

Geotechnical
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Materials Testing

Building Science

Hydrogeological Assessment and Terrain Analysis

Proposed Residential Subdivision
1240 Old Prescott Road,
Geographic Township of Osgoode,
Ottawa (Greely), Ontario

Prepared For

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1.0 INTRODUCTION

1.1 Terms of Reference

Paterson Group (Paterson) was retained by 2099116 Ontario Inc. to conduct a detailed hydrogeological assessment and terrain analysis on a 19.04 hectares vacant parcel of land having the legal identity of Part of Lot 4, Concession 4, former Village of Greely, now the City of Ottawa, Ontario and known, municipally, as 1240 Old Prescott Road, hereafter referred to as the subject property. (Refer to Figure 1-Site Location Plan, located in Appendix 5)

The purpose of this study has been to ascertain and assess the specific hydrogeological conditions and surficial terrain features that 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.

These works have been completed in general accordance with the present City of Ottawa industry standard which seeks to utilize the following Ontario Ministry of Environment (MOE) guidance documents in the completion of hydrogeological assessments:

- Guideline D-5: Planning for Sewage and Water Services (August 1996)
- Procedure D-5-4: Technical Guideline for Individual On-site Sewage Systems: Water Quality Impact Risk Assessment (August 1996)
- Procedure D-5-5: Technical Guideline for Private Wells: Water Supply Assessment (August 1996)

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 understood at the time of writing this report.

1.2 Existing Zoning and Description of Proposed Development

The subject property is currently designated Development Reserve (DR) in the City of Ottawa Official Plan. It is proposed to rezone the subject property to permit the creation of a Plan of Subdivision which would be developed on individual on site water and wastewater services.

The subject property encompasses a total area of approximately 19.04 hectares and is located within the southern limits of the existing Village of Greely, Ontario.

The minimum lot size for the proposed subdivision, as noted on the Draft Plan of Subdivision (Figure 4- Appendix 5), is 0.2 hectares with an average lot size of 0.27 hectares. A total of 45 lots are being evaluated as part of this terms of reference. Permissible minimum lot size within the former Village of Greely, as referenced by the City of Ottawa Official Plan (OP) is set for this site at 0.2 hectare (0.5 acre).

It is proposed that the subdivision will be serviced by individual onsite wells and onsite wastewater treatment systems (OWTS). This form of servicing is consistent with the established hierarchy prescribed in Section 1.6.4.4 of the Ontario Provincial Policy Statement and is consistent with the established development within the Village of Greely and surrounding rural areas. This report will seek to demonstrate the long term viability of the proposed development.

2.0 BACKGROUND

2.1 Site Setting

The subject property is located on the west side of Old Prescott Road and to the north of McKeown Drive (refer to Figure 1). It is further bound to the west and north by existing residential developments.

The parcel of land is generally rectangular in shape extending deep into the Lot beyond the eastern road boundary. The lot is considered to be relatively flat to slightly sloping and is primarily treed, save for two (2) areas: a hydro and drainage easement located in the western quadrant, and cleared area located immediately to the west of Old Prescott Road. Drainage of the property is considered to be imperfect to good and appears to be dictated by the local surficial topography.

Historically, it would appear that the site was used for modest agricultural purposes as evidenced by the existing cleared area where there is evidence of small field crop plantings. In addition, there is an existing large diameter dug well present in the cleared area which would appear to have been the primary source of water for irrigation purposes. Considering the small size of the cleared area, it is opined that the farming operation was extremely small scale, consistent with organic vegetable production.

With respect to the dug well, the well was measured in the field to be approximately 6 m deep and 1.2 m in diameter. It was observed to be constructed of precast concrete well tiles set on top of one another and backfilled in place. The cover of the well was noted to be precast concrete and a 50 mm diameter hole was observed to have been cored in the middle of the cover. The interior conditions of the well were considered to be, based on field observations, unacceptable for potable water use.

In addition to the existing well, a small, steel clad, rectangular outbuilding is present at the site. Adjacent to the outbuilding, it was noted that a steel shipping crate present several metres to the west. A narrow, gravel driveway extends from Old Prescott Road to the outbuilding.

2.2 Hydrology

The subject property is located in a temperate climatic zone consisting of warm, humid summers and cold, dry winters. The mean annual precipitation for this area is approximately 902 mm (Environment Canada- Climatic Services).

The site is relatively flat to gently sloping from east to west across the site with an obvious modest depression located near the approximate centre of the parcel. The average elevation of the site is approximately 101.6 m amsl. There are no defined drainage structures present within, or along the perimeter of the site, with the exception of a drainage ditch that bisects the property in the western quadrant. The drainage ditch follows an existing hydro easement and appears to transmit stormwater from the existing ponds located to the north and west of the site, southward to existing water courses located beyond the site. Drainage patterns within the subject property boundaries, itself, appear to direct runoff water into the wooded area within the central quadrant where it appears to infiltrate into the subsurface.

2.3 Regional Geology and Hydrogeology

Published surficial geology mapping for the area within the vicinity of the subject property indicate that the overburden consists of various Post Champlain Sea deposits however the subject property is generally shown to be overlain by a narrow band of organic deposits to glaciofluvial materials consisting of stratified sand and silt. The relevant sections of the available surficial geology mapping has been reproduced for reference purposes and appears in Figure 2 located in Appendix 5.

Published geological mapping (Refer to Figure 3 located in Appendix 5), provided by the Ontario Geologic Survey, reveals that the site and immediate surroundings are underlain by limestone of the Oxford Formation of the Paleozoic Period. 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.

A cursory review of the MOE 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.

2.3.1 Water Well Construction and Aquifer Interception

A search of the available MOE 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 search returned over 100 individual MOE WWRs within a 500 m radius of the centre of the subject property.

Analysis of the individual MOE WWRs resulted in approximately 51 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 located immediately to the north of the subject property. One (1) WWR was noted to lack sufficient aquifer intercept information to be included in the regional analysis and one (1) WWR was noted to be a WWR abandonment record. In total, 49 MOE 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 49 MOE WWRs included in the analysis, 100% of the wells were noted to 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 below ground surface. 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 39 MOE 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 below ground surface (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 lgpm). The specific capacity of the wells, based on the WWR's reviewed is of the order of 30 L/min/m of drawdown.

Although most of the available MOE 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. As such, given that several wells intercept the upper and lower Oxford Formation limestone aquifers, these aquifers can be considered to be hydraulically interconnected. Moreover, upwards of 5 of the 49 WWRs reviewed (10%) reported intercepted both the lower Oxford Formation and March Formation water supply aquifers.

2.3.2 Neighbouring Water Quality Analysis

As part of the fieldwork process, neighbouring water quality within the vicinity of the site was reviewed. Paterson has extensive experience with the hydrogeology of the area having completed numerous hydrogeological investigations in the immediate vicinity. The South Village Subdivision, located directly to the north of the subject site, was supported by the hydrogeological study completed by J.D. Paterson & Associates Ltd. in 2003-2004. Moreover, Paterson completed the Servicing Review Study Report for Phase 1 of the South Village Subdivision in 2007.

The water quality data compiled in support of the original hydrogeological study and from the SRS for the South Village Subdivision, appear below in Table 2-1.

More recently, in 2013, Paterson completed a hydrogeological study in support of a commercial property located on McKeown Drive, to the south of the subject property. In that report, Paterson Report No. PH1985-REP.01, the existing well and neighbouring wells within the immediate vicinity of the site were sampled for a standard subdivision analysis package. The relevant water quality data from that study is presented for comparative purposes in Table 2-2, below.

In addition, due to neighbouring automotive land uses, the well was also tested for a suite of volatile organic compounds (VOC's) and petroleum hydrocarbons. Reference should be made to Table 2-3 in Section 2.3.5.

In September 2014, Paterson undertook to canvas and obtain additional water quality samples from neighbouring wells on both the downgradient and upgradient sides of the subject property. During this sampling event, raw water samples were collected from two (2) commercial properties located on the upgradient side (i.e. south/southwest) of the subject property and from three (3) residential properties located on the downgradient side (north-northeast) side of the subject property. Reference should be made to Table 2-3 for the summary of the water quality data. The laboratory reports for the samples are provided in Appendix 3 for reference purposes.

Based on an analysis of the water quality data summarized for the neighbouring wells, the water quality within the water supply aquifers within the subject lands is considered to be consistent with the surrounding areas. It is prudent to note that there is an absence of anthropogenic water quality characteristics, (i.e nitrates, chlorides, etc.) which suggests that the water supply aquifer system located within the Oxford Formation is not considered to be hydrogeologically sensitive and has a low intrinsic vulnerability.

Moreover, analysis of the South Village wells shows little, if any, drift within the water quality over the past nine (9) to 10 years of operation of the subdivision.

TABLE 2-1 :COMPARISON OF AESTHETIC BASED PARAMETERS FOR TEST WELLS (ORIGINAL AND PRESENT) FOR SOUTH VILLAGE SUBDIVISION

PARAMETER	UNITS	MDL	TW2 (G7643-1)		TW2 (G8105-11)		TYPE	LIMIT	UNITS
			Original Sample (2000-03-02)	Present (2005-08-05)	Original Sample (2001-02-16)	Present (2005-08-07)			
AESTHETIC RELATED									
Alkalinity as CaCO3	mg/L	5	339	277	186	174	OG	500	mg/L
Chloride	mg/L	1	271	209	12	21	AO	250	mg/L
Colour	TCU	2	<2	<2	2	<2	AO	5	TCU
Conductivity	uS/cm	5	1597	1300	428	457			uS/cm
Dissolved Organic Carbon	mg/L	0.5	2.7	0.8	0.6	0.5	AO	5	mg/L
Hydrogen Sulphide	mg/L	0.01	0.04	<0.01	N/A	<0.01	AO	0.05	mg/L
pH			7.44	8.01	7.8500	8.12	AO	6.5-8.5	
Phenols	mg/L	0.001	<0.001	<0.001	<0.001	<0.001			mg/L
Sulphate	mg/L	1	127	78	36	45	AO	500	mg/L
Tannin & Lignin	mg/L	0.1	<0.1	<0.1	0.10	<0.1			mg/L
TDS (COND - CALC)	mg/L	5	972	845	268	297	AO	500	mg/L
Hardness as CaCO3	mg/L	1	550	400	217	214	OG	100	mg/L
Ion Balance		0.01	1.01	0.99	0.98	0.94			
Calcium	mg/L	1	119	124	54	56			mg/L
Magnesium	mg/L	1	62	22	20	18			mg/L
Potassium	mg/L	1	9	2	2	2			mg/L
Sodium	mg/L	2	135	114	7	9	AO	20	mg/L
Iron	mg/L	0.03	0.05	0.07	0.25	0.41	AO	0.3	mg/L
Manganese	mg/L	0.01	0.05	0.01	0.01	0.02	AO	0.05	mg/L

TABLE 2-2: SUMMARY OF HEALTH AND AESTHETIC/OPERATIONAL OBJECTIVE PARAMETERS							
PARAMETER	UNITS	MDL	WS #1	WS #2	WS #3	TYPE	ODWS
			6968 McKeown	1375 Greely	6961 McKeown		
MICROBIOLOGICAL							
Total Coliforms	ct/100mL	-	0	0	0	MAC	0
Escherichia Coli	ct/100mL	-	0	0	0	MAC	
Heterotrophic Plate Count	ct/1mL	-	29	0	0	-	-
Faecal Coliforms	ct/100mL	-	0	0	0	-	-
Faecal Streptococcus	ct/100mL	-	1	0	0	-	-
GENERAL CHEMICAL - HEALTH RELATED							
Fluoride	mg/L	0.1	0.13	0.12	0.14	MAC	2.4
N-NH3 (Ammonia)	mg/L	0.02	0.04	0.05	0.04	-	-
N-NO ₂ (Nitrite)	mg/L	0.10	<0.10	<0.10	<0.10	MAC	1.0
N-NO ₃ (Nitrate)	mg/L	0.10	<0.10	<0.10	<0.10	MAC	10.0
Total Kjeldahl Nitrogen	mg/L	0.05	0.1	0.15	0.13	-	-
Turbidity	NTU	0.1	<u>8.9</u>	<u>10.6</u>	<u>2.6</u>	MAC/AO	1.0/5.0
GENERAL CHEMICAL - AESTHETIC RELATED							
Alkalinity (as CaCO ₃)	mg/L	5	<u>220</u>	<u>225</u>	<u>229</u>	OG	500
Chloride	mg/L	1	45	96	47	AO	250
Colour	TCU	2	<u>6</u>	5	<u>8</u>	AO	5
Conductivity	uS/cm	5	625	829	643	-	-
Dissolved Organic Carbon	mg/L	0.5	2.3	3	2.3	AO	5
Hydrogen Sulphide	mg/L	0	<u>0.08</u>	0.02	<0.01	AO	0.05
pH	-	-	8.06	8.04	8.04	AO	6.5-8.5
Phenols	mg/L	0	<0.001	<0.001	<0.001	-	-
Sulphate	mg/L	1	48	56	46	AO	500
Tannin & Lignin	mg/L	0.1	<0.1	<0.1	<0.1	-	-
TDS (COND - CALC)	mg/L	5	406	<u>539</u>	418	AO	500
Hardness as CaCO3	mg/L	1	<u>290</u>	<u>373</u>	<u>299</u>	OG	100
Ion Balance	-	0	0.98	1	0.98	OG	-
Calcium	mg/L	1	80	105	80	-	-
Magnesium	mg/L	1	22	27	24	-	-
Potassium	mg/L	1	2	2	2	-	-
Sodium	mg/L	2	15	20	17	AO	200
Iron	mg/L	0	<u>1.46</u>	<u>0.79</u>	<u>0.38</u>	AO	0.3
Manganese	mg/L	0	0.03	0.04	0.03	AO	0.05
HYDROCARBONS							
F1 (C6-C10)	mg/L	0.1	-	<0.1	-	-	
F2 (C10-C16)	mg/L	0.1	-	<0.1	-	-	
F3 (C16-C34)	mg/L	0.2	-	<0.2	-	-	
F4 (C34-C50)	mg/L	0.2	-	<0.2	-	-	0.05

TABLE 2-3: SUMMARY OF HEALTH AND AESTHETIC/OPERATIONAL OBJECTIVE PARAMETERS FOR UPGRADIENT SOURCES					
PARAMETER	UNITS	MDL	ADDRESS	TYPE	ODWS
			1359 Coker		
MICROBIOLOGICAL					
Escherichia Coli	ct/100mL	-	0	MAC	
Faecal Coliforms	ct/100mL	-	0	-	-
Faecal Streptococcus	ct/1mL	-	0	-	-
Heterotrophic Plate Count	ct/100mL	-	2	-	-
Total Coliforms	ct/100mL	-	0	MAC	0
GENERAL CHEMICAL - HEALTH RELATED					
Fluoride	mg/L	0.1	0.12	MAC	2.4
N-NH3 (Ammonia)	mg/L	0.02	0.10	-	-
N-NO ₂ (Nitrite)	mg/L	0.1	<0.10	MAC	1
N-NO ₃ (Nitrate)	mg/L	0.1	<0.10	MAC	10.0
Total Kjeldahl Nitrogen	mg/L	0.05	<0.10	-	-
Turbidity	NTU	0.1	1.0	MAC/AO	1.0/5.0
GENERAL CHEMICAL - AESTHETIC RELATED					
Alkalinity as CaCO3	mg/L	5	212	OG	500
Chloride	mg/L	1	55	AO	250
Colour	TCU	2	2	AO	5
Conductivity	uS/cm	5	672	-	-
Dissolved Organic Carbon	mg/L	0.5	2	AO	5
Sulfide	mg/L	0	<0.01	AO	0.05
pH	-	-	7.97	AO	6.5-8.5
Phenols	mg/L	0	<0.001	-	-
Sulphate	mg/L	1	63	AO	500
Tannin & Lignin	mg/L	0.1	<0.1	-	-
TDS (COND-CALC)	mg/L	5	437	AO	500
Hardness as CaCO3	mg/L	1	328*	OG	100
Ion Balance	-	0	1.03	OG	-
Calcium	mg/L	1	90	-	-
Magnesium	mg/L	1	25	-	-
Potassium	mg/L	1	2	-	-
Sodium	mg/L	2	17	AO	200
Iron	mg/L	0	0.27	AO	0.3
Manganese	mg/L	0	<0.05	AO	0.05

