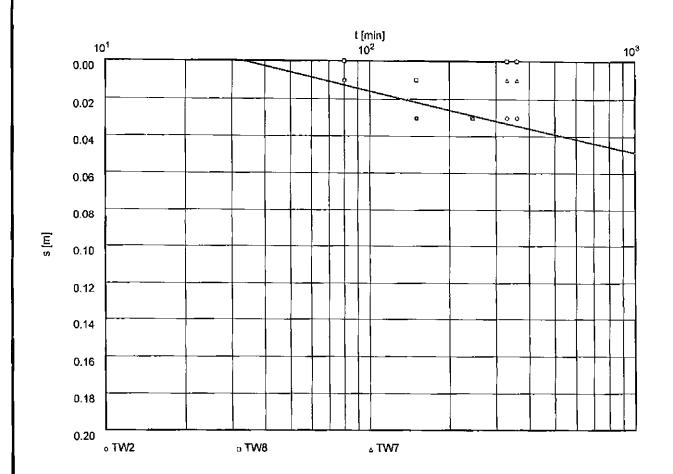
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Wate	rloo Hydrogeologic olumbia St. W.	Pumping test analysi	s	Date:	поле, Раде 8	
	olumbia St. W. o,Ontario,Canada	Theis analysis method Confined aquifer		Project: PH0482		
	)746-1798		Evaluated by:			
Pumpi	ing Test No. 24 hour	<u> </u>	Test conducted on:			
TW8			TW9			
Discha	arge 0.76 l/s			umping well 304.000	m	
	water level: 2.930 m below datum					
	Pumping test duration	Water level	Drawdo	wn		
	[min]	[m]	[m]		- <u></u>	
2	60.00	2.960		0.030		
3	100.00	2.960		0.030		
4	150.00	2.960		0.030		
5	180.00	2.960		0.030	<del>.</del>	
6 7	240.00 300.00	2.960 2.960		0.030		
8	360.00	2.960		0.030		
9	420.00	2.950		0.020		
10	480.00	2.960		0.030		
11	540.00	2.960		0.030		
12	600.00	2.940		0.010		
13	660.00	2.960		0.030		
14	720.00	2.960		0.030		
15	1080.00	2,960 2,960		0.030	<del>_</del>	
16	1440.00	2.90.	<u>'                                    </u>	0.030		
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Pumping test analysis		Date:	none, Page 1	
COOPER & JACOB	Project: PH0482			
Confined aquifer	Confined aquifer		Evaluated by:	
-	Test conducte	ed on:		
	Time-Drawdown-r COOPER & JACC	Time-Drawdown-method after COOPER & JACOB Confined aquifer	Time-Drawdown-method after COOPER & JACOB Confined aguifer	



Transmissivity [m²/min]:  $4.19 \times 10^{-1}$ 

Storativity:  $4.07 \times 10^{-4}$ 

#### Waterloo Hydrogeologic Date: Pumping test analysis none, Page 2 180 Columbia St. W. Time-Drawdown-method after Project: PH0482 Waterioo,Ontario,Canada **COOPER & JACOB** ph.(519)746-1798 Confined aquifer Evaluated by: Pumping Test No. 1 Test conducted on: TW9 TW9 Discharge 1.26 l/s Static water level: 2.930 m below datum Pumping test duration Water level Drawdown [min] [m] [m]2 1.00 3.010 0.080 3 2.00 3.030 0.100 4 3.00 3.030 0.100 5 4.00 3.030 0.100 6 5.00 3.030 0.100 7 6.00 3.030 0.100 8 7.00 3.030 0.100 9 8.00 3.030 0.100 10 9.00 3.030 0.100 11 10.00 3.030 0.100 12 15.00 3.030 0.100 13 20.00 3.040 0.110 14 25.00 3.040 0.110 15 30.00 3.040 0.110 16 40.00 3.040 0.110 17 50.00 3.040 0.110 18 60.00 3.040 0.110 19 80.00 3.050 0.120 20 120.00 3.050 0.120 150.00 21 3.060 0.130 22 180.00 3.060 0.130 3.060 23 210.00 0.130

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Waterloo Hydrogeologic Pumping test analy 180 Columbia St. W. Time-Drawdown-rr		Pumping test analysis	3	Date:	none, Page 3	
		Time-Drawdown-method after		<del></del>	Thomas ago o	
	oo,Ontario,Canada 9746-1798	COOPER & JACOB	A A		Project: PH0482	
		Evaluated by:				
	ing Test No. 1		Test conducted on:			
TW9			TW2			
Disch	arge 1.26 l/s		Distance from the pu	ımping well 277.00	0 m	
	water level: 4.390 m below datum					
	Pumping test duration	Water level	Drawdo			
		- Justi 16461	Drawgo.	7811		
	[min]	[m]	[m]			
2	80.00	4,400		0.010		
3	150.00	4.420		0.010 0.030		
4	245.00	4.420		0.030		
5	330.00	4.420		0.030		
6	360.00	4.420	-	0.030		
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Waterloo Hydrogeologic 180 Columbia St. W.		Pumping test analysis		Date:	none, Page 4
rou Columbia Si Naterico,Ontario,Ca		Time-Drawdown-meth COOPER & JACOB	od after	Project: PH04	
•		Confined aquifer		Evaluated by:	
Pumping Test No. 1 Test cond		Test conducted on:	<u> </u>		
TW9			TW8		
Discharge 1.26 L	's		Distance from the p	umping well 304	000 m
Static water leve	l: 4.880 m below datum				
Pumpi	ng test duration	Water level	Drawdo	wn	
	[min]	r1			
	fumil	<u>[m]</u>	[m]		
2	80.00	4.880		0.000	
3 4	150.00 245.00	4.890		0.010	
5	330.00	4.910 4.880		0.030	
6	360.00	4.880		0.000	
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Wate	erloo Hydrogeologic columbia St. W.	Pumping test analysi	<u> </u>	Date:	none, Page 5
	180 Columbia St. W. Time-Drawdown-met COOPER & JACOB		hod after	Project: PH0482	none, rage o
	9)746-1798	COOPER & JACOB Confined aquifer		Evaluated by:	
Pumping Test No. 1			Test conducted on:	Evaluated by.	
TW9			TW7	·	
	arge 1.26 l/s				
			Distance from the pu	umping well 344.000	m 
Static	water level: 5.230 m below datum				
	Pumping test duration	Water level	Drawdov	wn	
	[min]	[m]	[m]		
2	80.00	5.240		0.010	
3	150.00	5.260	<del>-</del>	0.030	
<b>4</b> 5	245.00 330.00	5.260		0.030	
6	360.00	5.240 5.240		0.010 0.010	
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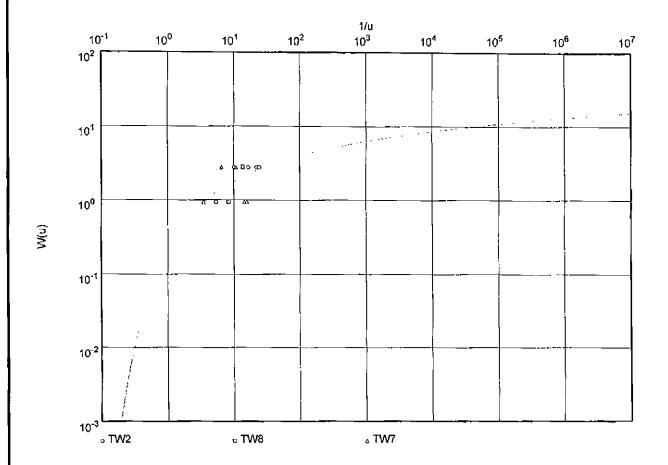
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Waterloo Hydrogeologic 180 Columbia St. W.	Pumping test analys		Date:	none, Page 1
Waterloo,Onlano,Canada	Theis analysis metho Confined aquifer	oa	Project: PH0482 Evaluated by:	
ph (519)746-1798				
Pumping Test No. 1		Test conducted of	on:	
TW9				
Discharge 1.26 l/s				
Discharge 1.26 l/s				