TABLE 2-4: SUMMARY OF HEALTH AND AESTHETIC/OPERATIONAL OBJECTIVE PARAMETERS FOR DOWNGRADE LOCATIONS							
PARAMETER	UNITS	MDL	ADDRESS			TYPE	ODWS
			1308 South Beach	1320 South Beach	6961 McKeown		
MICROBIOLOGICAL							
Escherichia Coli	ct/100mL	-	0	0	0	MAC	
Faecal Coliforms	ct/100mL	-	0	0	0	-	-
Faecal Streptococcus	ct/1mL	-	0	0	0	-	-
Heterotrophic Plate Count	ct/100mL	-	6	1	1	-	-
Total Coliforms	ct/100mL	-	0	0	0	MAC	0
GENERAL CHEMICAL - HEALTH RELATED							
Fluoride	mg/L	0.1	0.11	0.12	0.17	MAC	2.4
N-NH3 (Ammonia)	mg/L	0.02	0.05	0.08	0.08	-	-
N-NO2 (Nitrite)	mg/L	0.1	<0.10	<0.10	<0.10	MAC	1
N-NO3 (Nitrate)	mg/L	0.1	<0.10	<0.10	<0.10	MAC	10.0
Total Kjeldahl Nitrogen	mg/L	0.05	<0.10	<0.10	0.30	-	-
Turbidity	NTU	0.1	0.1	4.3*	3.6*	MAC/AO	1.0/5.0
GENERAL CHEMICAL - AESTHETIC RELATED							
Alkalinity as CaCO3	mg/L	5	247	253	218	OG	500
Chloride	mg/L	1	109	105	62	AO	250
Colour	TCU	2	<2	2	3	AO	5
Conductivity	uS/cm	5	913	896	687	-	-
Dissolved Organic Carbon	mg/L	0.5	1.5	1.2	2.6	AO	5
Sulfide	mg/L	0	<0.01	<0.01	<0.01	AO	0.05
pH	-	-	7.92	7.97	7.97	AO	6.5-8.5
Phenols	mg/L	0	<0.001	<0.001	<0.001	-	-
Sulphate	mg/L	1	72	71	54	AO	500
Tannin & Lignin	mg/L	0.1	<0.1	<0.1	<0.1	-	-
TDS (COND-CALC)	mg/L	5	593*	582*	447	AO	500
Hardness as CaCO3	mg/L	1	393*	386*	345*	OG	100
Ion Balance	-	0	1.08	1.04	1.08	OG	-
Calcium	mg/L	1	103	100	92	-	-
Magnesium	mg/L	1	33	33	28	-	-
Potassium	mg/L	1	3	3	2	-	-
Sodium	mg/L	2	53	49	20	AO	200
Iron	mg/L	0	<0.03	0.56*	0.44*	AO	0.3
Manganese	mg/L	0	<0.01	0.03	0.02	AO	0.05

2.3.3 Recharge/Discharge Areas

A detailed visual assessment of the subject property was completed and there were no observed area of groundwater discharge located within the limits of the property.

With respect to recharge, the site, as detailed in Section 2.2, has surficial topographic characteristics which seek to promote infiltration into the shallow overburden groundwater regime. Hydraulic testing was completed on the deep boreholes which were completed, and screened into the low permeable soils present beneath the site. The results of this testing, as detailed in Section 4 of this report, suggest the lower portions of the overburden present beneath the site have several orders of magnitude lower permeability than the overlying sand. As such, while the site is considered to be conducive to the recharge of the shallow, overburden groundwater regime, it is not considered to be a significant recharge area to the deep bedrock aquifer system present beneath the site.

Rather, based on the available aquifer information, contained within both the Shield's Creek Subwatershed Study, and the Groundwater Impact Assessment for the Village of Greely, the Oxford, March, and Nepean Formation water supply aquifers are generally thought to be recharged from shallow or at surface bedrock present in the far west end of the City of Ottawa, extending into Beckwith Township.

2.3.4 Hydrogeologically Sensitive Areas

As the subject site is overlain by at least 14 m of overburden, approximately 60% of which is known to be of low hydraulic conductivity (as noted in the slug test analysis carried out on the deep boreholes completed on the site- Section 4.0), the site is not considered to be hydrogeologically sensitive. A detailed discussion of the surficial soils present beneath the subject property is contained in Section 4.0.

2.3.5 Potential Sources of Contamination

For the purposes of the hydrogeological assessment, potential sources of contamination, located within a radius of approximately 500 m of the subject property, have been grouped into three categories according to their relative degree of risk of contaminating or otherwise adversely affecting the bedrock aquifers beneath the subject property:

Low

The neighbouring residential and commercial developments are all privately serviced with onsite water wells and sewage systems. The long term operation of the sewage systems in the vicinity, and located upgradient of the subject property, has been identified as being a potential source of contamination to the water supply aquifers.

Medium

The commercial/light industrial development to the south of the property has some automotive repair uses which have been identified as having a medium risk of being a potential source of contamination.

Works completed by Paterson in the close proximity to the subject property related to a commercial lot severance, however, did not find any evidence of contamination in the bedrock aquifer system from either petroleum hydrocarbons or volatile organic compounds. Table 2-3, below summarizes the results of the water quality analysis carried out in support of the hydrogeological study referenced for the McKeown Drive project, Paterson Report No. PH1985-REP.01, dated February 2013. This table shows no detectable concentrations of VOC's or petroleum hydrocarbons (Table 2-2). The locations of the sampling locations are shown on Figure 1 located in Appendix 5.

TABLE 2-5: SUMMARY OF VOC ANALYSIS FOR NEIGHBOURING PROPERTIES							
PARAMETER	UNITS	MDL	WS #1	WS #2	WS #3	TYPE	ODWS
			6968 McKeown	1375 Greely	6961 McKeown		
VOLATILE ORGANIC COMPOUNDS							
1,1,1,2-tetrachloroethane	ug/mL	0.5	-	<0.5	-	-	-
1,1,1-trichloroethane	ug/mL	0.4	-	<0.4	-	-	-
1,1,2,2-tetrachloroethane	ug/mL	0.5	-	<0.5	-	-	-
1,1,2-trichloroethylene	ug/mL	0.4	-	<0.4	-	-	-
1,1-dichloroethane	ug/mL	0.4	-	<0.4	-	-	-
1,1-dichloroethylene	ug/mL	0.5	-	<0.5	-	MAC	14
1,2-dibromoethane	ug/mL	0.2	-	<0.2	-	-	-
1,2-dichlorobenzene	ug/mL	0.4	-	<0.4	-	MAC	200
1,2-dichloroethane	ug/mL	0.2	-	<0.2	-	IMAC	5
1,2-dichloroethane-d4	%	1	-	1	-	-	-
1,2-dichloropropane	ug/mL	0.5	-	<0.5	-	-	500
1,3,5-trimethylbenzene	ug/mL	0.3	-	<0.3	-	-	100
1,3-dichlorobenzene	ug/mL	0.4	-	<0.4	-	-	-
1,4-dichlorobenzene	ug/mL	0.4	-	<0.4	-	MAC	5
4-bromofluorobenzene	%	1	-	109	-	MAC	5
Benzene	ug/mL	0.5	-	<0.4	-	-	-
Bromodichloromethane	ug/mL	0.3	-	<0.3	-	-	-
Bromoform	ug/mL	0.4	-	<0.4	-	-	-
Bromomethane	ug/mL	0.5	-	<0.5	-	-	-
c-1,2-dichloroethylene	ug/mL	0.4	-	<0.4	-	-	-
c-1,3-dichloropropylene	ug/mL	0.2	-	<0.2	-	-	-
Carbon Tetrachloride	ug/mL	0.2	-	<0.2	-	MAC	5
Chloroethane	ug/mL	0.2	-	<0.2	-	-	-
Chloroform	ug/mL	0.5	-	<0.5	-	-	-
Chloromethane	ug/mL	0.2	-	<0.2	-	-	-
Dibromochloromethane	ug/mL	0.3	-	<0.3	-	-	-
Dichlorodifluoromethane	ug/mL	0.5	-	<0.5	-	-	-
Dichloromethane	ug/mL	4	-	<4.0	-	MAC	50
Ethylbenzene	ug/mL	0.5	-	<0.5	-	AO	2.4
m/p-xylene	ug/mL	0.5	-	<0.5	-	-	-
Monochlorobenzene	ug/mL	0.2	-	<0.2	-	MAC	80
o-xylene	ug/mL	0.5	-	<0.5	-	-	-
Styrene	ug/mL	0.5	-	<0.5	-	-	-
t-1,2-Dichloroethylene	ug/mL	0.5	-	<0.5	-	-	-
t-1,3-Dichloropropylene	ug/mL	0.4	-	<0.4	-	-	-
Tetrachloroethylene	ug/mL	0.2	-	<0.2	-	MAC	30
Toluene	ug/mL	0.3	-	<0.3	-	AO	24
Toluene-d8	%	1	-	105	-	-	-
Trichloroethylene	ug/mL	0.3	-	<0.3	-	MAC	5
Trichlorofluoromethane	ug/mL	0.5	-	<0.5	-	-	-
Vinyl Chloride	ug/mL	0.2	-	<0.2	-	MAC	2
Xylene; total	ug/mL	1	-	<1.0	-	AO	300

In addition to the commercial operations, etc. portions of the existing residential development, located to the east and northeast of the subject property were constructed prior to the adoption of the Osgoode By-Law regarding water well construction. This By-Law was considered to be instrumental in ensuring a consistent minimum construction standard for water well construction, which went beyond the minimum of Ontario Regulation 903, the Provincial legislation regarding water well construction. As such, poorly constructed wells may be present in these areas which may allow for the short circuiting of contaminants (mainly sewage system effluent) directly into the water supply aquifers in the area.

High

Based on the visual assessment of the lands located beyond the subject property, there are no identified sources of contamination which present a high risk of contaminating or otherwise adversely affecting the bedrock water supply aquifers beneath the subject site.

2.3.6 Large Water Uses and PTTW Review

Based on a review of large water taking uses in the vicinity of the site, there are no single large water uses presently operating at the time of preparation of this report. Individual well operation, however, has been identified as an overall large water use of the bedrock water supply aquifers and potential well interference effects on the wells proposed on the property, albeit temporary and of minimal amplitude, are likely to occur. Potential well interference is discussed in greater detail in Section 5.5 of this report.

Beyond the vicinity of the subject property, Paterson is aware of a registered Permit To Take Water located at the Shadow Ridge residential development located approximately 1800 m south of the subject property on Old Prescott Road and another PTTW issued for dewatering operations in one of the pit/quarry operations located approximately 3000 m north by northwest on Albion Road. Neither of these water uses are considered to have any measurable impacts on potential aquifer yield due, primarily, to their distance away from the proposed development.

3.0 HYDROGEOLOGICAL ASSESSMENT

In order to evaluate the water supply aquifer(s) underlying the site, a total of four (4) test wells, hereafter denoted as TW1 to TW4, inclusive, were constructed across the site. The locations of the wells were selected by Paterson to ensure that the spacing of the wells was adequate to obtain representative lot coverage for aquifer testing. The general well locations were chosen in order to ensure adequate areal coverage across the site, while, at the same time, endeavoring to maintain sufficient proximity such that response could be measured in observation wells during the pumping tests. Reference should be made to Paterson Drawing No. PH2095-1- Test Hole Location Plan, located in Appendix 5.

A rigorous review of available Water Well Records for the immediate area, published by the Ontario Ministry of the Environment (MOE) 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 previous experience in the area, and combined with the available Water Well Records and neighbouring, stable, water quality characteristics, a conceptual hydrogeological model was established. A comprehensive well construction protocol was subsequently established based on the conceptual model and field results.

3.1 Conceptual Hydrogeologic Model

As the subsurface geology and aquifer system in the area has been well studied by Paterson and others over the past few decades, the derivation of the conceptual hydrogeologic model for the subject property is generally straight forward.

Bedrock of the Oxford Formation is present beneath a thick glacial till layer which overlies marine sediments and glaciofluvial overburden soils deposits. The Oxford Formation, comprised of carbonate limestone, has several intermittent water supply aquifers present in the upper and lower portions of the Formation.

Below the Oxford Formation, there is a water supply aquifer with broad presence within the March Formation, present between the Oxford and Nepean Formations, respectively. Beneath the March Formation, the Nepean Formation contains the only recognized regional aquifer system. Reference should be made to the hydrogeological cross section, drawing no. PH2095-3, in Appendix 5.

Water quality and quantity are considered to be good to excellent in all of the water supply aquifers present in the vicinity of the subject property as evidenced by the neighbouring geochemistry assay.

3.2 Test Well Construction Protocol

The test well installation program was carried out by Air Rock Drilling Company Ltd. between May 2013 and September 2014. 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. The Ministry of the Environment (MOE) Water Well Records for each test well appear in Appendix 2.

Based on the intermittent nature of the bedrock aquifer within the vicinity of the subject area, it was decided, that the casing hole should be extended through the overburden and seated upwards of 3.0 m into the Oxford Formation limestone and at least 1.0m into competent bedrock. Thereafter, the open borehole would be extended downward until a suitable water supply aquifer was encountered.

TW1

A 228 mm diameter casing hole was advanced using a rotary tri-cone bit through the shallow overburden, to the underlying limestone bedrock. The casing hole was advanced into the bedrock an additional 1.8 m to ensure that each casing was seated into competent (i.e. unfractured) bedrock.

A new, 150 mm diameter steel casing, having an approximate length of 14 m, was installed in the casing hole, thereby providing for a casing stickup of approximately 0.6m. The annular space was grouted utilizing a neat cement and sodium bentonite slurry introduced into the bottom of the annular space and pumped, using pressure grouting equipment, to the surface of the ground. The return of the grout to the surface of the ground, was visually observed by Paterson staff. As such, the casing installation and grouting of the annular space is considered to be in compliance with Ontario Regulation 903, the current regulation governing water well construction in the Province of Ontario.

After the completion of the casing installation and seating into the bedrock, the open borehole was advanced using a 150 mm diameter air percussion button bit. The well contractor reported, as shown on the WWR for TW1, that there were no aquifer intercepts encountered within the Oxford Formation limestone. Rather, a suitable water supply aquifer was located within the March Formation located beneath the Oxford Formation limestone and the Nepean Formation sandstone.