Transmissivity [m²/min]: 5.65 x 10<sup>-1</sup>

Storativity: 4.38 x 10<sup>-4</sup>

su Calumbia C	Pumping test analysis		Date:	none, Page 2
180 Columbia St. W. Theis analysis meth Waterloo,Ontario,Canada Confined aquifer ph.(519)746-1798		Theis analysis method	Project: PHO	482
		Commod aquiter	Evaluated by	
Pumping Test No. 1			t conducted on:	
		TW		
ischarge 1.26	l/s			
<del></del>	el: 2.930 m below datum			
- ,	ing test duration	Water level	Drawdown	
	[min]	[m]	[m]	<del></del>
2	1.00	3.010	0.080	·
3	2.00	3,030	0.100	
4	3.00	3.030	0.100	
5	4.00	3.030	0.100	
6	5.00	3.030	0.100	
7	6.00	3.030	0.100	
8	7.00	3.030	0.100	
9	8.00	3.030	0.100	
10	9.00	3.030	0.100	
11	10.00 15.00	3.030	0.100	
13	20.00	3.030 3.040	0.100	
14	25.00	3.040	0.110 0.110	
15	30,00	3.040	0.110	
16	40.00	3.040	0.110	
17	50.00	3.040	0.110	
18	60.00	3.040	0.110	
19	80.00	3.050	0.120	
20	120.00	3.050	0.120	• • • • • • • • • • • • • • • • • • • •
21	150.00	3.060	0.130	
22	180.00	3.060	0.130	
23	210.00	3.060	0.130	
24	240.00	3.070	0.140	
25	300.00	3.070	0.140	
26 27	360.00 361.00	3.070 2.990	0.140 0.060	<u> </u>
28	362.00	2.990	0.060	<del></del>
29	363.00	2.970	0.040	
30	364.00	2.970	0.040	
31	365.00	2.970	0.040	
32	366.00	2.970	0.040	· · · · · · · · · · · · · · · · · · ·
33	367.00	2.960	0.030	
34	368.00	2.960	0.030	
35	369.00	2.960	0.030	
36	370.00	2.960	0.030	
37	375.00	2.950	0.020	
38	380.00	2.940	0.010	
39	385.00	2.930	0.000	
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Wate	rloo Hydrogeologic	Pumping test analysi		Date:	none, Page 3
	rloo Hydrogeologic olumbia St. W.	Theis analysis metho	od	Project: PH0482	Hone, Fage 6
	o,Ontario,Canada )745-1798	Confined aquifer		Evaluated by:	
Pumpi	ing Test No. 1		Test conducted on:	Lvaluated by.	<del></del>
TW9			TW2		
	arge 1.26 l/s				
			Distance from the pu	mping well 277.000	m
Static	water level: 4.390 m below datum				
	Pumping test duration	Water level	Drawdov	wn	
	[min]	[m]	[m]		
2	80.00	4.400		0.010	
3	150.00	4.420		0.010 0.030	
4	245.00	4.420		0.030	
5	330.00	4.420	•	0.030	
6	360.00	4.420		0.030	
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Waterloo	Hydrogeologic bia St. W.	Pumping test analysis	S	Date:	none, Page 4	
		Theis analysis methol Confined aquifer	eis analysis method nfined aquifer		Project: PH0482	
ph.(519)746-1				Evaluated by:		
Pumping T	est No. 1		Test conducted on:		<del>.</del>	
TW9			TW8		<u>.</u>	
Discharge	1.26 l/s		Distance from the pu	mping well 304.000		
	er level: 4.880 m below datum					
	Pumping test duration	Water level	Drawdo	WD.		
			Brawco			
-	[min]	[m]	[m]			
2	80.00	4.880	· · · · · · · · · · · · · · · · · · ·	0.000	·	
3	150.00	4.890		0.010		
4	245.00	4.910		0.030		
5 6	330.00	4.880		0.000		
0	360.00	4.880		0.000		
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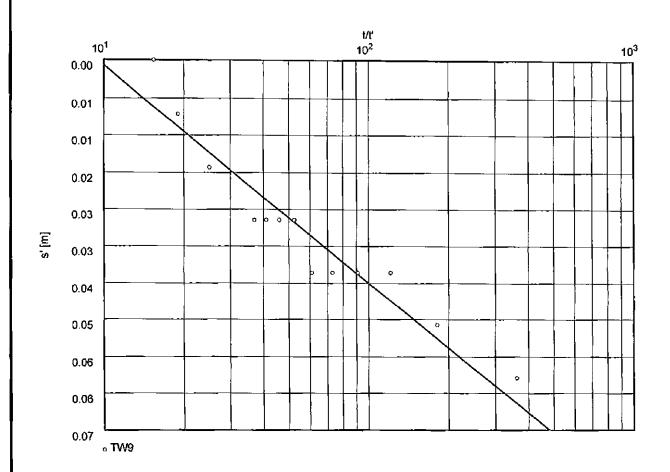
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			Project: PH048			
ph.(519)74			Evaluated by:			
Pumping	Test No. 1		Test conducted on:	<del></del>		
TW9			TW7			
Discharg	ge 1.26 l/s		Distance from the p	umping well 344.000	m	
	ater level: 5.230 m below datum					
	Pumping test duration	Water level	Drawdo	wn		
}	, p		D.C.IIda			
	[min]	[m]	[m]			
2	80.00	5.240		0.010		
3	150.00	5.260		0.030		
4 5	245.00 330.00	5.260 5.240		0.030	· · · · · · · · · · · · · · · · · · ·	
6	360.00	5.240		0.010		
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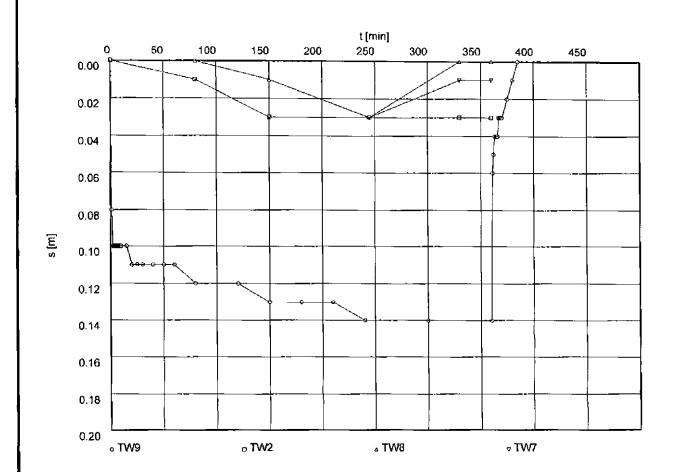
Waterloo Hydrogeologic 180 Columbia St. W	Pumping test analys Recovery method af		Date:	none, Page 1
Waterloo,Ontario,Canada	THEIS & JACOB	(C)	Project: PH0	482
ph.(519)746-1798	Confined aquifer		Evaluated by:	
Pumping Test No. 1		Test conducted on		
TW9				
Discharge 1.26 Vs		,	·	
		Pumping test durat	ion: 360 00 min	



Transmissivity [m²/min]: 3.37 x 10<sup>-1</sup>

Waterloo Hydrogeologic Pumping test analysis Date: none, Page 2 180 Columbia St. W. Recovery method after Project: PH0482 Waterloo,Ontario,Canada THEIS & JACOB Confined aquiler ph (519)746-1798 Evaluated by: Pumping Test No. 1 Test conducted on: TW9 TW9 Discharge 1.26 l/s Static water level: 2.930 m below datum Pumping test duration: 360,00 min Time from Water level Residual end of pumping drawdown [min] [m] (m) 1 1.00 2.990 0.060 2 2.00 2.980 0.050 3 3.00 2.970 0.040 4 4.00 2.970 0.040 5 5.00 2.970 0.040 6 6.00 2.970 0.040 7 2.960 7.00 0.030 8 8.00 2.960 0.030 9 9.00 2.960 0.030 10 10.00 2.960 0.030 11 15.00 2.950 0.020 12 20.00 2.940 0.010 13 25.00 2.930 0.000

Waterloo Hydrogeologic 180 Columbia St. W.	Pumping test analysis	Date:	none, Page 1	
Waterloo,Ontario,Canada	Time-Drawdown plot	Project: PH0482		
ph.(519)746-1798		Evaluated by	Evaluated by:	
Pumping Test No. 1	Test conduc	cted on:		
TW9				
Discharge 1.26 l/s				
TW9	Test conduc	oted on:		