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 a one hour constant rate pumping test was carried out. The rate chosen for the one 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 MOE Water Well Records.

Construction of TW2, TW3, and TW4

After TW1 was constructed successfully, thereby validating the well construction protocol and supporting the previously established conceptual hydrogeological model, the remaining test wells were constructed.

Each of the remaining test wells, with the exception of TW3, were constructed utilizing the same construction protocol as in TW1. In each case, the casing was advanced into the limestone bedrock a sufficient depth in order to ensure that the minimum casing length extended a minimum of 3 m below ground surface. A copy of the MOE Water Well Record for each of the test wells is provided, for reference purposes, in Appendix 2.

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.

Construction of TW5

In September, 2014, Paterson oversaw the installation of an additional test well, denoted hereafter as TW5. This well was constructed based on the recommendations for a deeper well casing to effectively seal off water from the upper portions of the Oxford formation and exploit the aquifer system located at the bottom of the Oxford and into the March/Nepean Formations.

TW5 was constructed using a total of 40 m of casing below ground surface. The casing hole was pressure grouted in accordance with Ontario Regulation 903 requirements and the well was subsequently purged and disinfected prior to the start of the pumping test. A copy of the MOE WWR for TW5 is attached in Appendix 2.

3.3 Aquifer Analysis Methodology

Each of the four (4) 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, as noted in Section 2.2. 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 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 75mm dia. 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 (ie. roadside ditch, or sloping terrain, etc.). 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 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 (ie. 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%.

A series of chemical 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 presented in Appendix 3.

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 and accompanying hydrographs are tabulated and provided in Appendix 4.

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 a few short 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 relevant data was available):

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

The results of the aquifer analysis are presented and discussed in Section 7 of this report.

3.4 Aquifer Analysis

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

3.4.1 Aquifer Characteristics

The aquifer characteristics determined from the compilations of the pumping tests for the four (4) test wells are summarized in Appendix 4 along with the detailed aquifer analysis. It is prudent to note that the test wells were not reported to have intercepted large enough quantities of water within the Oxford Formation, itself, during drilling. Based on the MOE WWR's prepared by the driller, it would appear that all of the test wells intercepted the water supply aquifers within the March Formation and possibly the Nepean Formations also.

The summary of the pumping tests along with the associated aquifer parameters are summarized in Table 3-1, below:

Table 3-1: SUMMARY OF AQUIFER CHARACTERISTICS RESULTING FROM ANALYSIS OF CONSTANT RATE PUMPING TEST DATA

PARAMETER	TEST WELL IDENTIFIER				
	TW1	TW2	TW3	TW4	TW5
Transmissivity ¹ (m ² /d)	5.4	86.4	33.2	124	0.76
Storativity ²	1.0 x 10 ⁻⁴	1.0 x 10 ⁻⁴	1.0 x 10 ⁻⁴	1.0 x 10 ⁻⁴	1.0 x 10 ⁻⁴
Pumping Rate (L/min)	37.8	30	30	83.4	45.4
Available Drawdown (m)	51.8	70.1	82.3	82.3	80.16
Maximum Drawdown (m)	12.2	17.35	11.67	11.76	37.5
%Drawdown	23.6	24.8	14.2	14.3	46.8
Specific Capacity (L/min/m dd)	3.1	1.73	2.6	7.10	1.2

1. The transmissivity has been calculated using the Cooper & Jacobs I analysis
2. The Storativity has been estimated based on literature sources for limestone bedrock

3.4.2 Groundwater Geochemistry Assessment

As detailed in the previous sections, the raw groundwater was sampled at two (2) key milestones for each pumping test for each test well. During each sampling event, the free chlorine residual was measured in the field and confirmed to be below the hand held unit's detection limit prior to collection of the samples. The handheld unit utilized by Paterson is a Hanna C-114 Turbidimeter/free chlorine meter.

For each sampling event, the raw water was poured into the sampling bottles via a secondary stopcock valve fitted onto Air Rock's discharge hose. This stopcock allows for the sampling of laminar water while it is forced through the discharge at a much higher pressure. This ensures accurate sampling for hydrogen sulfide and phenols.

Each of the set of sample bottles for each sampling event were preserved on ice for immediate transportation to the Ottawa Branch of Exova Accutest Laboratories Ltd. Exova is an accredited laboratory which has the relevant accreditation to perform analyses on drinking water samples. Each sample was submitted for analysis for bacteriological, chemical and physical water quality parameters consistent with a "subdivision package". A subdivision package is a suite of water quality parameters recognized by the City of Ottawa as being the minimum industry standard with respect to water quality analysis for residential development within the City of Ottawa.

The groundwater geochemistry for each of the test wells is conveniently summarized on Table 3-2 below for TW1 to TW4 and Table 3-3 for TW5:

TABLE 3-2: SUMMARY OF GROUNDWATER GEOCHEMISTRY OBTAINED THROUGH PUMPING TESTS											
PARAMETER	UNITS	ODWS		TW1		TW2		TW3		TW4	
		LIMIT	TYPE	3hr	6hr	3hr	6hr	3hr	6hr	3hr	6hr
MICROBIOLOGICAL											
Escherichia Coli (E.Coli)	ct/100mL	0	MAC	0	0	0	0	0	0	0	0
Faecal Coliforms	ct/100mL			0	0	0	0	0	0	-	-
Faecal Streptococcus	ct/100mL			-	-	-	-	-	-	0	0
Heterotrophic Plate Count	ct/1mL			4	1	18	16	23	38	-	-
Total Coliforms	ct/100mL	0	MAC	0	0	0	0	0	0	0	0
GENERAL CHEMICAL - HEALTH RELATED											
Fluoride	mg/L	1.5(2.4)	MAC	0.65	0.65	0.48	0.48	0.11	0.11	0.11	0.12
Nitrite	mg/L	1	MAC	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Nitrate	mg/L	10	MAC	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Turbidity (Lab)	NTU	1.0(5.0)	MAC/AO	0.8	0.5	0.5	0.5	1.3	1.4	0.3	0.5
Ammonia	mg/L			0.20	0.20	0.24	0.23	0.03	<0.02	<0.02	0.03
Total Kjeldahl Nitrogen	mg/L			0.24	0.19	0.21	0.16	<0.10	<0.10	<0.10	0.14
GENERAL CHEMICAL - AESTHETIC RELATED											
Hardness	mg/L	100	OG	162	162	241	250	320	320	329	348
Ion Balance	unitless			0.93	0.92	0.98	1.01	0.95	0.96	0.99	1.01
Total Dissolved Solids	mg/L	500	AO	447	450	482	486	495	496	494	492
Alkalinity	mg/L	500	OG	209	210	220	218	226	225	224	237
Chloride	mg/L	250	AO	66	65	71	70	73	73	71	72
Colour	TCU	5	AO	<2	2	<2	<2	2	2	3	2
Conductivity	uS/cm			688	692	741	748	761	763	760	757
pH	unitless	6.5-8.5	AO	8.19	8.17	7.99	8.03	7.97	7.93	8.02	8.21
Sulphide	mg/L	0.05	AO	<0.01	<0.01	0.17	0.14	<0.01	<0.01	<0.01	<0.01
Sulphate	mg/L	500	AO	51	51	62	60	68	68	66	66
Calcium	mg/L			32	32	52	54	87	87	89	95
Iron	mg/L	0.3	AO	0.05	0.06	0.06	0.06	0.21	0.21	0.15	0.18
Potassium	mg/L			7	6	5	6	2	2	2	2
Magnesium	mg/L			20	20	27	28	25	25	26	27
Manganese	mg/L	0.05	AO	0.01	0.01	0.01	0.01	0.03	0.03	0.02	0.03
Sodium	mg/L	200	AO	73	72	60	58	27	27	26	28
Phenols	mg/L			<0.001	<0.001	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001
Tannin & Lignin	mg/L			<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1
Dissolved Organic Carbon	mg/L	5	AO	0.6	<0.5	0.9	0.8	1.3	1.6	<0.10	1.5

1. ODWS identifies the following types of parameters:
MAC=Maximum Allowable Concentration
AO = Aesthetic Objective
OG= Operational Guideline
2. Shaded Concentration Indicates an Exceedance of the ODWS Objective

TABLE 3-3: SUMMARY OF HEALTH AND AESTHETIC/OPERATIONAL OBJECTIVE PARAMETERS						
PARAMETER	UNITS	MDL	TEST WELL ID		TYPE	ODWS
			TW5-WS1	TW5-WS2		
MICROBIOLOGICAL						
Escherichia Coli	ct/100mL	-	0	0	MAC	
Faecal Coliforms	ct/100mL	-	0	0	-	-
Faecal Streptococcus	ct/1mL	-	0	0	-	-
Heterotrophic Plate Count	ct/100mL	-	>500	79	-	-
Total Coliforms	ct/100mL	-	1*	0	MAC	0
GENERAL CHEMICAL - HEALTH RELATED						
Fluoride	mg/L	0.1	0.69	0.75	MAC	2.4
N-NH3 (Ammonia)	mg/L	0.02	0.24	0.25	-	-
N-NO ₂ (Nitrite)	mg/L	0.1	<0.10	<0.10	MAC	1
N-NO ₃ (Nitrate)	mg/L	0.1	<0.10	<0.10	MAC	10.0
Total Kjeldahl Nitrogen	mg/L	0.05	0.28	0.26	-	-
Turbidity	NTU	0.1	0.3	0.3	MAC/AO	1.0/5.0
GENERAL CHEMICAL - AESTHETIC RELATED						
Alkalinity as CaCO3	mg/L	5	196	200	OG	500
Chloride	mg/L	1	114	147	AO	250
Colour	TCU	2	<2	<2	AO	5
Conductivity	uS/cm	5	892	993	-	-
Dissolved Organic Carbon	mg/L	0.5	1.0	1.0	AO	5
Sulfide	mg/L	0	<0.10	<0.10	AO	0.05
pH	-	-	8.15	8.17	AO	6.5-8.5
Phenols	mg/L	0	<0.001	<0.001	-	-
Sulphate	mg/L	1	63	64	AO	500
Tannin & Lignin	mg/L	0.1	<0.1	0.2	-	-
TDS (COND-CALC)	mg/L	5	580*	645*	AO	500
Hardness as CaCO3	mg/L	1	238*	229*	OG	100
Ion Balance	-	0	1.06	1.03	OG	-
Calcium	mg/L	1	46	44	-	-
Magnesium	mg/L	1	30	29	-	-
Potassium	mg/L	1	8	8	-	-
Sodium	mg/L	2	93	114	AO	200
Iron	mg/L	0	1.17*	2.55*	AO	0.3
Manganese	mg/L	0	0.03	0.06*	AO	0.05

3.4.3 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 witness three bedroom single family homes, using the Procedure D-5-5 methodology, the number of persons would be four (4) and the total peak demand rate is calculated to be 18.75 L/min.

Analysis of Table 3-1, 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 15% of the available drawdown during the pumping tests. The calculated 20 year long term safe yield, calculated based on the equation $0.68 T \Delta S$ (average T of 62.2 and ΔS of 50 m) is 2,100,000 L/day (i.e. 1450 L/min). This information, combined with the calculated 20 year long term safe yield value, 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.

Water Quality

A review of the water quality analysis data from Table 3-2, 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).

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

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. TW2 and the HW 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 MOE in 1995.

Sodium (Na) concentrations in all of the test wells reported to be present above a concentration of 20 mg/L. The sodium concentration did not show significant reductions during the pumping tests. 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.

For Table 3-3, which reflects the water quality for TW5, iron and manganese were noted to be present above the ODWS, but below the concentrations considered to be reasonably treatable in Table 3 of D-5-5. As such, at the measured concentrations, iron and manganese will impart a metallic taste to the water and will stain porcelain sinks, toilets, etc.

3.5 Treatability of Raw Water Supply

Based on the groundwater geochemistry summarized in Table 3-2 and Table 3-3, there may be a desire by future homeowners to reduce the hardness concentrations in the raw water. This is especially true for TW5, which reflects the water quality expected in all future wells. Given that the measured concentrations appear to peak at around 348 mg/L, the water is considered to be hard to very hard at approximately 20 grains of hardness. (17.1 mg/L hardness reported as calcium carbonate equals 1 "grain" of hardness in water treatment vernacular). As such, a standard residential grade water softener will be sufficient to remove the hardness concentrations in the water.

While a water softener will effectively remove the hardness from the raw water, the treated water produced by the softener will have increased sodium concentrations. Based on the hardness concentrations, the anticipated post treatment sodium concentrations may approach 200 mg/L. As such, it is prudent for a separate tap be installed at each location where water will be consumed. That tap should be plumbed only to the raw water system, effectively bypassing the water softener. This is considered standard practice in the water treatment industry in Ontario.

Alternatively, one may utilize a potassium chloride salt, which is significantly more expensive than standard sodium chloride salt, in place of the sodium chloride salt in water softeners. This is recommended, where there is a need to circumvent the bypass tap.

Test well 2 exhibited evidence of elevated hydrogen sulfide, measured at concentration of between 0.14 and 0.17 mg/L. While hydrogen sulfide was not measured in the other

four (4) test wells, and given that TW5 reflects the water quality expected in all future wells constructed at the site, hydrogen sulfide is not considered to be an issue requiring significant treatment. Furthermore, given that the raw water from TW5 will likely require iron and manganese treatment, a standard residential grade air injector for iron and manganese removal will also remove the hydrogen sulfide, if present.

4.0 TERRAIN ANALYSIS

As part of this study, a series of test holes, consisting of a combination of boreholes, and hand excavated test holes, were put down on the subject property to delineate the subsurface soil conditions beneath the site. The field investigations took place between November 2012 and September 2013. During this investigation, a total of six (6) boreholes and eight (8) test holes were constructed within the limits of the study area. The test pit locations were selected by Paterson personnel to ensure that adequate representation of the subsurface soil profile was delineated across the site.

Summary of Borehole Construction

A series of three (3) boreholes, BH1-BH3 inclusive, were put down across the subject property in November 2012. The boreholes were constructed with a CME- 55 power auger, attached to a track mounted drilling rig, and were advanced to refusal on inferred bedrock. The purpose of the construction of these initial boreholes was to evaluate the composition of the parent material beneath the site from a hydrogeological perspective.

In March, 2013, an additional three (3) boreholes, BH4 to BH6, inclusive, were put down within selected areas on the subject property. The locations of these additional boreholes were selected to fill in gaps in the subsurface profile created by the initial drilling program.

Each of the boreholes were constructed under the full time supervision by Paterson and samples were recovered from split spoons every 1.5 m for field assessment and classification. Following the completion of the tactile evaluation of each sample, the samples were transferred to a storage bag and catalogued for transportation to the laboratory for further analysis. The depths at which the soil samples were recovered from the test holes are shown as "SS" on the Soil Profile and Test Data sheets provided in Appendix 1. The locations of the test pits put down on the subject property are referenced on Drawing No. PH2095-1, entitled "Test Hole Location Plan", and is located in Appendix 2 of this report.

Summary of Test Hole Construction and In Situ Testing

To complement the borehole works, a series of test holes were put down within the treed areas across the remainder of the site in the areas where the boreholes were absent. The purpose of the test holes, excavated using hand equipment only, was to delineate the surficial soils located within the upper 2 m of the surface of the ground and to better define the overburden groundwater table beneath the site.

A total of eight (8) test holes were put down on the subject property in September 2013. Each hole was advanced to a depth of approximately 2.0 m below ground surface by a member of the hydrogeological department of Paterson. The surficial soils were visually and tactually classified in the field and representative samples were recovered and stored for further laboratory analysis. The depths at which the soil samples were recovered from the test holes are noted as a "G" on the Soil Profile and Test Data Sheets located in Appendix 1. The locations of the test holes put down on the subject property are referenced on Drawing No. PH2095-1, entitled "Test Hole Location Plan", and is located in Appendix 5 of this report.

4.1 Summary of Surficial Soil Stratigraphy

The surficial soils in the vicinity of the subject area generally consist of glacio-fluvial deposits of sand and glacial till associates with the glacial outwashes from the Champlain Sea. Typically, a shallow to thick deposit of medium to fine grained silty sand is present overlying a cohesive layer of silt or silty clay beneath the broader lands beyond the subject property. A cohesive to very dense non-cohesive till is typically present beneath the shallower deposits and rests atop bedrock.

Test hole locations and corresponding stratigraphy of the main soil types are summarized on the Test Hole Location Plan (Drawing No. PH2095-2 in Appendix 2) and a detailed discussion of each dominant soil strata is advanced below:

Organic Deposits (Topsoil)

The site is generally overlain by a thick layer of topsoil having a thickness of between 0.15 m and 0.45 m. The topsoil layer was noted to have significant organic content but has an overall loamy texture and composition. This is generally reflective of the sand, parent material underlying the organic layer. Of note is the fact that thickness of the organic layer increases moving east to west across the site until the hydro easement and drainage ditch. Beyond the drainage ditch to the west, the topsoil layer thins somewhat and has an average consistent thickness of approximately 0.2 m.

Silty Sand

A transition zone of silty sand is present directly beneath the topsoil across the subject property. The vertical migration of silt from the thick organic layer has resulted in the silt contamination of the underlying clean sand strata. While still considered to be a medium sand, the presence of silt is sufficient to classify, using the Unified Soil Classification System (USCS), as a silty sand. The layer has varying degrees of natural soil compaction with the most compact areas of this layer present within the heavily treed areas within the central quadrant of the site. The layer is heavily oxidized in the eastern quadrant of the site while in the central and western portions of the site, this layer is greyish-brown to brown. This suggests the this layer is influenced by the overburden groundwater levels within these central and western quadrants.

Sand

A layer of medium to coarse sand is present beneath the silty sand transition layer. The sand has a USCS classification of an SP, poorly graded sand and has a combination of coarse to medium sand grain sizes. The layer was noted to have a moisture content in the order of 20 to 35 % in the upper portions of the strata. The moisture content increases to over 40% at the lower portions of the layer. A review of published literature sources related to the moisture content of sand and the water holding capacity, suggest the sand is at, or near field capacity at the base of the layer. This is corroborated by the presence of overburden groundwater at the transitional interface between the base of the sand layer and the upper edge of the underlying soil layer. Reference should be made to the grain size distribution curves for this sand, located in Appendix 1.

Coarse Sand

Underlying the medium to coarse sand is a coarse sand with some fine gravel present, with little to no fines. The layer was noted to be present in each of the test holes and was also noted to be completely saturated at the time of the September 2013 works.

Silty Clay

A layer of silty clay, having variable thickness, was present throughout the western limits of the site. The clay pinches out in portions of the central quadrant of the site, in the area of BH2 on Drawing No. PH2095-1 (see Appendix A), and thickens somewhat again moving further to the east to the edges of the study limit.

The composition of the clay was consistent with that of a silty clay of low plasticity

(USCS classification of CL). The silty clay was present in a firm consistency when first encountered. The consistency changed to soft approaching the base of the layer.

Silt

A layer of compact to very dense silt was present beneath the silty clay layer in the eastern quadrant of the site and is present directly beneath the coarse sand layer where the silty clay pinches out in the central quadrant of the site. The silty clay layer, itself, pinches out to the east of the hydro easement where the silty clay is present directly beneath the coarse sand.

The consistency of the silty is such that it exhibits significant degrees of natural compaction which has significantly reduced the saturated hydraulic conductivity of the layer.

Till

A layer of very dense till was encountered in each of the boreholes put down on the subject property. The till layer appears to be significantly dense across much of the site such that practical refusal (i.e. greater than 50 blow counts per 300 mm of penetration) was encountered throughout most of the property.

4.2 Groundwater

Overburden Aquifer

At the time of the fieldwork, the overburden groundwater levels were measured and are recorded as shown, where applicable, on the Soil Profile and Test Data sheets. Groundwater levels in the test holes varied across the site from 0.95 m to 1.65 m bgs.

The overburden groundwater appears to be retarded within the coarse sand layer present above the silty clay and silt strata. The rate of infiltration into the lower soil strata appears to be limited by these lower layers of very low hydraulic conductivity.

With respect to the seasonal high groundwater levels, the soil analysis suggests that the central portion of the site, where the sand layer is grey-brown to grey within the lower portions of the layer, reasonably reflects the overburden groundwater. As such,

it is opined that the overburden groundwater levels are shallowest in the central quadrant of the site, due to the bowl shaped topography and shallowness of the layers of low hydraulic conductivity.

With respect to the direction of overburden groundwater flow, analysis of the water levels reported in the test holes and monitoring wells suggests the flow is in a south to southwest direction beneath the site.

Background Nitrates Assessment

As standard practice in the completion of the terrain analysis, samples of the raw water were recovered from a total of four (4) test holes across the subject property. All but one of the samples reported Total Kjeldahl Nitrogen (TKN) concentrations of <0.10 mg/L (ie. below the method detection limit). Only one sample (TH4) reported a TKN concentration of 0.12 mg/L. As such, the background nitrate concentrations are essentially at, or below method detection limits which indicates that the site has seen virtually no anthropogenic activities which would produce nitrate-nitrogen, nor is the upgradient land uses showing any measurable impacts on the overburden groundwater. A copy of the nutrient analysis is provided for TH1 to TH4 in Appendix 3 (Exova Report No. 1322004).

Additional testing was completed at the site in 2014, with respect to nitrate and nitrite concentrations. A total of four (4) test holes, shown as BNH1 to BNH4 on the test hole location plan - PH2095-1, in Appendix 5, were sampled for these critical parameters. The results, as noted in Appendix 3, show no detectable concentrations of nitrate or nitrite within the study area.

Bedrock Aquifer

The bedrock aquifer, contained within the Oxford Formation has an interpreted direction of groundwater flow towards the east to northeast. The March/Nepean formation has an interpreted direction of groundwater flow towards the east.

5.0 DEVELOPMENT RECOMMENDATIONS

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

5.1 Site Development

Based on the results of our study, this site is considered to be suitable for the development of more than 40 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.

5.2 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. PH2095-2) 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 400 m², assuming a four (4) bedroom, two-storey 300 m² (3,500 ft²) home, and including a garage of 50 m², and 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. PH2095-2) 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.)

5.3 Predictive Impact Assessment

Hydrogeological Sensitivity

In accordance with Section 5.0 of the MOE 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.

Based on the thickness and low permeability of the lower soil strata present beneath the site, as detailed in Section 4.0 and observed on the published MOE WWR's, combined with the shallow, retarded water table conditions present across most of the site, the subject property is not considered to be hydrogeologically sensitive.

Predictive Impact Assessment for Nitrate

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 low hydraulic conductivity in the lower soil horizons. However, the flow would tend to be contained onsite through the construction of a series of best management practices for stormwater management. A discussion on the stormwater management considerations is advanced in Section 5.8.

In conducting an assessment of the impact of the proposed development, the estimate of groundwater recharge, by infiltration of precipitation, is the primary site-specific input parameter. In this regard, assumptions are required to be made with respect to evaporation and evapotranspiration, as well as infiltration and runoff rates.

The rate of infiltration will be dependent upon the following:

- surficial soil type(s), especially within the depth of influence of the sewage systems;
- ground covers and their distribution; and
- site topography, especially after development.

Based on the findings of the site specific soil infiltration rate assay, a water holding capacity was derived for each of the dominant soil types. The surficial soil descriptions and estimated water holding capacities were submitted to Environment Canada's Climate Services department to produce a site specific water balance. Based on the results of the site specific water balance (refer to Appendix 4 for the received data set) the surplus water data for the in situ coarse to medium sand layer, constituting the receiving soil has been calculated to be of the order of 394 mm/m of soil per year.

With respect to the selection of appropriate runoff/infiltration coefficients, the following summaries are provided:

Topography

Pre-development Conditions

The site, while generally flat, has several existing land features that require a weighted average approach to the derivation of the pre-development infiltration factors. The eastern quadrant of the site is open and has a rolling topography. Moreover, the hydro easement is open and considered rolling due to the presence of the drainage ditch bisecting the corridor. The remaining portions of the site are heavily wooded and flat. The weighted average pre-development topographic factor was calculated to be 0.253. The calculations are provided for reference purposes in Appendix 4.

Post Development Conditions

Development of the site will see most of the site retain the flat nature of the site, but will see lot specific grade raises of the order of 1 m to 2 m above existing grades at the building envelopes. Similarly, the shallow overburden water table present in the central quadrant (flattest area) will result in the requirements for partially raised leaching beds which will result in grade raises of the order of 1 m above existing values. As such, the calculated post-development topographic factor for the site is 0.2. Reference can be made to the calculations in Appendix 4.

Soil

Predevelopment Conditions

The existing sand layer, present beneath the existing sandy silt, organic topsoil layer, is a clean medium to coarse grained sand. As such, the weighted soil factor has been calculated to be 0.48 based on 1.2 m thickness of soil horizons between the surface of the ground and the normal high water table (i.e. 1.2 m below ground surface).

Post Development Conditions

The placement of fill material around the foundations, if site excavated material is used and the topsoil is stripped from the excavation areas, should result in only a slightly reduced long term infiltration value. This also assumes typical even natural compaction of the backfill material achieved through good construction practice. As such, the post development soil infiltration value has been adjusted to 0.40. For the purposes of conservative predictive impact assessment for nitrate, the PIA has been completed using a maximum soil infiltration value of 0.4.

Cover

Pre-development Conditions

The pre-development cover factor has been calculated to be 0.19. This value factors in the bulk of the subject property being wooded with the two (2) open areas associated with the hydro easement and previously cultivated areas.

Post Development Conditions

The post development cover for the subject property will consist primarily of urban lawn with retained areas for tree preservation along the side and rear lot lines. The anticipated lot coverage for retained trees, based on the adjacent developments is of the order of 25 to 30%. As such, the new factored cover value is calculated, based on a weighted area average to be 0.15.

Based on the pre-development conditions, the calculated volume of infiltration water anticipated to occur on the subject property is of the order of 342.5 mm/m of soil per annum. The post development water surplus, as calculated based on the assumptions detailed above and in the spreadsheet analysis summarized in Appendix 4, is of the order of 300.8 mm/m of soil per annum. Based on the results of an iterative analysis, the site is capable of attenuating effluent for approximately 45 individual sewage systems through only dilution processes.

5.4 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 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 large 4 bedroom luxury residence with a finished floor area of 300 m² 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 (PH2095-2) 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. PH2095-2 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. PH2095-2) 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.

5.5 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 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 all of the test wells recovered within a few hours of the completion of pumping, the continued, intermittent operation of future wells, based on the pumping test analysis, is expected to have no measurable long term effect on the overall potentiometric head of the water supply aquifer.

5.6 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 IGPM 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 wells should be isolated from the Oxford Formation. As the Oxford Formation limestone water supply aquifer is located at a depth of between 12 to 20 m below the ground surface in the northern quadrant of the site where it was encountered, all wells should be pilot drilled by first installing a 250 mm diameter working casing seated into the bedrock and extending a 150 mm diameter open borehole through the Oxford Formation and to the completion depth at the March Formation water supply aquifer. If the Oxford Formation water supply aquifer is intercepted in the borehole, the well contractor should record the depth of the interception(s) and, using a 200 mm diameter tricone bit, ream a 200 mm diameter casing hole to a depth of a minimum of 2 m below the deepest recorded aquifer intercept. In most instances, it is recommended that a minimum casing length of 40 m be specified for all future wells. This recommendation is considered to be very conservative, however, it will provide a simple specification for well contractors to follow and reduce the reliance on solely assessing the rock cuttings during the casing hole construction.

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 from Paterson Group Inc.

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 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 from the casing.

With respect to the existing test wells, it is recommended that TW3 be either decommissioned or properly deepened and sleeved as per TW2A. The remaining wells which intercept the March Formation without intercepting a water supply aquifer within the Oxford Formation in the open borehole, are considered to be acceptable for reuse as future wells as they meet the intent of the well construction specifications presented above.

5.7 Water Conditioning Considerations

As the water within the preferred zone of aquifer interception contains elevated hardness and, to a lesser extent, iron and manganese 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. It may be prudent, however, to include an air injector and iron/manganese removal system into the process stream in order to minimize softener regeneration cycles.

As the water is considered to be very 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.

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.

5.8 Stormwater Management Considerations

The subject property is directly underlain by a medium to coarse sand overlying lower permeable silt and silty clay deposits. From a hydrologic perspective, the site can be assigned a hydrologic soil classification of A-AB corresponding to soils which have low to medium runoff potential.

It is anticipated that the post development water surplus will be reduced by approximately 13% (345.5 mm/year to 300.8 mm/year). Given the excellent infiltration capacity of the sand layer overlying the lower permeable strata beneath the site, best management practices for promoting infiltration in a post development scenario are applicable for this site. These practices include:

- infiltration trenches;
- shallow grade swales complete with perforated subdrains; and
- shallow grade road side ditches complete with perforated subdrains.

It is anticipated that the implementation any combination of these best management practices, especially the shallow graded swales and ditches (i.e. 0.5% and 0.3%, respectively) will achieve pre-development infiltration values thereby further reducing the theoretical long term nitrate concentrations generated beneath the site.

5.9 Existing Well Decommissioning

Given that TW1 to TW4, inclusive, do not follow the recommended well construction methodology, these wells should either be decommissioned in accordance with Ontario Regulation 903.

As an alternative, the wells could be sleeved to a depth of at least 40 m below ground surface and used for future production wells, if their locations are deemed to be satisfactory.

6.0 CONCLUSIONS

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

1. The subject property is located in a relatively flat to slightly sloping setting with all areas exhibiting excellent infiltration and imperfect surficial drainage characteristics in pre-development condition.
2. There is minimal potential impacts from surrounding land uses within 500 m of the site, based on available information. Moreover, offsite impacts from the proposed density of residential development are considered to be negligible.
3. The surficial geology of the subject property generally consists of coarse to medium grained sand overlying silt and silty clay deposits of low hydraulic conductivity.
4. The bedrock geology beneath the site consists of limestone of the Oxford Formation. The Oxford Formation is underlain by the March Formation, and Nepean Formation, respectively. The direction of groundwater flow is interpreted to be towards the south west in the March Formation.
5. The construction of the test wells on the subject property appear have intercepted at a water supply aquifer within the Oxford and March Formations that has sufficient quality and quantity of groundwater for use by the proposed development.
6. The most consistent zones of aquifer intercept is within the March Formation as reported in the test wells and neighbouring wells is between 47.5 and 66 m below ground surface.
7. 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
8. Water quality of the Oxford and March Formation water supply aquifers, based on the analyses conducted in this report, is considered to be excellent for domestic use.
9. 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.
10. Sewage systems, containing fully raised leaching beds, are easily accommodated on each of the proposed lots. Several areas of the proposed development may be serviced using sewage systems which are either in-ground or partially raised also. Site specific soil morphology analysis, carried out by a qualified geotechnical engineer, should be completed for each individual sewage system design.