Wate	rloo Hydrogeologic	Pumping test analysis	<u> </u>	Date:	none, Page 2
180 C	columbia St. W. co,Ontario,Canada	Time-Drawdown plot		Project: PH04	
	)746-1798			Evaluated by:	· · · · · · · · · · · · · · · · · · ·
Pump	ing Test No. 1		Test conducted on:	Lyaluated by:	
TW9					
			TW9		
Disch	arge 1.26 l/s				
Static	water level: 2.930 m below datum	1			
	Pumping test duration	Water level	Drawdo	лwл	
	r:-1				
1 (	(min] 0.00	[m] 2.930	[m]	0.000	
2	1.00	3.010		0.000	<del></del>
3	2.00	3.030	<del></del>	0.100	
4	3.00	3.030	<del></del>	0.100	
5	4.00	3.030		0.100	
6	5.00	3.030		0.100	
7	6.00	3.030		0.100	
8	7.00	3.030		0.100	
9	8.00	3.030		0.100	
10	9.00	3.030	_	0.100	
11	10.00 15.00	3.030	<del></del>	0.100	
13	20.00	3.030 3.040	<del> </del>	0.100	
14	25.00	3.040		0.110 0.110	
15	30.00	3.040		0.110	··
16	40.00	3.040	<del></del>	0.110	
17	50.00	3.040		0.110	·
18	60.00	3.040	_	0.110	
19	80.00	3.050		0.120	
20	120.00	3.050		0.120	
21	150.00	3.060		0.130	
22	180.00	3.060		0.130	
23 24	210.00	3.060		0.130	_ <del></del>
25	240.00 300.00	3.070 3.070		0.140	
26	360.00	3.070	<del></del>	0.140 0.140	- <del></del>
27	361.00	2.990	<del>-</del>	0.060	· · · · · · · · · · · · · · · · · · ·
28	362.00	2.980	<del>-  </del>	0.050	· <u>-</u>
29	363.00	2.970		0.040	
30	364.00	2.970		0.040	
31	365.00	2.970		0.040	
32	366.00	2.970		0.040	
33	367.00	2.960		0.030	
34	368.00	2.960		0.030	
35	369.00	2.960		0.030	
36 37	370.00 375.00	2.960 2.950		0.030	<del></del>
38	380.00	2.940		0.020	
39	385.00	2.930	<del>-  </del>	0.000	
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Waterioo Hydrogeologic Pumping test analysis 180 Columbia St. W. Pumping test analysis Time-Drawdown plot		3	Date:	none, Page 3	
	80 Columbia St. W. Time-Drawdown plo		Project: PH04		
ph.(519)74				Evaluated by:	
Pumpino	g Test No. 1		Test conducted on:	L	<del></del>
TW9			TW2	<del> </del>	
	ge 1.26 l/s		Distance from the pu	Imping well 277.000	m
	ater level: 4.390 m below datum				
	Pumping test duration	Water level	Drawdov	wn	
	Product	f. 1			
1	[min] 0.00	[m] 4,390	[m]	0.000	
2	80.00	4.400	-	0.010	
3	150.00	4.420		0.030	
4	245.00	4.420		0.030	• • • • • • • • • • • • • • • • • • • •
5	330.00	4.420		0.030	
6	360.00	4.420		0.030	
-	000.00	7.720		0.030	
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Wate	rloo Hydrogeologic olumbia St. W.	Pumping test analysis	5	Date:	none, Page 4
	olumbia St. W. o,Ontario,Canada	Time-Drawdown plot		Project: PH0482	
	)746-1798			Evaluated by:	<del>-</del>
Pumpi	ing Test No. 1	<del></del>	Test conducted on:	L	
TW9			TW8		
	arge 1.26 l/s				0 ***
			Distance from the po	Jmping Well 304.00	0 m
Static	water level: 4.880 m below datum		<del></del>		
	Pumping test duration	Water level	Drawdo	wn	
	[min]	(m)	[m]		
1	0.00	4.880		0.000	
2	80.00 150.00	4.880 4.890		0.000	
4	245.00	4.910	<del>-  </del>	0.010 0.030	<u></u>
5	330.00	4.880	<b></b>	0.000	
6	360.00	4.880		0.000	
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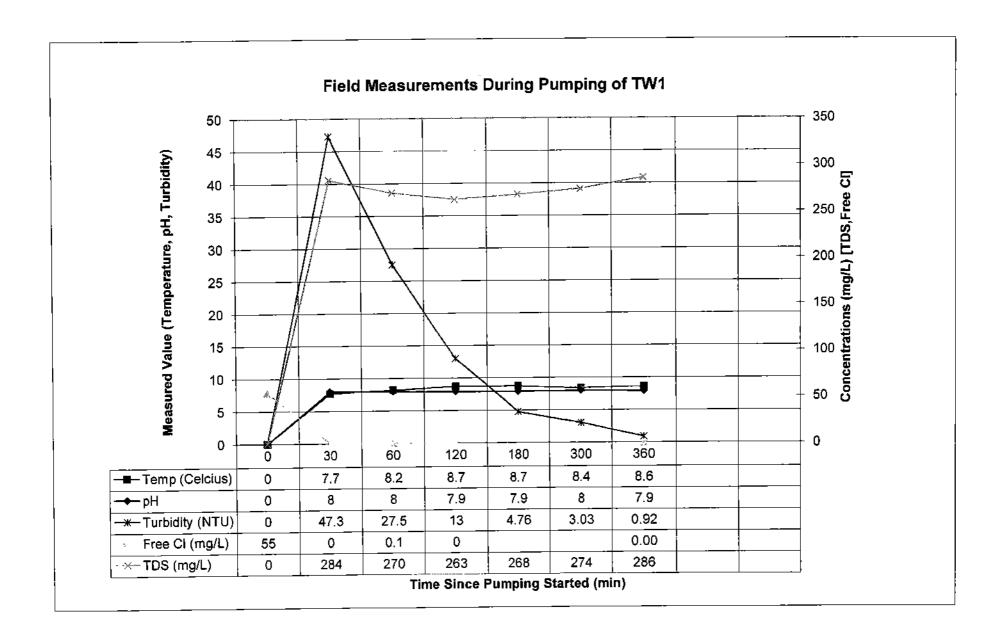
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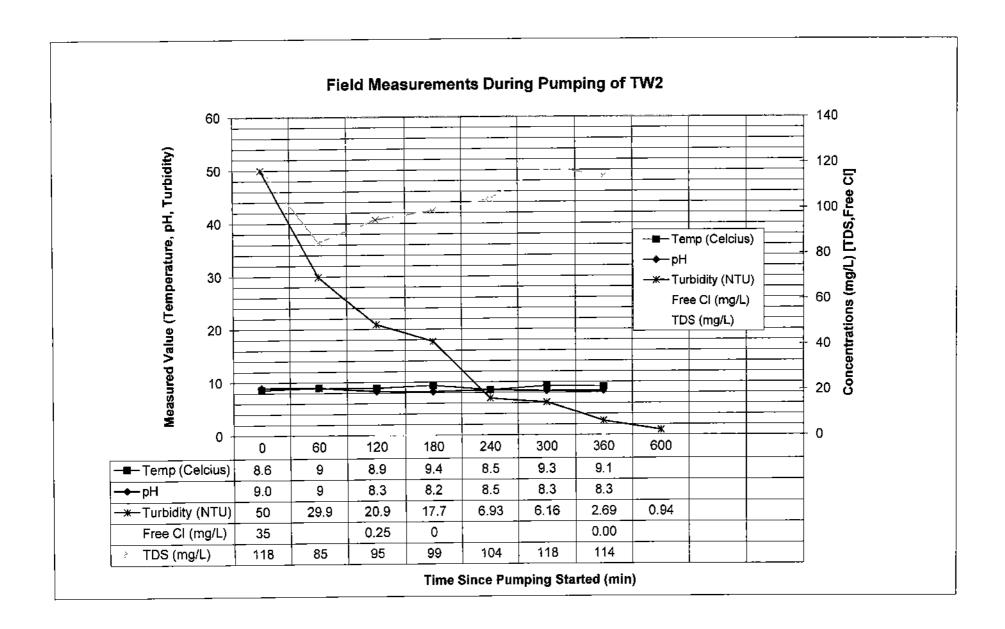
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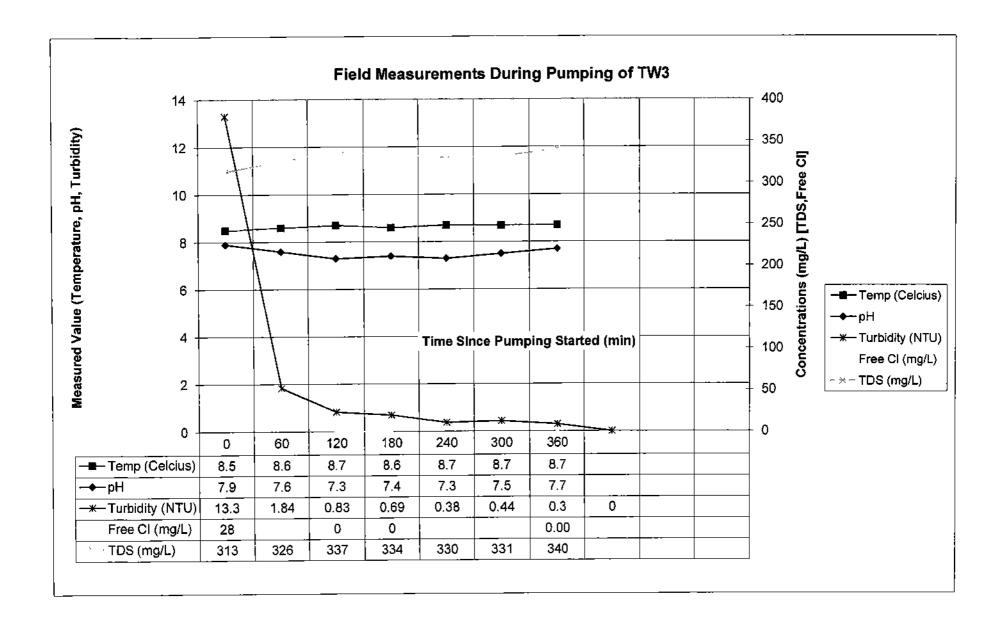
Water	rioo Hydrogeologic olumbia St. W.	Pumping test analysis	3	Date:	none, Page 5
	olumbia St. W. o.Ontario,Canada	Time-Drawdown plot		Project: PH0482	
	)746-1798			Evaluated by:	
Pumpir	ng Test No. 1	<u> </u>	Test conducted on:		
TW9			TW7		
Discha	arge 1.26 l/s		Distance from the pu	moing well 344 000	
	water level: 5.230 m below datum			The state of the s	
	Pumping test duration	Water level	Drawdov	wn .	
1	[min] 0.00	[m]	[m]		
2	80.00	5.230 5.240	<del></del>	0.000	
3	150.00	5,260		0.010 0.030	
4	245.00	5.260	<del></del>	0.030	
5	330.00	5.240		0.010	
6	360.00	5,240		0.010	
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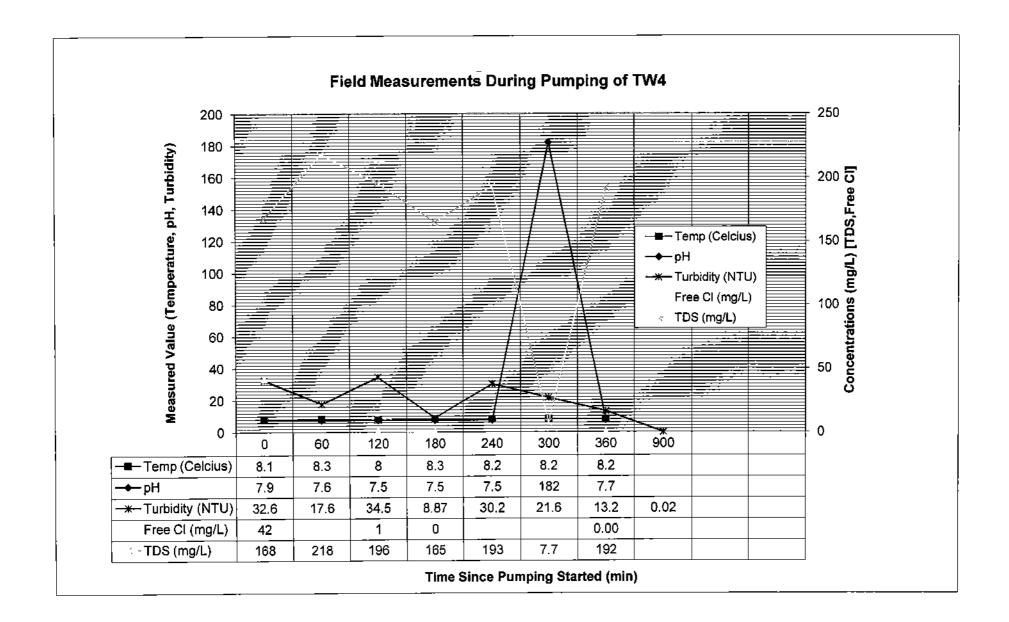
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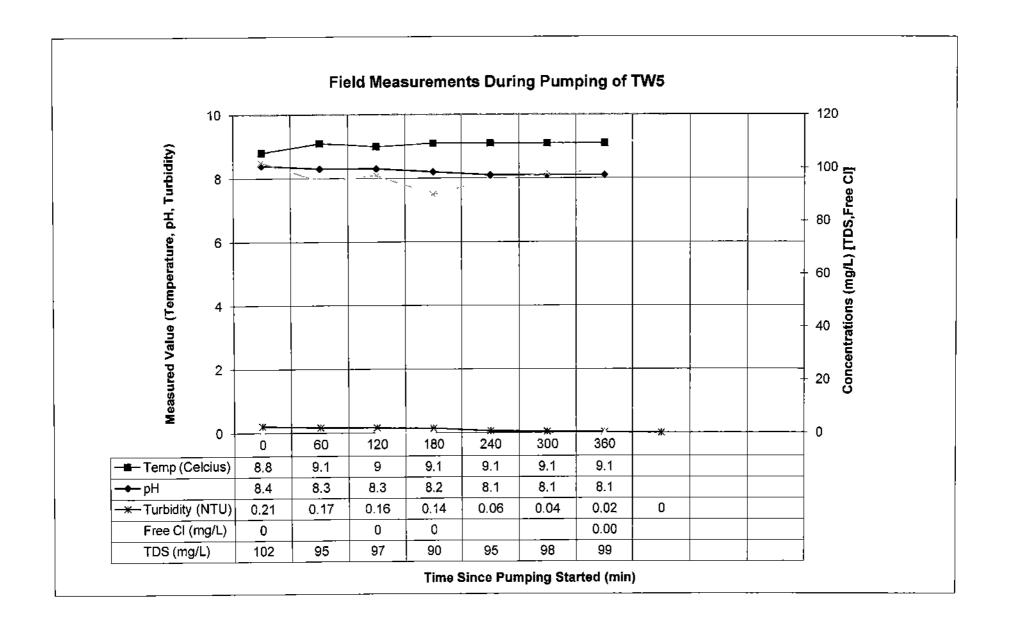
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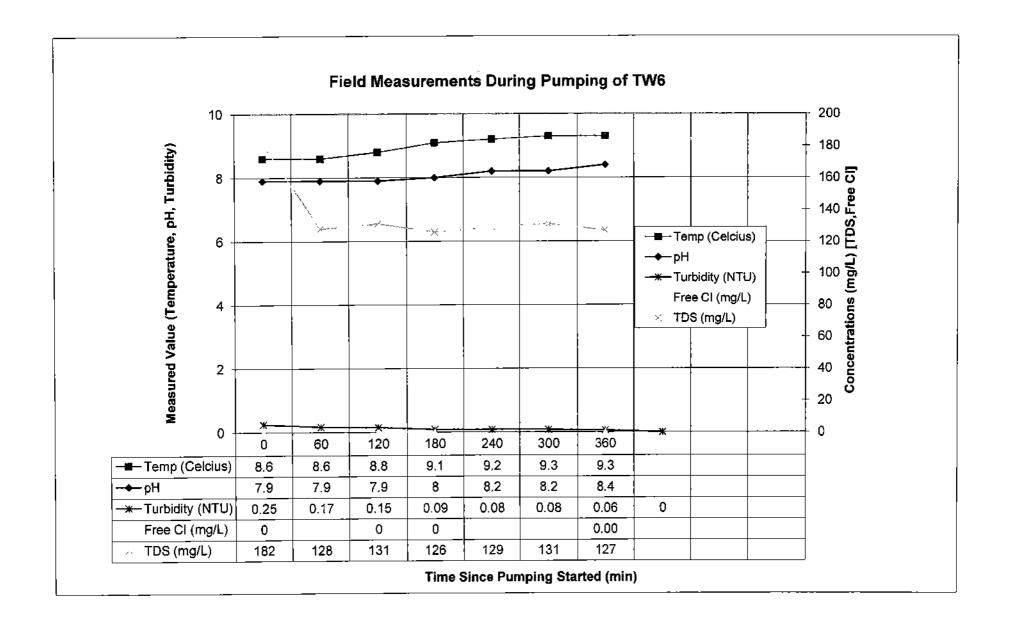