11. The subject property is suitable for development as a residential subdivision at the proposed density. Impacts to the neighbouring low density residential development area is expected to be minimal.

7.0 RECOMMENDATIONS

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

1. 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. If the use of water softeners are considered, 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.
3. Wells should be constructed such that the casing hole extends into sound bedrock at least 3 m into the Oxford Formation. A minimum casing length, per well, of 40 m, should be specified for the casing hole to account for variations of elevation of the underlying bedrock and to case off the upper Oxford Formation water supply aquifer. 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 47 m to 66 m measured below the ground surface. Wells should be constructed with a rotary air drilling rig and should be surged and purged to a sand free state prior to completion of the well.
5. The recommended minimum range of well yields is set at between 15 L/min and 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 of Ontario. Furthermore, it is recommended that a qualified Professional Engineer 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 additional well development should take place during well construction, or alternatively, take place during the mandatory pumping test set forth by Ontario Regulation 903. If the additional well development takes place during the pumping test, the duration of pumping at the design rate should be increased to at least a minimum of three (3) hours.
8. All future water wells be completed such that the top of well casing is a minimum of 450 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.
9. Individual future well owner should carry out semi annual verification of potability of the raw water supply. Moreover, the well owner should ensure that the maintain the wellhead and immediate area in accordance with the requirements of Ontario Regulation 903.
10. The existing dug well must be decommissioned in strict accordance with Ontario Regulation 903 and the decommissioning works should be overseen by a Professional Engineer or Professional Geoscientist of Ontario.
11. The existing test wells, which cannot be reused due to well construction methodology or spatial location on the proposed lots, must be decommissioned in strict accordance with Ontario Regulation 903 and the decommissioning works should be overseen by a Professional Engineer or Professional Geoscientist of Ontario

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.

PATERSON GROUP INC.



**Robert A. Passmore, P.Eng.
Senior Environmental Engineer**

APPENDIX 1

- ☐ **SOIL PROFILE & TEST DATA SHEETS**
- ☐ **SYMBOLS AND TERMS**
- ☐ **GRAIN SIZE ANALYSIS FOR RECEIVING SAND**

SOIL PROFILE AND TEST DATA

Hydrogeological Study

Proposed Residential Development - Old Prescott Road
Ottawa, Ontario

DATUM Datum provided by Stantec Geomatics Limited.

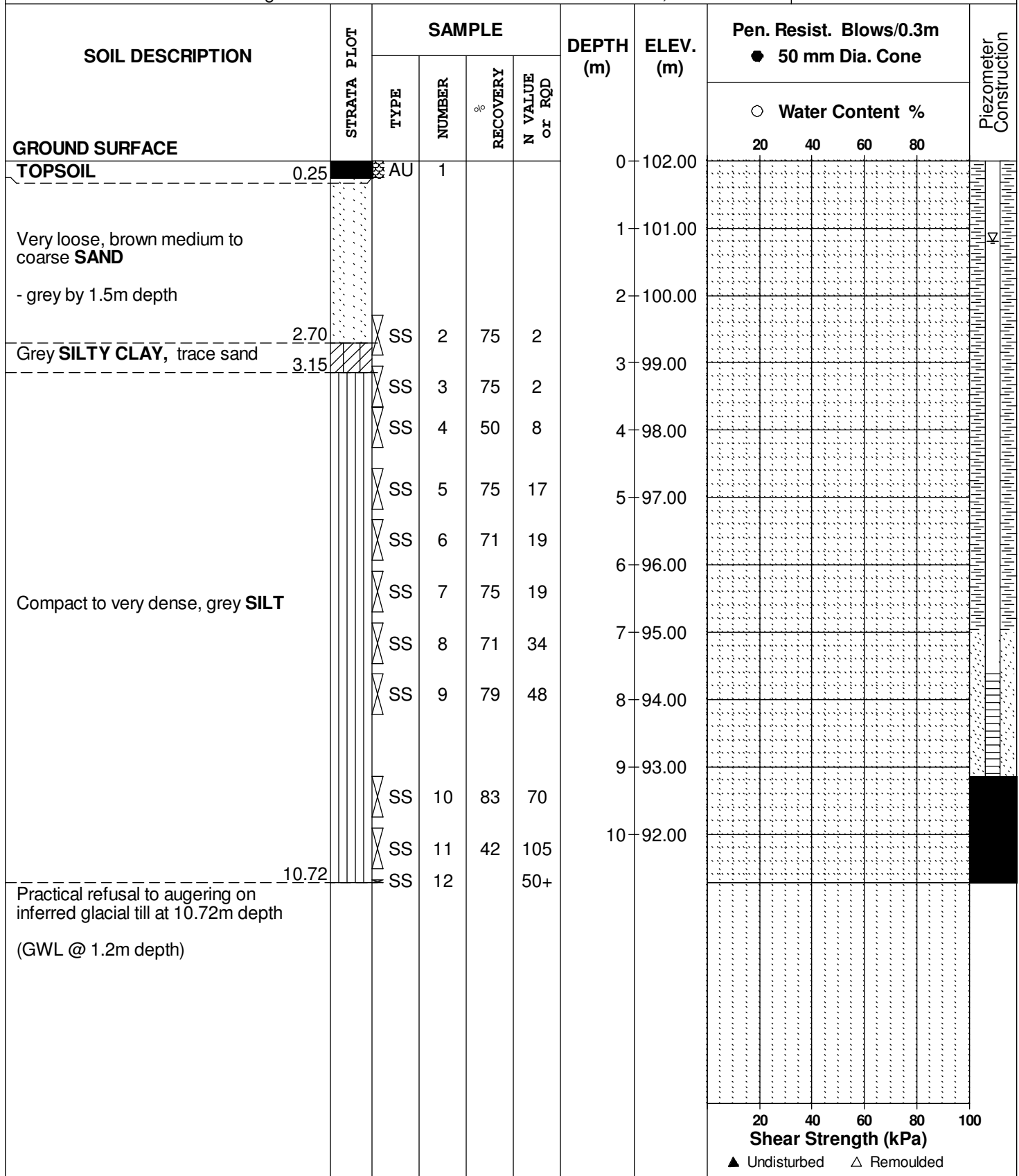
REMARKS

BORINGS BY CME 55 Power Auger

DATE November 19, 2012

FILE NO. **PH2095**

HOLE NO. **BH 1**



[illegible]

SOIL PROFILE AND TEST DATA

Hydrogeological Study

Proposed Residential Development - Old Prescott Road
Ottawa, Ontario

DATUM Datum provided by Stantec Geomatics Limited.

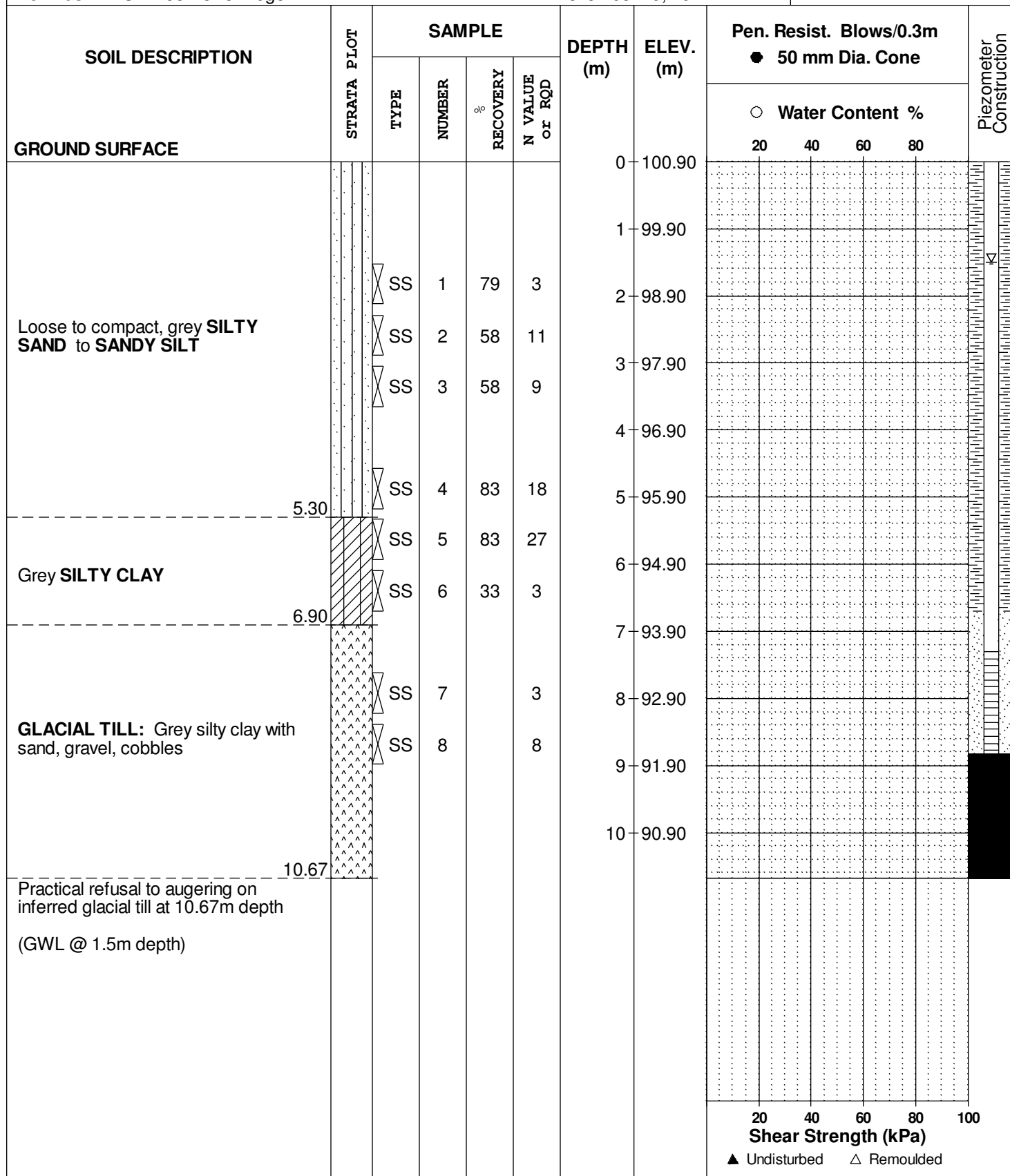
REMARKS

BORINGS BY CME 55 Power Auger

DATE November 19, 2012

FILE NO. **PH2095**

HOLE NO. **BH 3**



SOIL PROFILE AND TEST DATA

Hydrogeological Study

Proposed Residential Development - Old Prescott Road
Ottawa, Ontario

DATUM Datum provided by Stantec Geomatics Limited.

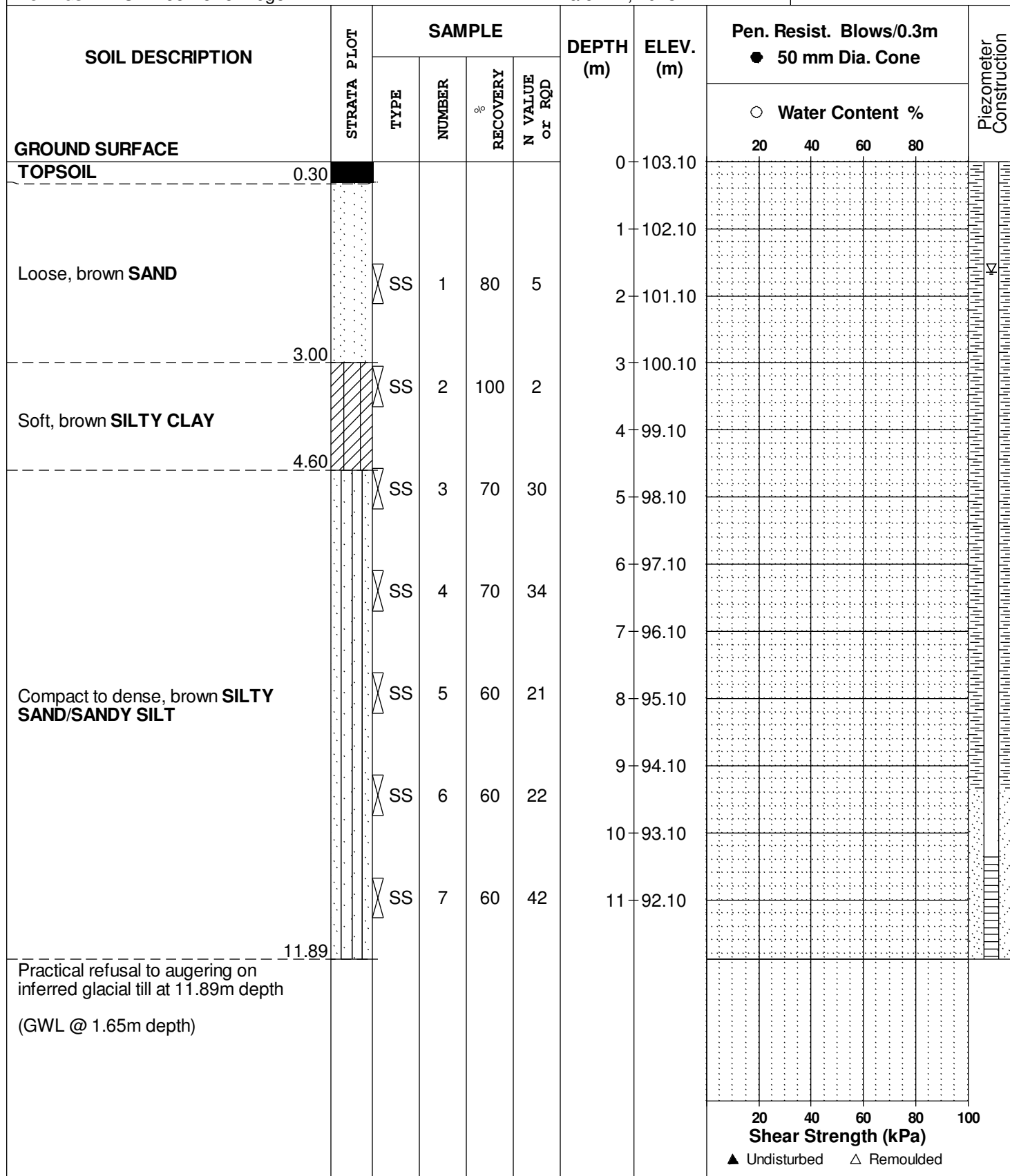
REMARKS

BORINGS BY CME 55 Power Auger

DATE March 14, 2013

FILE NO.
PH2095

HOLE NO.
BH 4



SOIL PROFILE AND TEST DATA

Hydrogeological Study

Proposed Residential Development - Old Prescott Road
Ottawa, Ontario

DATUM Datum provided by Stantec Geomatics Limited.