# Model No. 1: Determination of Potential Well Interference- 20 Year Cumulative Impact

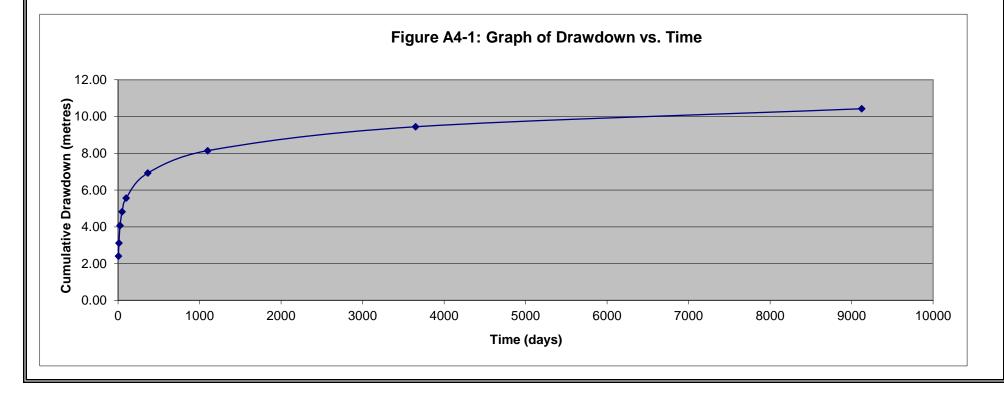
Pumping Rate (Q) m3/day 3 Average anticipated well depth: 48 M Transmissivity (T) m2/day 13.3 % drawdown under worst case scenario: 22% Average Well Spacing (m) r 100

Notes: Analysis Assumes Continuous Pumping of 61 to 70 Wells

0.00068

Coefficient of Storage S

	1st Well Grou	ping	2nd Well G	rouping	3rd Well G	rouping	4th Well G	rouping	
Time (days)	u	W(u)	u	W(u)	u	W(u)	u	W(u)	Drawdown
5	1.3E-02	3.7785	3.8E-02	2.7306	6.4E-02	2.2346	8.9E-02	1.9290	2.41
10	6.4E-03	4.4806	1.9E-02	3.4050	3.2E-02	2.8965	4.5E-02	2.5684	3.12
25	2.6E-03	5.3776	7.7E-03	4.2970	1.3E-02	3.7785	1.8E-02	3.4581	4.07
50	1.3E-03	6.0695	3.8E-03	4.9993	6.4E-03	4.4806	8.9E-03	4.1534	4.83
100	6.4E-04	6.7775	1.9E-03	5.6906	3.2E-03	5.1706	4.5E-03	4.8310	5.56
365	1.8E-04	8.0455	5.3E-04	6.6959	8.8E-04	6.4592	1.2E-03	6.1494	6.93
1100	5.8E-05	9.1779	1.7E-04	8.1027	2.9E-04	7.5687	4.1E-04	7.2240	8.15
3650	1.8E-05	10.3479	5.3E-05	9.2681	8.8E-05	8.7610	1.2E-04	8.4509	9.44
9125	7.0E-06	11.2924	2.1E-05	10.1938	3.5E-05	9.6830	4.9E-05	9.3465	10.42



#### Model No. 2: Determination of Potential Well Interference- Individual Well Pumping at 50,000L/day

FIIE NO.	PH3/45
Pumping Rate (Q) m3/day	50
Transmissivity (T) m2/day	13.3
Radius of impact (m)	100
Coefficient of Storage S	0.00068

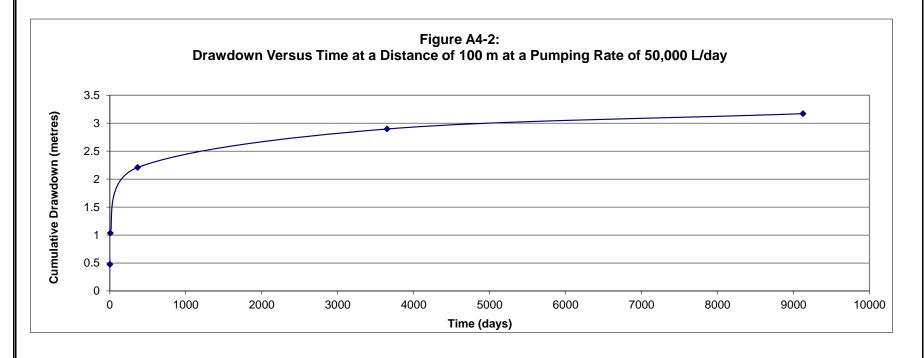
Notes:

Continuous Pumping of 1 well

Time (days)	u	W(u)	drawdown
1	1.3E-01	1.5889000	0.48
7	1.8E-02	3.4581000	1.03
365	3.5E-04	7.3807000	2.21
3650	3.5E-05	9.6830000	2.90
9125	1.4E-05	10.5993000	3.17

Average anticipated well depth: 48.00 m % drawdown under worst case scenario 7%

As such, at maximum rate allowed by the Ontario Water Resources Act , only 7% of the available drawdown is anticipated to be removed from the well during pumping. Given recovery data provided, well is expected to recover with interim potential well interference.



Ottawa Intl A WATER BUDGET MEANS FOR	R THE PERIOD 1939-2019	DC20492
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	45.32 G 75.67		_	_	_	[TY1			AT IND		36.68 1.079
DATE	TEMP (C)	PCPN	RAIN	MELT	PE	AE	DEF	SURP	SNOW	SOIL	ACC P
31- 1	-10.7	62	11	14	0	0	0	24	84	98	295
28- 2	-9.0	56	11	16	1	1	0	26	113	98	350
31- 3	-2.9	65	31	77	5	5	0	101	70	100	416
30- 4	5.7	73	68	75	31	31	0	112	0	100	490
31- 5	13.1	76	76	0	80	80	0	14	0	81	566
30- 6	18.3	85	85	0	116	112	-4	5	0	49	651
31- 7	20.9	88	88	0	136	114	-22	3	0	20	739
31- 8	19.6	84	84	0	118	87	-31	1	0	16	823
30- 9	14.8	82	82	0	75	65	-10	3	0	30	905
31-10	8.3	77	77	0	37	36	-1	9	0	63	77
30-11	1.2	76	59	8	10	10	0	31	9	89	154
31-12	-6.9	79	26	14	1	1	0	32	48	97	233
AVE	6.0 TTL	904	698	204	610	542	-68	361			

Ottawa Intl A STANDARD DEVIATIONS FOR THE PERIOD 1939-2019 DC20492

DATE	TEMP (C)	PCPN	RAIN	MELT	PE	ΑE	DEF	SURP	SNOW	SOIL	ACC P
31- 1	2.9	25	15	18	1	1	0	28	44	8	59
28- 2	2.6	27	14	26	1	1	0	35	59	7	63
31- 3	2.6	28	22	49	5	5	0	55	87	0	71
30- 4	1.8	32	33	88	9	9	0	89	3	2	80
31- 5	1.8	34	34	3	12	12	0	25	0	22	94
30- 6	1.2	38	38	0	8	12	10	16	0	36	105
31- 7	1.1	45	45	0	8	28	29	17	0	30	118
31- 8	1.3	37	37	0	8	28	30	4	0	29	127
30- 9	1.5	39	39	0	8	16	16	13	0	35	133
31-10	1.5	37	37	1	7	7	2	19	0	35	37
30-11	1.8	27	27	8	4	4	0	32	13	20	45
31-12	3.0	30	22	14	1	1	0	30	34	9	55

# patersongroup

1934 Stagecoach Road, Ottawa

PREDICTIVE NITRATE IMPACT ASSESSEMENT						
Infiltration Factors						
Topography	0.15					
Soil	0.20					
Cover	0.10					
Total	0.45					
Site Characteristics						
Area of Site :	625720	$m^2$				
Total of roof areas:	24420	$m^2$				
Total area of paved driveway areas:	31101	$m^2$				
Roof + paved driveway areas	55521	$m^2$				
Impervious Area	55521	$m^2$				
Percent Impervious Area =	9	%				
Impervious Area according to SWMDB completed by JFSA	125144	$m^2$				
Percent Impervious Area according to SWMDB completed by JFSA	20%	%				
Infiltration Area =	500576	$m^2$				
Septic Effluent						
Concentration of Effluent (Cs) =	40	mg/L				
Daily Sewage Flow (Qs)=	66	$m^3$				
See Notes below.						
Infiltration Calculation						
Nitrate concentration in precipitation (C <sub>i</sub> ) =	0	mg/L				
Surplus Water (Environment Canada)	361	mm/yr				
Factored Water Surplus =	162	mm/yr				
Infiltration % due to stormwater management measures	-	%				
Infiltration rate from stormwater management measures =	0	mm/yr				
Infiltration Flow Entering the System (Q <sub>i</sub> ) =	223	m <sup>3</sup> /day				
Mass Balance Model (MOEE, 1995)						
$C_T = (Q_b C_b + Q_e C_e + Q_i C_i)/(Q_b + Q_e + Q_i) = Cumulati$	ive Nitrate Concentration					
Q <sub>b</sub> = flow entering the system across the upgradient area	0	m³/day				
C <sub>b</sub> = background nitrate concentration	0.16	mg/L				
Q <sub>e</sub> = flow entering the system from the septic drainfield	66	m <sup>3</sup> /day				
C <sub>e</sub> = concentration of nitrates in the septic effluent	40	mg/L				
Q <sub>i</sub> = flow entering the system from infiltration	223	m <sup>3</sup> /day				
C <sub>i</sub> = Concentration of nitrates in the infiltrate	0	mg/L				
C <sub>T</sub> =	9.14	mg/L				
Estimate Number of Lots	66	lots				