REMARKS

BORINGS BY CME 55 Power Auger

DATE March 14, 2013

FILE NO. **PH2095**

HOLE NO. **BH 5**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE												
TOPSOIL	0.30					0	101.75					
Compact, brown SAND - with clayey silt by 3.0m depth						1	100.75					
		SS	1	60	16	2	99.75					
		SS	2	80	41	3	98.75					
		SS	3	80	66	4	97.75					
Very dense to dense, blue-grey SILT	4.60					5	96.75					
		SS	4	80	42	6	95.75					
		SS	5	80	22	7	94.75					
		SS	6	90	7	8	93.75					
Loose, brown SANDY SILT with gravel	9.10					9	92.75					
		SS	7	40	4	10	91.75					
		SS	8	50	50	11	90.75					
		SS	9			12	89.75					
Dense, brown SAND with gravel	12.20					12	89.75					
Practical refusal to augering on inferred glacial till at 13.11m depth (GWL @ 1.0m depth)	13.11					13	88.75					
								20	40	60	80	100
								Shear Strength (kPa)				
								▲ Undisturbed △ Remoulded				

SOIL PROFILE AND TEST DATA

Hydrogeological Study

Proposed Residential Development - Old Prescott Road
Ottawa, Ontario

DATUM Datum provided by Stantec Geomatics Limited.

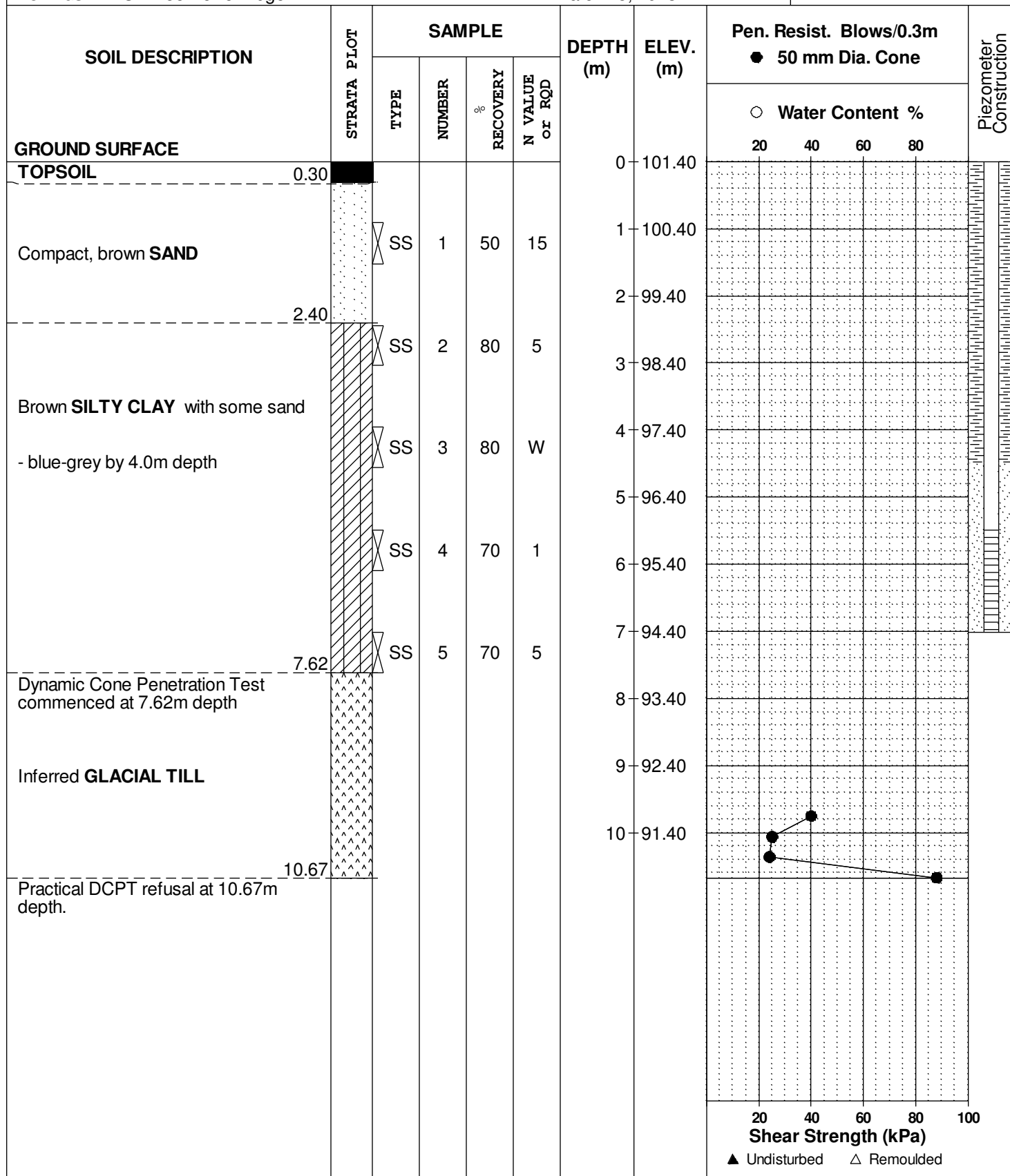
REMARKS

BORINGS BY CME 55 Power Auger

DATE March 15, 2013

FILE NO.
PH2095

HOLE NO.
BH 6



SOIL PROFILE AND TEST DATA

Hydrogeological Study

Proposed Residential Development - Old Prescott Road
Ottawa, Ontario

DATUM Datum provided by Stantec Geomatics Limited.

REMARKS

BORINGS BY Hand Auger

DATE October 5, 2013

FILE NO. PH2095

HOLE NO. TH 1

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction	
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %					
								20	40	60	80		
GROUND SURFACE						0	103.30						
TOPSOIL													
0.20													
Red SILTY SAND													
0.65													
Brown SAND													
1.00						1	102.30						
Brown to grey coarse SAND													
1.60													
End of Test Hole (GWL @ 1.65m depth)													▽
			</										

SOIL PROFILE AND TEST DATA

Hydrogeological Study

Proposed Residential Development - Old Prescott Road
Ottawa, Ontario

DATUM Datum provided by Stantec Geomatics Limited.

REMARKS

BORINGS BY Hand Auger

DATE October 5, 2013

FILE NO. PH2095

HOLE NO. TH 2

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
GROUND SURFACE						0	102.20	20	40	60	80	
TOPSOIL												
0.15												
Red SILTY SAND												
0.45												
Brown SAND												
1.20						1	101.20					
Brown to grey coarse SAND												
1.50												
End of Test Hole (GWL @ 1.4m depth)												
								20	40	60	80	100
								Shear Strength (kPa)				
								▲ Undisturbed △ Remoulded				

SOIL PROFILE AND TEST DATA

**Hydrogeological Study
Proposed Residential Development - Old Prescott Road
Ottawa, Ontario**

DATUM Datum provided by Stantec Geomatics Limited.

FILE NO. **PH2095**

REMARKS

HOLE NO. TH 3

BORINGS BY Hand Auger

DATE October 5, 2013

[illegible]

SOIL PROFILE AND TEST DATA

Hydrogeological Study Proposed Residential Development - Old Prescott Road Ottawa, Ontario

DATUM Datum provided by Stantec Geomatics Limited.

FILE NO. **PH2095**

REMARKS

HOLE NO. TH 4

BORINGS BY Hand Auger

DATE October 5, 2013

[illegible]

SOIL PROFILE AND TEST DATA

**Hydrogeological Study
Proposed Residential Development - Old Prescott Road
Ottawa, Ontario**

DATUM Datum provided by Stantec Geomatics Limited.

FILE NO. **PH2095**

REMARKS

HOLE NO. TH 5

BORINGS BY Hand Auger

DATE October 5, 2013

[illegible]

SOIL PROFILE AND TEST DATA

**Hydrogeological Study
Proposed Residential Development - Old Prescott Road
Ottawa, Ontario**

DATUM Datum provided by Stantec Geomatics Limited.

FILE NO. **PH2095**

REMARKS

HOLE NO. TH 6

BORINGS BY Hand Auger

DATE October 5, 2013

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction	
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %					
								20	40	60	80		
GROUND SURFACE						0	101.35						
TOPSOIL													
0.25													
Brown SAND													
0.80													
Brown to grey coarse SAND						1	100.35						
1.40													
End of Test hole (GWL @ 1.2m depth)													

20406080100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

SOIL PROFILE AND TEST DATA

**Hydrogeological Study
Proposed Residential Development - Old Prescott Road
Ottawa, Ontario**

DATUM Datum provided by Stantec Geomatics Limited.

FILE NO. **PH2095**

REMARKS

HOLE NO. TH 7

BORINGS BY Hand Auger

DATE October 5, 2013

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE						0	101.55					
TOPSOIL												
0.30												
Brown SAND												
0.80												
Brown to grey coarse SAND						1	100.55					
1.30												
End of Test Hole (GWL @ 1.1m depth)												

20406080100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

SOIL PROFILE AND TEST DATA

**Hydrogeological Study
Proposed Residential Development - Old Prescott Road
Ottawa, Ontario**

DATUM Datum provided by Stantec Geomatics Limited.

FILE NO. **PH2095**

REMARKS

HOLE NO. **TH 8**

BORINGS BY Hand Auger

DATE October 5, 2013

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE						0	100.85					
TOPSOIL												
0.30												
Brown SAND												
0.75												
Brown to grey coarse SAND						1	99.85					
1.35												
End of Test Hole (GWL @ 1.25m depth)												

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

▽

SOIL PROFILE AND TEST DATA

**Hydrogeological Study
Proposed Residential Development - Old Prescott Road
Ottawa, Ontario**

DATUM Datum provided by Stantec Geomatics Limited.

FILE NO. **PH2095**

REMARKS

HOLE NO. TH 9

BORINGS BY Hand Auger

DATE October 5, 2013

[illegible]

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 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, %
LL	-	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)
D _{xx}	-	Grain size at 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
D ₁₀	-	Grain size at which 10% of the soil is finer (effective grain size)
D ₆₀	-	Grain size at which 60% of the soil is finer
C _c	-	Concavity coefficient = $(D_{30})^2 / (D_{10} \times D_{60})$
C _u	-	Uniformity coefficient = D_{60} / D_{10}

C_c and C_u are used to assess the grading of sands and gravels:

Well-graded gravels have: $1 < C_c < 3$ and $C_u > 4$

Well-graded sands have: $1 < C_c < 3$ and $C_u > 6$

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

C_c and C_u 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' _o	-	Present effective overburden pressure at sample depth
p' _c	-	Preconsolidation pressure of (maximum past pressure on) sample
C _{cr}	-	Recompression index (in effect at pressures below p' _c)
C _c	-	Compression index (in effect at pressures above p' _c)

OC Ratio Overconsolidation ratio = p'_c / p'_o

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

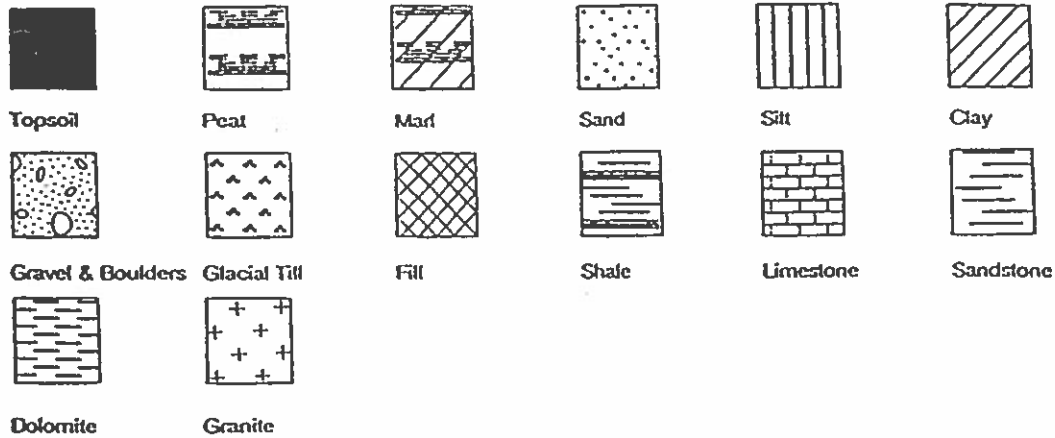
W_o Initial water content (at start of consolidation test)

PERMEABILITY TEST

k	-	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.
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SYMBOLS AND TERMS (continued)

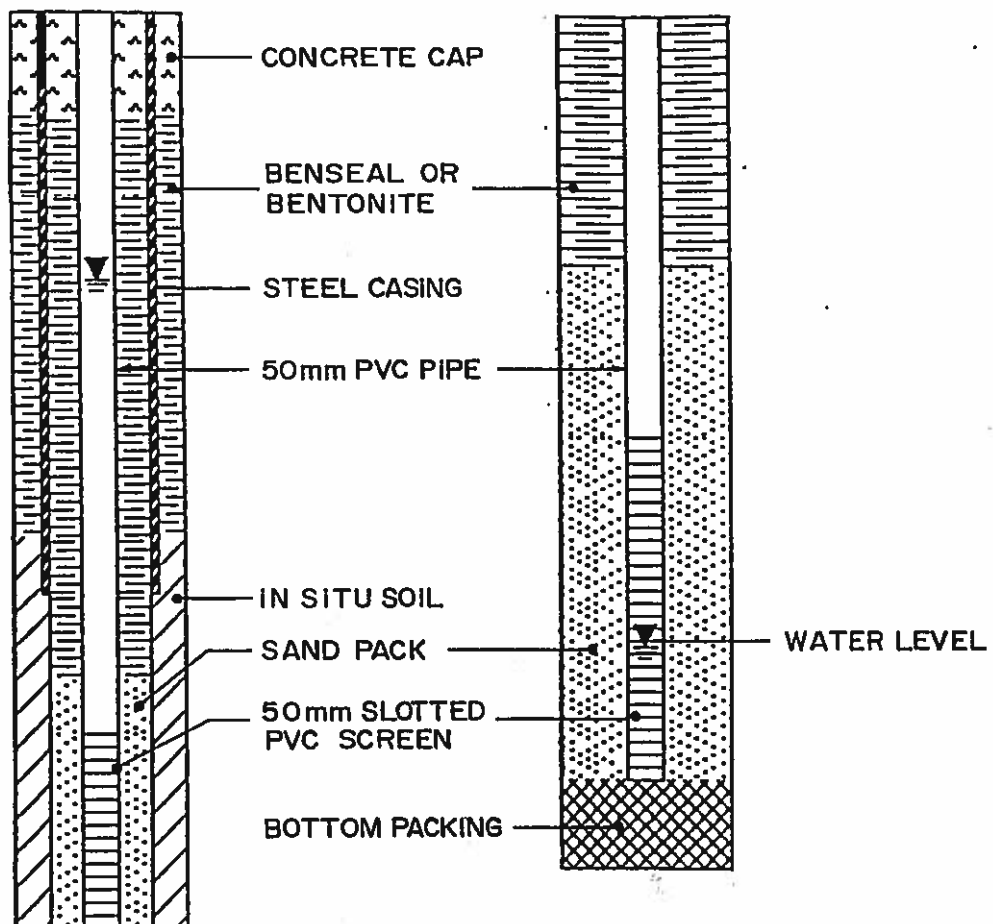
STRATA PLOT



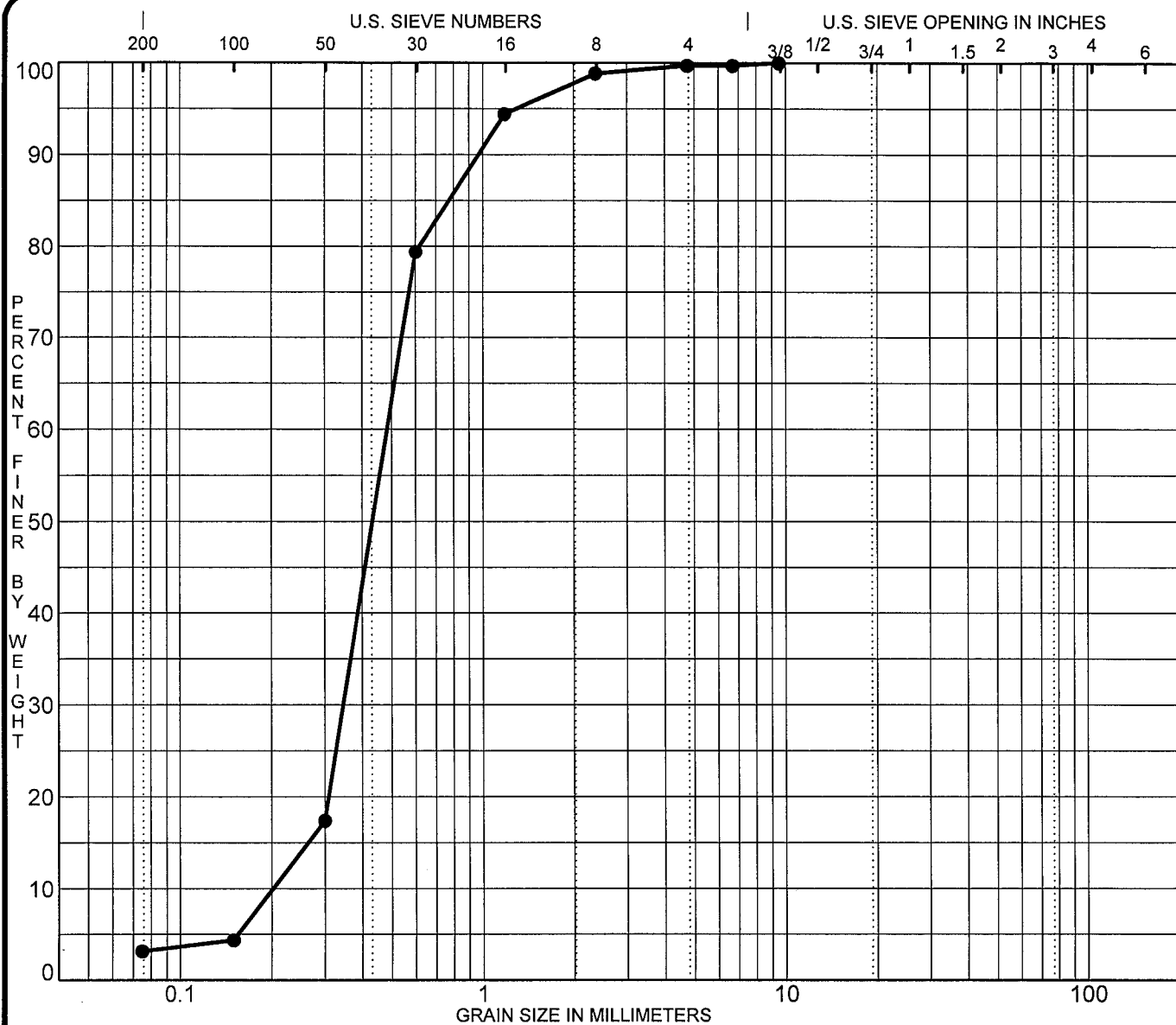
MONITORING WELL AND PIEZOMETER CONSTRUCTION

Monitoring Well Construction

Piezometer Construction



Grain Size Analysis Curve and Data Sheets for CH Soil
Stratigraphic Unit



SILT	SAND			GRAVEL		COBBLES
	fine	medium	coarse	fine	coarse	

Specimen Identification			Classification				MC%	LL	PL	PI	Cc	Cu
●	TP 1	G 1									1.22	2.4
☒												
▲												
★			Based on ASTM D 2487									
Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay		
●	TP 1	G 1	9.50	0.48	0.345	0.2027	0.3	96.6	3.1			
☒												
▲												
★												

CLIENT 1384341 Ontario LTD.

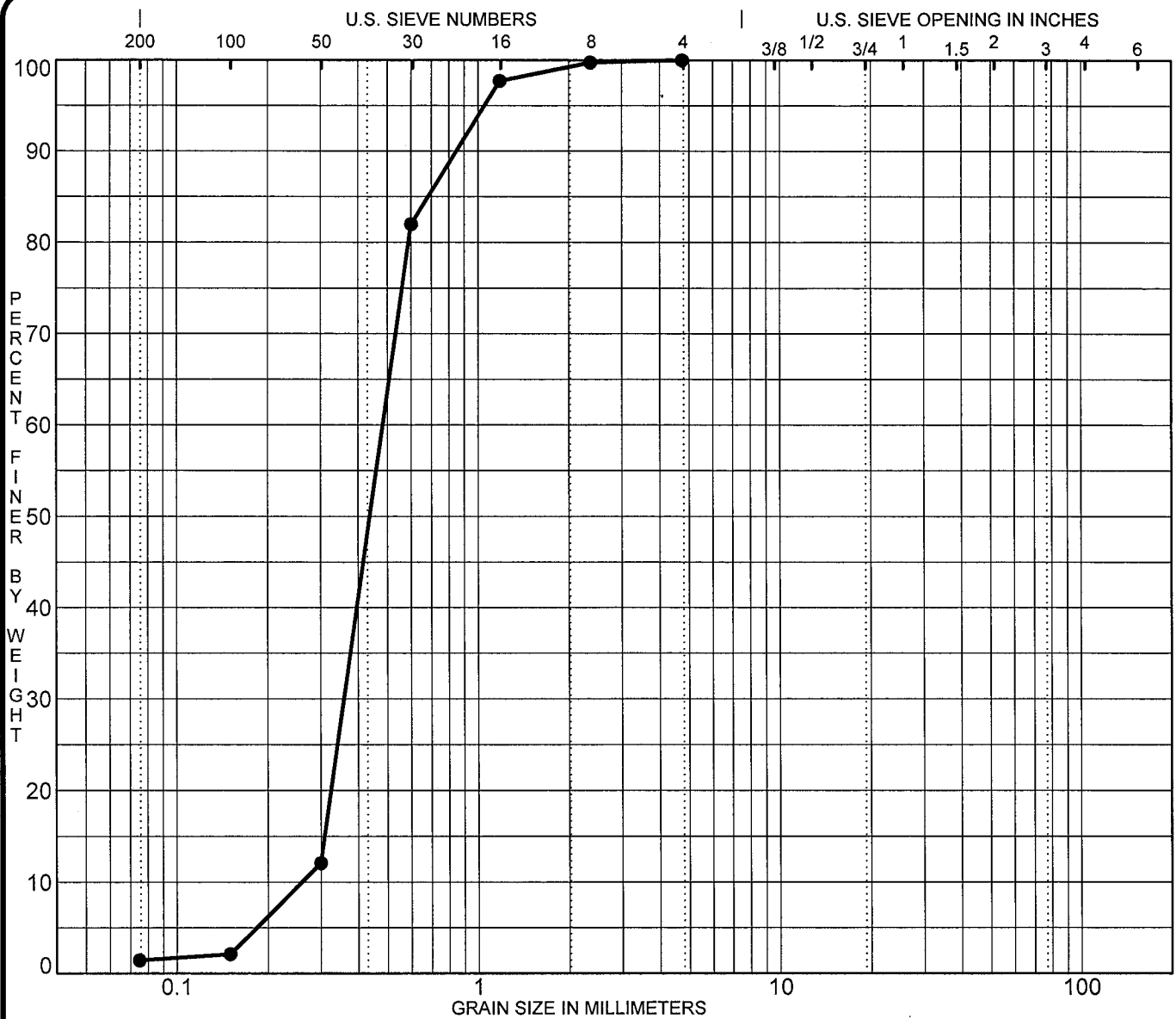
PROJECT Hydrogeological Study - Proposed Residential
Development - Old Prescott Road

FILE NO. PH2095

DATE 7 Oct 13

patersongroup Consulting Engineers
 154 Colonnade Road South, Ottawa, Ontario K2E 7J5

**GRAIN SIZE
DISTRIBUTION**



SILT	SAND			GRAVEL		COBBLES
	fine	medium	coarse	fine	coarse	

Specimen Identification		Classification				MC%	LL	PL	PI	Cc	Cu
●	TP 1	G 2								1.02	1.9
☒											
▲											
★			Based on ASTM D 2487								
Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt		%Clay	
●	TP 1	G 2	4.75	0.48	0.358	0.2599	0.0	98.6	1.4		
☒											
▲											
★											

CLIENT 1384341 Ontario LTD.

FILE NO. PH2095

PROJECT Hydrogeological Study - Proposed Residential
Development - Old Prescott Road

DATE 7 Oct 13

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

**GRAIN SIZE
DISTRIBUTION**

APPENDIX 2

- ☐ **PUBLISHED MOE WATER WELL RECORDS FOR TEST WELLS**

Air Rock Drilling

From: Air Rock Drilling <air-rock@sympatico.ca>
Sent: June-06-13 3:21 PM
To: 'rpassmore@patersongroup.ca'; 'Brandon Aubin (baubin@patersongroup.ca)'
Subject: AIR ROCK - Test Well # 1 - 1240 Old Prescott
Attachments: CCE06062013_00000.pdf

Good Afternoon

Please find enclosed MOE WWR & Compliance for

1384341 Ontario Limited

1240 Old Prescott Road – TEST WELL # 1

Have a good day !

Debbie



CERTIFICATE OF WELL COMPLIANCE

I, Ken Desaulniers DO HEREBY CERTIFY that I am licensed to drill wells in the Province of Ontario, and that I have supervised the drilling of a well on the

property of # 1384341 Ontario limited

located at # 1240 OLD PRESCOTT ROAD

(Lot/Plan No.) in the City of Ottawa (Geographical Township of Osgoode).

Part LOT 4 CONC 4S PLAN# X S/L # TEST WELL # 1

CERTIFY FURTHER that, I am aware of the well drilling requirements, the guidelines, recommendations and regulations of the Ministry of the Environment governing well installations in the Province of Ontario, and the standards specified in any subdivision agreement and hydrogeological report applicable to this site and City Standards.

AND DO HEREBY CERTIFY THAT the said well has been drilled, cased, grouted (cement or bentonite) as applicable and constructed in strict conformity with the standards required.

Signed this 27TH day of MAY 2013
Kenny Desaulniers Air Rock Drilling Co. Ltd.
Well Driller/Company

The Engineer on behalf of the landowner set out above Certifies that he/she has inspected the well and it was constructed in accordance with the specifications in O.Reg.903, this report and the Hydrogeological Report with regards to casing length and grouting requirements.

SIGNED this _____ day of _____

Engineer

Test Well # 1
2013 189
A 128 140





Ministry of
the Environment

Well

Tag#: A128140

(nt Below)

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Measurements recorded in: ☐ Metric ☒ Imperial

Well Owner's Information

First Name _____ Last Name / Organization **1384341 Ontario Limited (c/o Cavanagh Const)** E-mail Address _____
Mailing Address (Street Number/Name) **9094 Cavanagh Road** Municipality **Ashton** Province **On** Postal Code **K0A 1B0** Telephone No. (inc. area code) _____

Well Location

Address of Well Location (Street Number/Name) **1240 Old Prescott Road** Township **Osgoode** Lot **P/L 4** Concession **4S**
County/District/Municipality **Ottawa-Carleton** City/Town/Village **Greely** Province **Ontario** Postal Code _____
UTM Coordinates Zone **18** Easting **455133** Northing **5012245** Municipal Plan and Sublot Number _____

Overburden and Bedrock Materials/Abandonment Sealing Record (see instructions on the back of this form)

General Colour	Most Common Material	Other Materials	General Description	Depth (m)
	Sand			0' 11'
Grey	Sand	Silt		11' 34'
	Sand - Course	+6 sand & Boulders		34' 60'
Grey & Brown	Limestone			60' 125'
White	Sandstone			125' 136'
Grey	Limestone			136' 161'
Grey & White	Sandstone	Limestone	Mix	161' 292'
Grey & White	Sandstone	Limestone	Mix	292' 300'

Annular Space			Volume Placed (m ³)
Depth Set at (m)	Type of Sealant Used (Material and Type)		
70' 60'	Neat cement		10.9
60' 0'	Bentonite slurry		25.2

Method of Construction		Well Use	
<input type="checkbox"/> Cable Tool <input type="checkbox"/> Rotary (Conventional) <input type="checkbox"/> Rotary (Reverse) <input type="checkbox"/> Boring <input checked="" type="checkbox"/> Air percussion <input type="checkbox"/> Other, specify _____	<input type="checkbox"/> Diamond <input type="checkbox"/> Jetting <input type="checkbox"/> Driving <input type="checkbox"/> Digging	<input type="checkbox"/> Public <input checked="" type="checkbox"/> Domestic <input type="checkbox"/> Livestock <input type="checkbox"/> Irrigation <input type="checkbox"/> Industrial <input type="checkbox"/> Other, specify _____	<input type="checkbox"/> Commercial <input type="checkbox"/> Municipal <input type="checkbox"/> Test Hole <input type="checkbox"/> Cooling & Air Conditioning <input type="checkbox"/> Not used <input type="checkbox"/> Dewatering <input type="checkbox"/> Monitoring

Construction Record - Casing			Status of Well	
Inside Diameter (cm)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft)	
6 1/4"	Steel	.188"	+2' 70'	<input checked="" type="checkbox"/> Water Supply <input type="checkbox"/> Replacement Well <input type="checkbox"/> Test Hole <input type="checkbox"/> Recharge Well <input type="checkbox"/> Dewatering Well <input type="checkbox"/> Observation and/or Monitoring Hole <input type="checkbox"/> Alteration (Construction) <input type="checkbox"/> Abandoned, Insufficient Supply <input type="checkbox"/> Abandoned, Poor Water Quality <input type="checkbox"/> Abandoned, other, specify _____ <input type="checkbox"/> Other, specify _____
6 1/8"	Open Hole		70' 300'	

Construction Record - Screen			Status of Well	
Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft)	
			From To	

Water Details		Hole Diameter	
Water found at Depth 282' (m) <input type="checkbox"/> Gas <input checked="" type="checkbox"/> Other, specify _____	Kind of Water: <input type="checkbox"/> Fresh <input checked="" type="checkbox"/> Untested	Depth (m/ft)	Diameter (cm/in)
Water found at Depth _____ (m/ft) <input type="checkbox"/> Gas <input type="checkbox"/> Other, specify _____	Kind of Water: <input type="checkbox"/> Fresh <input type="checkbox"/> Untested	0' 70' 93 1/4"	
Water found at Depth _____ (m/ft) <input type="checkbox"/> Gas <input type="checkbox"/> Other, specify _____	Kind of Water: <input type="checkbox"/> Fresh <input type="checkbox"/> Untested	70' 300' 6 1/8"	