Notes: Although impervious area calculations result in an area of 9% (based on a 300 m2 home, including a garage of 70 m2, a driveway area of 140 m2 and a subdivision road length of 22,000 m2) the Stormwater Managements Design Brief completed by JFSA with Project Ref # P584-06 dated May 11, 2022 notes a impervious area of 20%. The impervious area of 20% was used to demonstrate that the NIA calculation would work for the subdivision using a conservative approach



# **APPENDIX 5**

PH4734 - 1 - Site Plan

PH4734 – 2 - MECP Water Well Location Plan

PH4734 – 3 - Surficial Geology Plan

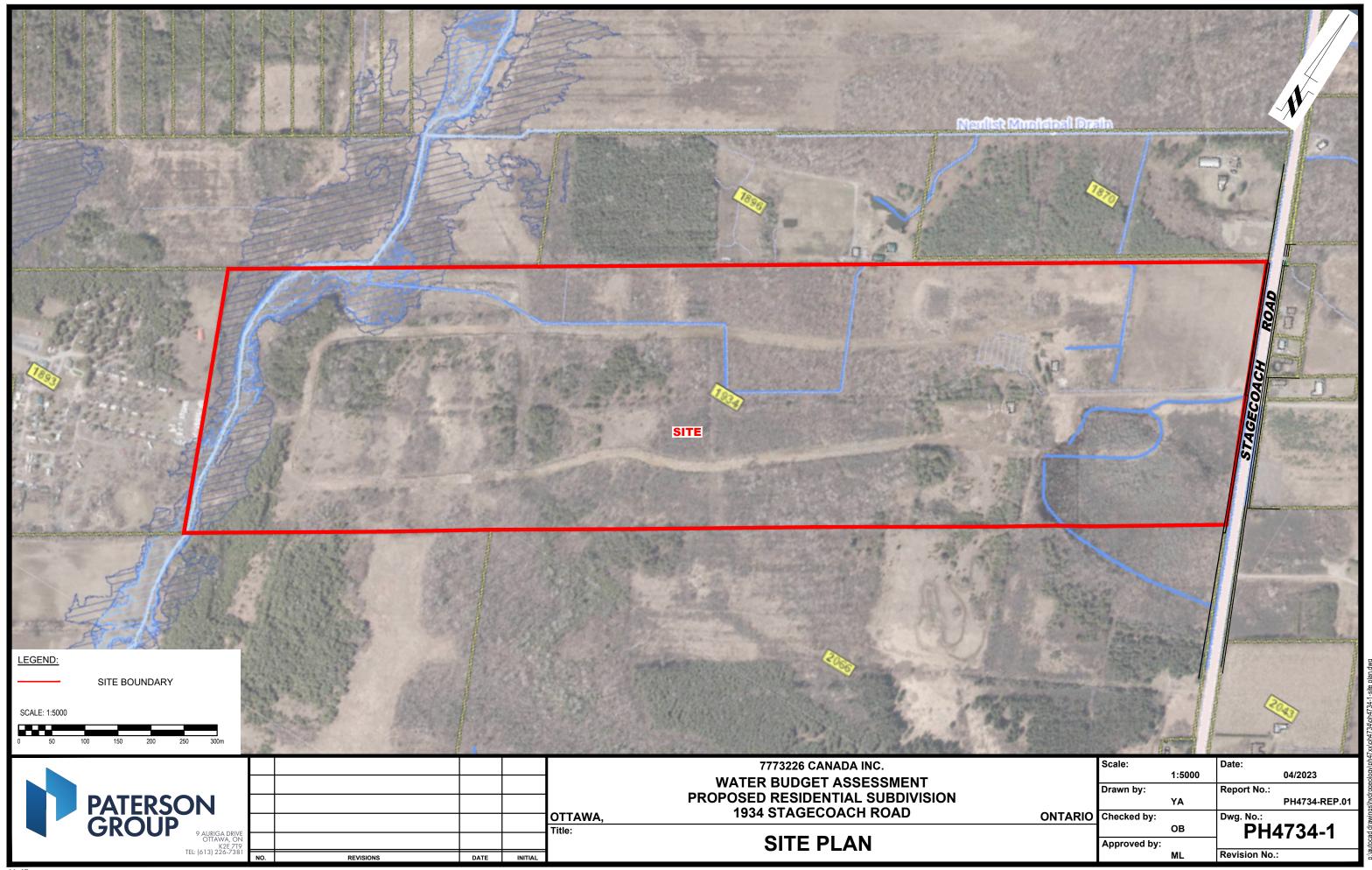
PH4734 - 4 - Bedrock Geology Plan

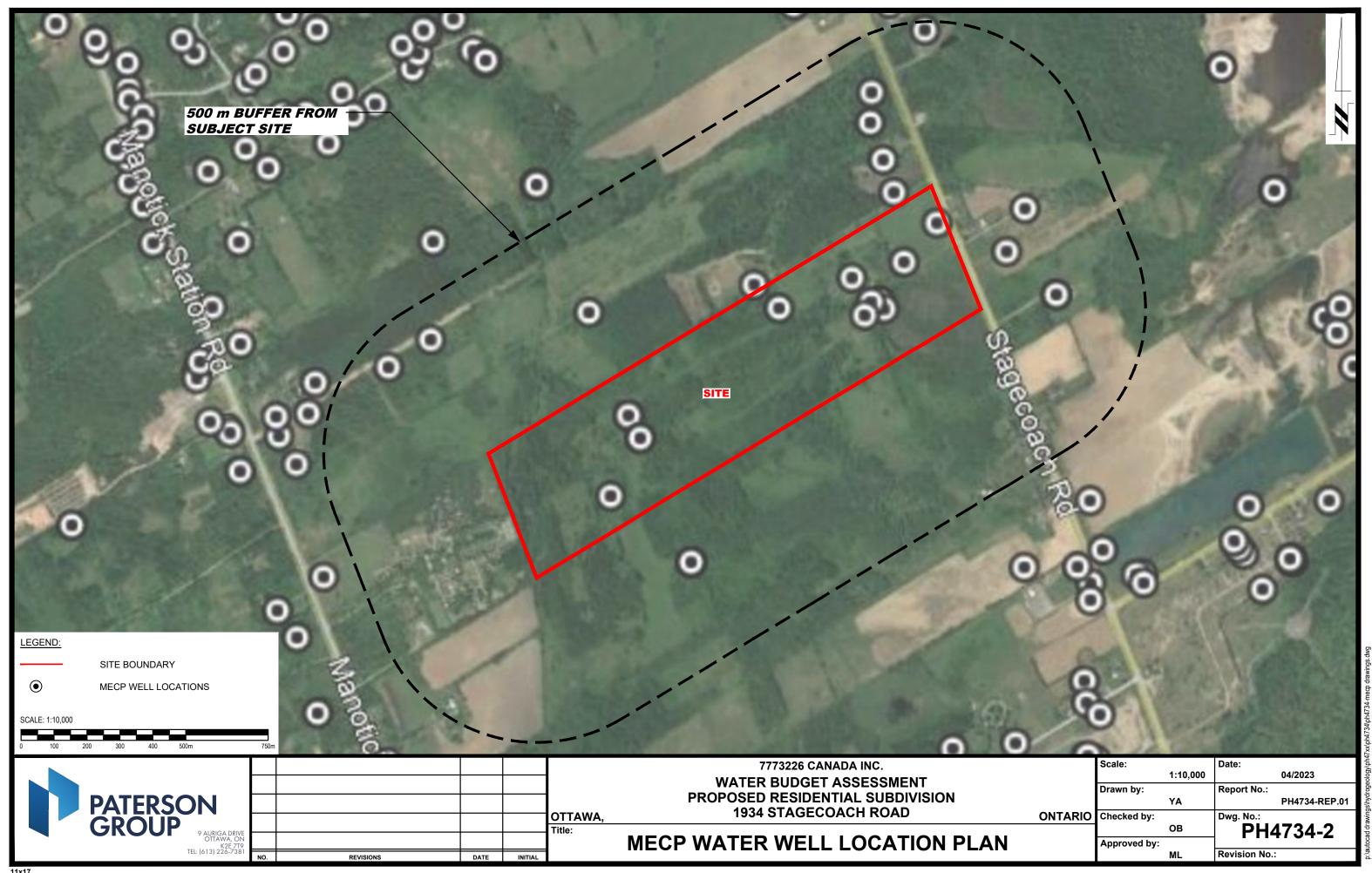
PH4734 – 5 - Bedrock Aquifer Plan

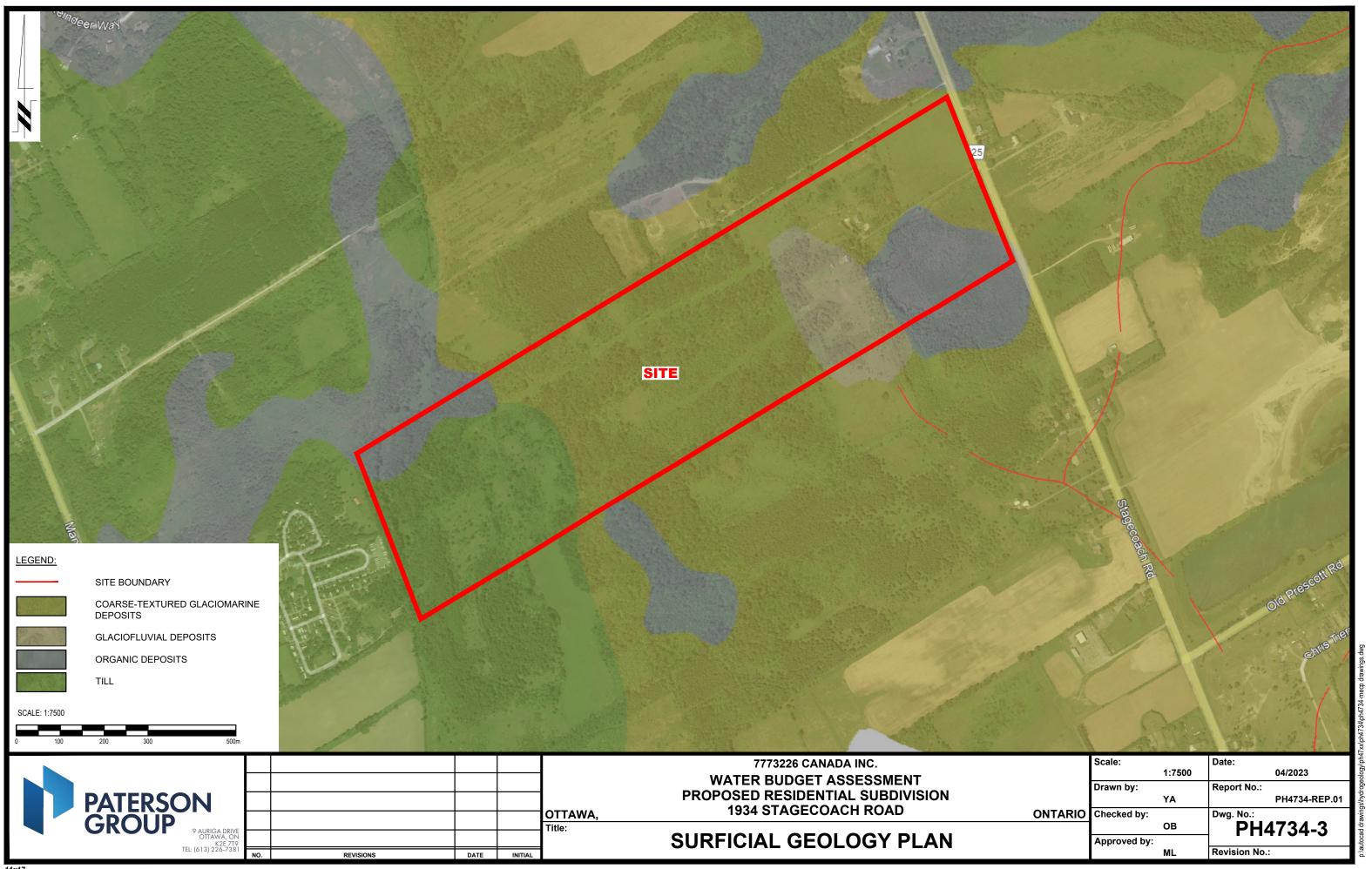
PH0482 – 4 – Generalized Hydrogeological Cross Section

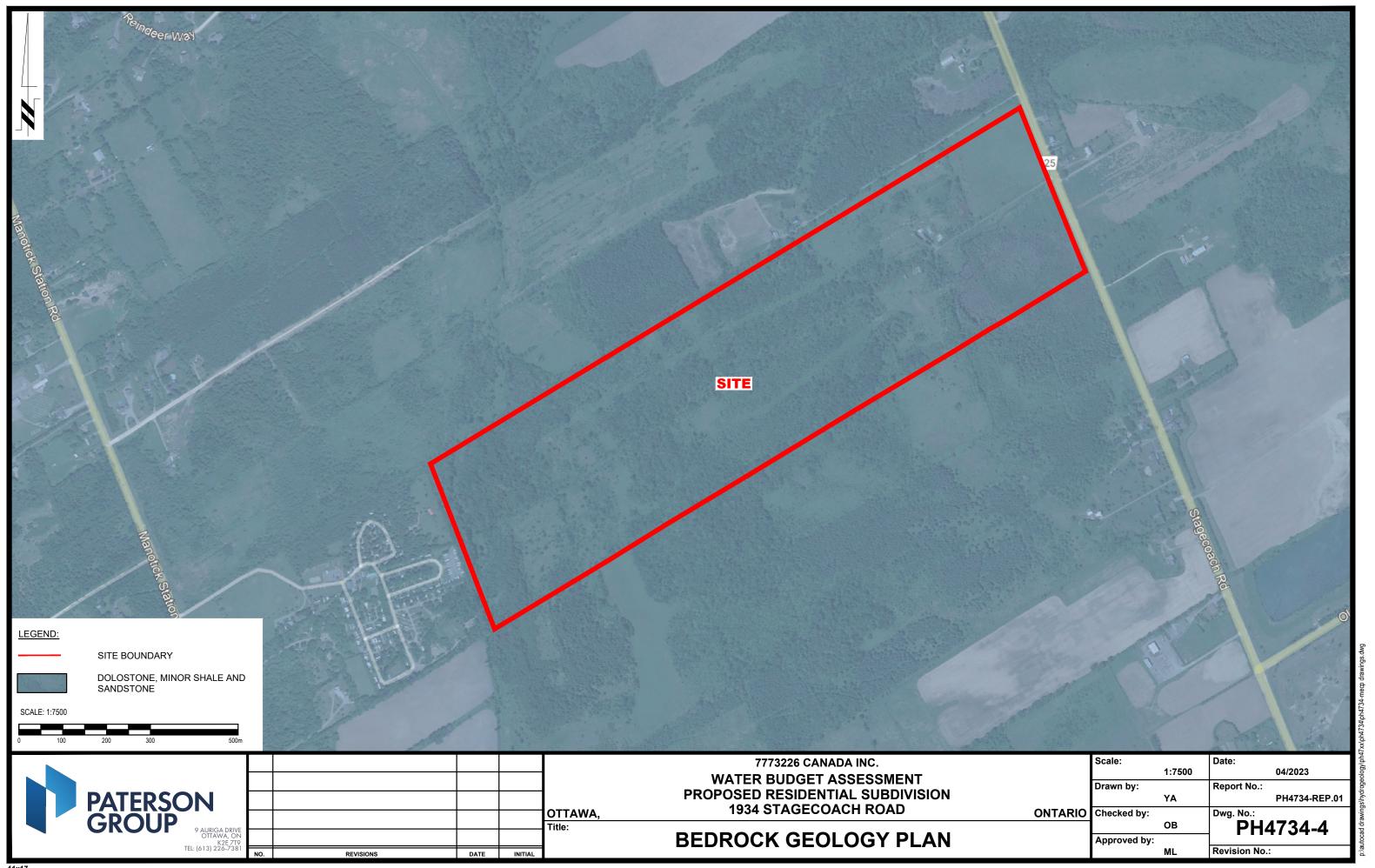
PH0482 - 7 - Lot Development Plan

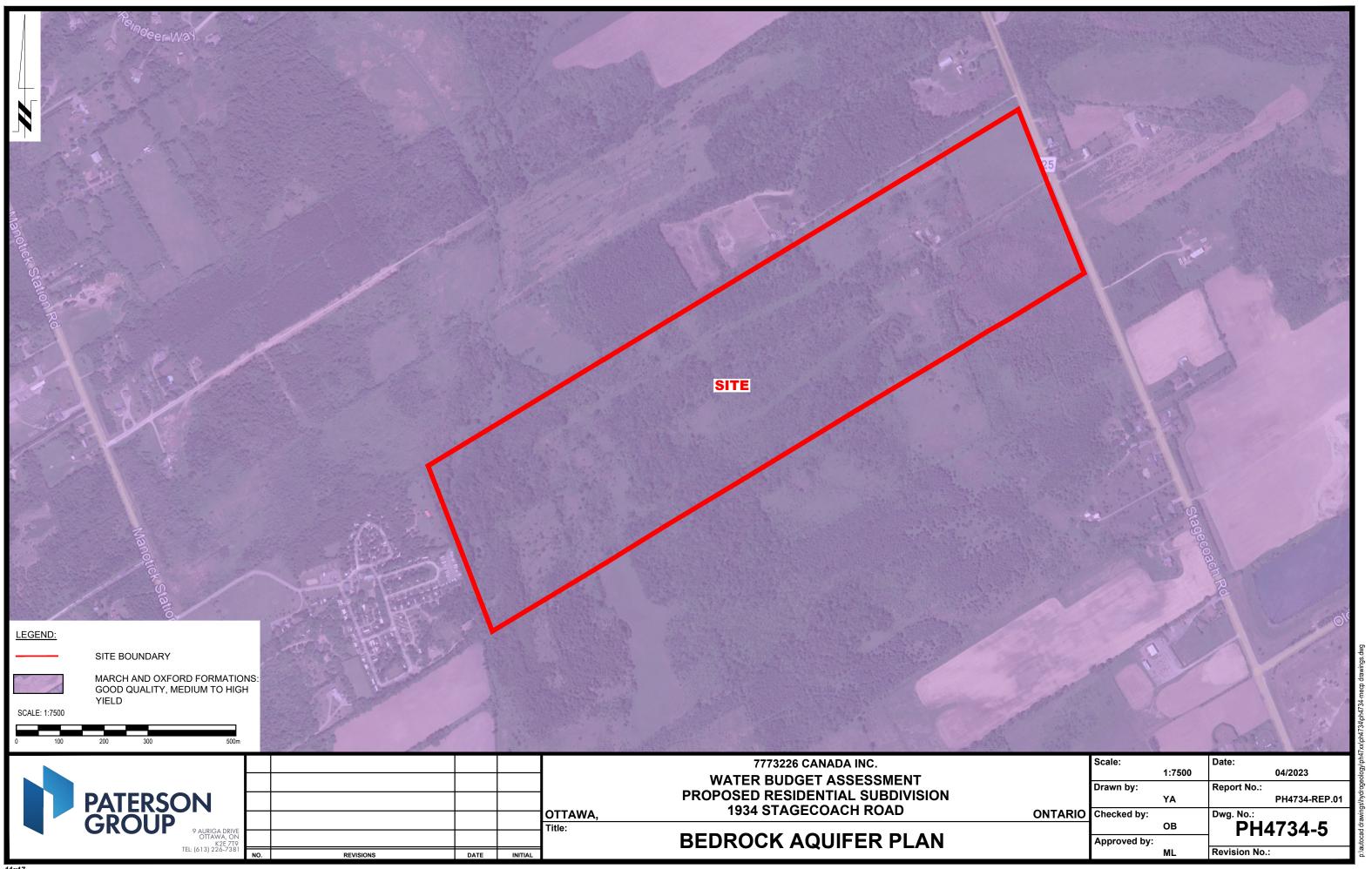


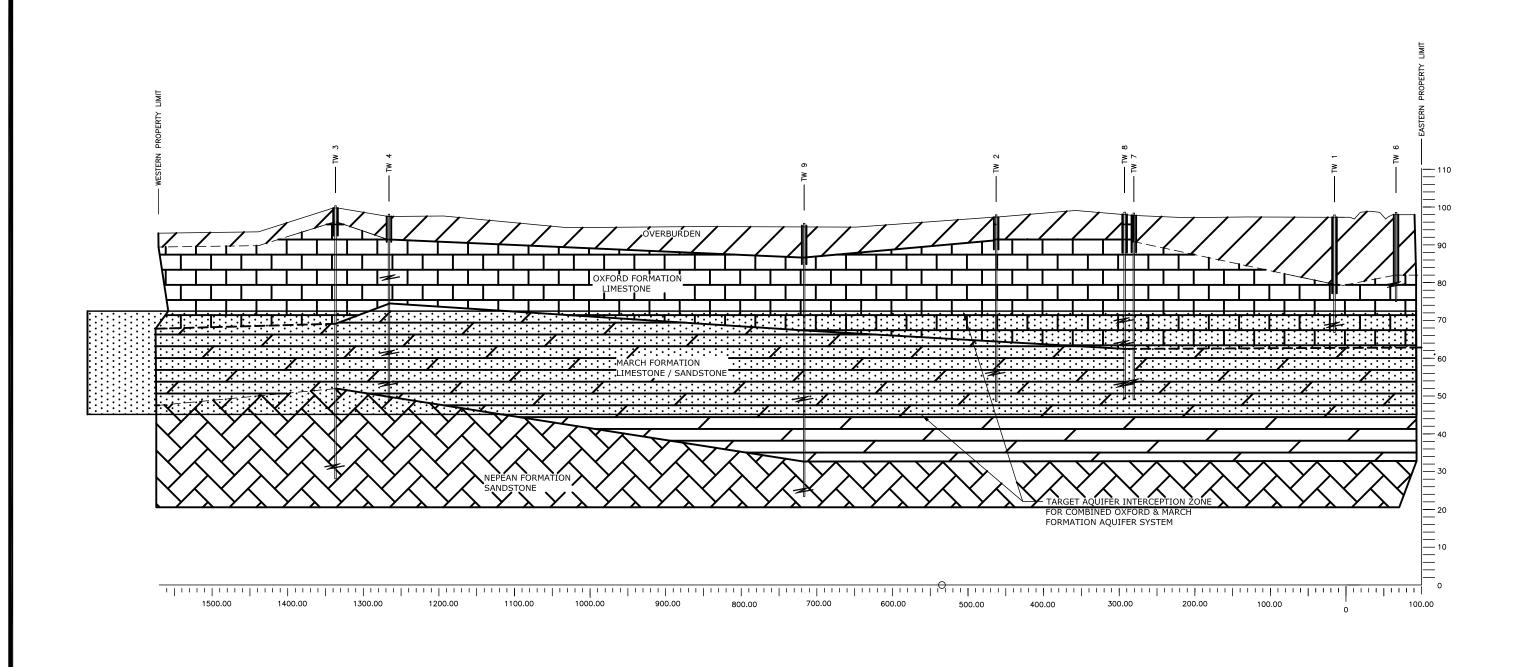












paterson group

consulting engineers
28 Concourse Gate, Unit 1, Ottawa, Ontario K2E 7T7

 Scale:
 H
 1:5000

 V:
 1:500

 Des.:
 RAP

 Dwn:
 RAP

 Chkd:
 RAP

VELIKA REALTY CORPORATION

HYDROGEOLOGICAL STUDY

1934 STAGECOACH ROAD

OTTAWA, (GREELY)

GENERALIZED SITE CROSS SECTION

ONTARIO

PHO482-4

PH0482-REP. **Date:** 11/2010



LEGEND:

APPROXIMATE TEST PIT LOCATION

APPROXIMATE TEST WELL LOCATION

GROUND SURFACE ELEVATION (m)

(09/02/2007) DATE OF TEST WELL CONSTRUCTION

Rev. Date Description

Client:

**7773226 CANADA INC.** 

Consultant:



9 AURIGA DRIVE OTTAWA, ON K2E 7T9 TEL: (613) 226-7381

Project:

#### PROPOSED RESIDENTIAL **DEVELOPMENT**

1934 STAGECOACH ROAD OTTAWA (OSGOODE), ONTARIO

Drawing:

#### **LOT DEVELOPMENT PLAN**

Date:		
06/2023		
Drawn by:	File:	
YA	PH0482	
Checked by:	Scale:	
EA	1:10	
Approved by:	Date: 06/2023	
MK	00/2023	

Drawing No.:

PH0482-7