Well Contractor and Well Technician Information
Business Name of Well Contractor **Air Rock Drilling Co. Ltd.** Well Contractor's Licence No. **1119**
Business Address (Street Number/Name) **8659 Franktown Road, RR#1** Municipality **Richmond**

Province **ON** Postal Code **K0A 2Z0** Business E-mail Address **air-rock@sympatico.ca**
Bus. Telephone No. (inc. area code) **8138382170** Name of Well Technician (Last Name, First Name) **Graham, Ryan**
Well Technician's Licence No. **T3484** Signature of Technician and/or Contractor *[Signature]* Date Submitted **2013 05 31**

Results of Well Yield Testing				
Well water was: and free Not tested nued, give reason:	Draw Down		Recovery	
	Time (min)	Water Level (m/ft)	Time (min)	Water Level (m/ft)
it (m/ft) in (GPM) ing min nd of pumping (m/ft)	Static Level	34.2'		85.4"
	1	42.2'	1	74.5'
	2	44.8'	2	63.4'
	3	47.2'	3	55.4'
	4	49.3'	4	50.4'
e (l/min / GPM)	5	53.6'	5	47.5'
	10	57.4'	10	38.6'
	15	66.4'	15	34.2'
	20	74.8'	20	34.2'
	25	74.8'	25	34.2'
ump depth (m/ft) 10 gpm ump rate	30	78.7'	30	34.2'
	40	80.2'	40	34.2'
	50	82.3'	50	34.2'
	60	85.4'	60	34.2'

Map of Well Location
Please provide a map below following instructions on the back.
[Hand-drawn map showing well location relative to 1240 Old Prescott Road and McKown Drive]

Comments: **TEST WELL #1**
Well owner's Information package delivered ☒ Yes ☐ No
Date Package Delivered **2013 05 29**
Date Work Completed **2013 05 27**
Ministry Use Only
Audit No. **Z 155095**
Received _____

Air Rock Drilling

From: Air Rock Drilling <air-rock@sympatico.ca>
Sent: June-06-13 4:14 PM
To: 'rpassmore@patersongroup.ca'; 'Brandon Aubin (baubin@patersongroup.ca)'
Subject: AIR ROCK - Test Well # 2 - 1240 Old Prescott
Attachments: CCE06062013_00000.pdf

Good Afternoon

Please find enclosed MOE WWR & Compliance for

1384341 Ontario Limited

1240 Old Prescott Road – TEST WELL # 2

Have a good day !

Debbie



CERTIFICATE OF WELL COMPLIANCE

I, Ken Desaulniers DO HEREBY CERTIFY that I am licensed to drill wells in the Province of Ontario, and that I have supervised the drilling of a well on the

property of # 1384341 Ontario limited

located at # 1240 OLD PRESCOTT ROAD

(Lot/Plan No.) in the City of Ottawa (Geographical Township of Osgoode).

Part LOT 4 CONC 4S PLAN# X S/L # TEST WELL #2

CERTIFY FURTHER that, I am aware of the well drilling requirements, the guidelines, recommendations and regulations of the Ministry of the Environment governing well installations in the Province of Ontario, and the standards specified in any subdivision agreement and hydrogeological report applicable to this site and City Standards.

AND DO HEREBY CERTIFY THAT the said well has been drilled, cased, grouted (cement or bentonite) as applicable and constructed in strict conformity with the standards required.

Signed this 30TH day of MAY 2013

Kenny Desaulniers Air Rock Drilling Co. Ltd.
Well Driller/Company

The Engineer on behalf of the landowner set out above Certifies that he/she has inspected the well and it was constructed in accordance with the specifications in O.Reg.903, this report and the Hydrogeological Report with regards to casing length and grouting requirements.

SIGNED this _____ day of _____

Engineer

Test Well #2
2013197
A128132



Ministry of
the Environment

Tag#: A128132

Print Below)

Well Record

Regulation 903 Ontario Water Resources Act

Measurements recorded in: ☐ Metric ☒ Imperial

Page _____ of _____

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	<input type="checkbox"/> Well Constructed by Well Owner
	1384341 Ontario Limited (c/o Cavanagh Const)		
Mailing Address (Street Number/Name)	Municipality	Province	Postal Code
9094 Cavanagh Road	Ashton	On	K0A 1B0

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
1240 Old Prescott Road	Osgoode	P/L 4	4S
County/District/Municipality	City/Town/Village	Province	Postal Code
Ottawa-Carleton	Greely	Ontario	
UTM Coordinates	Zone	Easting	Northing
NAD 83	18	454826	5012227
Municipal Plan and Sublot Number	Other	TEST WELL #2	

Overburden and Bedrock Materials/Abandonment Sealing Record (see instructions on the back of this form)

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft)
				From To
	Sand			0' 14'
Grey	Sandy Silt			14' 38'
	Sand & Gravel	Boulders		38' 47'
Grey	Limestone			47' 132'
Grey & White	Limestone	Sandstone Mix		132' 158'
Grey & White	Limestone	Sandstone Mix		158' 189'
Grey & White	Limestone	Sandstone Mix		189' 200'

Annular Space			Results of Well Yield Testing			
Depth Set at (m/ft) From To	Type of Sealant Used (Material and Type)	Volume Placed (m ³ /ft ³)	After test of well yield, water was: <input type="checkbox"/> Clear and sand free <input type="checkbox"/> Other, specify	Draw Down Time (min) Water Level (m/ft)	Recovery Time (min) Water Level (m/ft)	
58 48	Neat cement	10.9	<input checked="" type="checkbox"/> Not tested	Static Level	34.3'	98.7'
48 0	Bentonite slurry	25.2		1 42.8'	1 79'	
			Pump intake set at (m/ft) 190'	2 48'	2 74.7'	
				3 52.3'	3 65.4'	
				4 55.9'	4 59.8'	
				5 58.2'	5 55.1'	
				6 59.2'	6 55.1'	
				7 59.2'	7 55.1'	
				8 59.2'	8 55.1'	
				9 59.2'	9 55.1'	
				10 71.1'	10 40.1'	
				11 77.2'	11 36'	
				12 77.2'	12 36'	
				13 77.2'	13 36'	
				14 77.2'	14 36'	
				15 77.2'	15 36'	
				16 77.2'	16 36'	
				17 77.2'	17 36'	
				18 77.2'	18 36'	
				19 77.2'	19 36'	
				20 83.2'	20 34.3'	
				21 83.2'	21 34.3'	
				22 83.2'	22 34.3'	
				23 83.2'	23 34.3'	
				24 83.2'	24 34.3'	
				25 86'	25 34.3'	
				26 86'	26 34.3'	
				27 86'	27 34.3'	
				28 86'	28 34.3'	
				29 86'	29 34.3'	
				30 88.8'	30 34.3'	
				31 88.8'	31 34.3'	
				32 88.8'	32 34.3'	
				33 88.8'	33 34.3'	
				34 88.8'	34 34.3'	
				35 88.8'	35 34.3'	
				36 88.8'	36 34.3'	
				37 88.8'	37 34.3'	
				38 88.8'	38 34.3'	
				39 88.8'	39 34.3'	
				40 92'	40 34.3'	
				41 92'	41 34.3'	
				42 92'	42 34.3'	
				43 92'	43 34.3'	
				44 92'	44 34.3'	
				45 92'	45 34.3'	
				46 92'	46 34.3'	
				47 92'	47 34.3'	
				48 92'	48 34.3'	
				49 92'	49 34.3'	
				50 95.5'	50 34.3'	
				51 95.5'	51 34.3'	
				52 95.5'	52 34.3'	
				53 95.5'	53 34.3'	
				54 95.5'	54 34.3'	
				55 95.5'	55 34.3'	
				56 95.5'	56 34.3'	
				57 95.5'	57 34.3'	
				58 95.5'	58 34.3'	
				59 95.5'	59 34.3'	
				60 95.5'	60 34.3'	

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

Construction Record - Casing			Status of Well	
Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft)	
From To			From To	
6 1/4"	Steel	188"	+2'	58'
6 1/8"	Open Hole		58'	200'

Construction Record - Screen			Status of Well	
Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft)	
From To			From To	

Water Details		Hole Diameter	
Water found at Depth (m/ft)	Kind of Water: <input type="checkbox"/> Fresh <input checked="" type="checkbox"/> Untested	Depth (m/ft)	Diameter (cm/in)
158 (m/ft)	<input type="checkbox"/> Gas <input type="checkbox"/> Other, specify	From To	
189 (m/ft)	<input type="checkbox"/> Gas <input type="checkbox"/> Other, specify	0' 58'	9 3/4"
	<input type="checkbox"/> Gas <input type="checkbox"/> Other, specify	58' 200'	6 1/8"

Well Contractor and Well Technician Information	
Business Name of Well Contractor	Well Contractor's Licence No.
Air Rock Drilling Co. Ltd.	1119
Business Address (Street Number/Name)	Municipality
6659 Franktown Road, RR#1	Richmond

Province	Postal Code	Business E-mail Address
ON	K0A 2Z0	air-rock@sympatico.ca
Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)	
6138382170	Graham, Ryan	
Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
T3484	<i>[Signature]</i>	2013 08 28

Map of Well Location			
Please provide a map below following instructions on the back.			
Comments:			
3/4 HP - 10 GPM SET AT 190 FT TEST WELL #2			
Well owner's information package delivered	Date Package Delivered	Ministry Use Only	
<input checked="" type="checkbox"/> Yes	2013 06 04	Audit No.	z155104
<input type="checkbox"/> No	Date Work Completed	Received	
	2013 05 30		

Air Rock Drilling

From: Air Rock Drilling <air-rock@sympatico.ca>
Sent: September-05-13 3:31 PM
To: Rob Passmore (rpassmore@patersongroup.ca); 'Brandon Aubin (baubin@patersongroup.ca)'
Subject: AIR ROCK - TEST WELL 3 - 1240 Old Prescott
Attachments: CCE05092013_00000.pdf

Good Afternoon ~

Copy of TEST WELL # 3 – 1240 Old Prescott Road

Well Compliance & MOE WWR for

1384341 Ontario Limited (Tag A144873)

Have a gOod afternoon

Debbie



CERTIFICATE OF WELL COMPLIANCE

I, Ken Desaulniers DO HEREBY CERTIFY that I am licensed to drill wells in the Province of Ontario, and that I have supervised the drilling of a well on the property of 1384341 Ontario Limited (Cloverleaf Construction) located at #1240 OLD PRESCOTT ROAD

Lot/Plan No.) in the City of Ottawa (Geographical Township of Osgoode).

LOT 4 CONC 4S PLAN# Test well #3

CERTIFY FURTHER that, I am aware of the well drilling requirements, the guidelines, recommendations and regulations of the Ministry of the Environment governing well installations in the Province of Ontario, and the standards specified in any subdivision agreement and hydrogeological report applicable to this site and City Standards.

AND DO HEREBY CERTIFY THAT the said well has been drilled, cased, grouted (cement or bentonite) as applicable and constructed in strict conformity with the standards required.

Signed this 14TH day of AUGUST 2013
Kenny [Signature] Air Rock Drilling Co. Ltd.
Well Driller/Company

The Engineer on behalf of the landowner set out above Certifies that he/she has inspected the well and it was constructed in accordance with the specifications in O.Reg.903, this report and the Hydrogeological Report with regards to casing length and grouting requirements.

SIGNED this _____ day of _____

Engineer

#2013393
TAB A144873
TESTWELL#3





Ministry of
the Environment

Tag#: A144873

A144873

Regulation 903 Ontario Water Resources Act

Page of

Measurements recorded in: ☐ Metric ☒ Imperial

Well Owner's Information

First Name Last Name / Organization E-mail Address
1384341 Ontario Limited (c/o Cavanagh Const)
Mailing Address (Street Number/Name) Municipality Province Postal Code Telephone No. (inc. area code)
9094 Cavanagh Road Ashton On K0A 1B0

Well Location

Address of Well Location (Street Number/Name) Township Lot P/L 4 Concession
1240 Old Prescott Road Osgoode 4S
County/District/Municipality City/Town/Village Province Postal Code
Ottawa-Carleton Greely Ontario
UTM Coordinates Zone Easting Northing Municipal Plan and Sublot Number Other
NAD 83 18 454433 5012012 TEST WELL #3

Overburden and Bedrock Materials/Abandonment Sealing Record (see instructions on the back of this form)

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft)
Brown	Sand			0' 44'
	Sand & Gravel	Boulders		44' 48'
Grey	Limestone			48' 127'
Grey	Limestone			127' 170'
Grey	Limestone	Sandstone Mix		170' 236'
Grey	Limestone	Sandstone Mix		236' 250'

Depth Set at (m/ft)	Type of Sealant Used (Material and Type)	Volume Placed (m ³ /ft ³)
58' 48'	Neat cement	12.5
48' 0'	Bentonite slurry	37.8

Method of Construction	Well Use
<input type="checkbox"/> Cable Tool <input type="checkbox"/> Rotary (Conventional) <input type="checkbox"/> Rotary (Reverse) <input type="checkbox"/> Boring <input checked="" type="checkbox"/> Air percussion <input type="checkbox"/> Other, specify	<input type="checkbox"/> Public <input checked="" type="checkbox"/> Domestic <input type="checkbox"/> Livestock <input type="checkbox"/> Irrigation <input type="checkbox"/> Industrial <input type="checkbox"/> Other, specify <input type="checkbox"/> Commercial <input type="checkbox"/> Municipal <input type="checkbox"/> Test Hole <input type="checkbox"/> Cooling & Air Conditioning <input type="checkbox"/> Not used <input type="checkbox"/> Dewatering <input type="checkbox"/> Monitoring

Construction Record - Casing	Status of Well
Inside Diameter (cm/in) 6 1/4" Steel 6 1/8" Open hole	Depth (m/ft) From To +2' 58' 58' 250'
Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel) Wall Thickness (cm/in) .188"	<input checked="" type="checkbox"/> Water Supply <input type="checkbox"/> Replacement Well <input type="checkbox"/> Test Hole <input type="checkbox"/> Recharge Well <input type="checkbox"/> Dewatering Well <input type="checkbox"/> Observation and/or Monitoring Hole <input type="checkbox"/> Alteration (Construction) <input type="checkbox"/> Abandoned, Insufficient Supply <input type="checkbox"/> Abandoned, Poor Water Quality <input type="checkbox"/> Abandoned, other, specify <input type="checkbox"/> Other, specify

Construction Record - Screen	Status of Well
Outside Diameter (cm/in) Material (Plastic, Galvanized, Steel) Slot No. Depth (m/ft) From To	<input type="checkbox"/> Other, specify

Water Details	Hole Diameter
Water found at Depth (m/ft) 170' Gas 236' Gas Water found at Depth (m/ft) Kind of Water: <input type="checkbox"/> Fresh <input checked="" type="checkbox"/> Untested 58' Gas 250' Gas Water found at Depth (m/ft) Kind of Water: <input type="checkbox"/> Fresh <input checked="" type="checkbox"/> Untested	Depth (m/ft) From To 0' 58' 58' 250'
	Diameter (cm/in) 9 3/4" 6 1/8"

Business Name of Well Contractor
Air Rock Drilling Co. Ltd.
Business Address (Street Number/Name)
6030 Banktown Road, RR#1
Municipality
Richmond

Province ON Postal Code K0A 2Z0 Business E-mail Address air-rock@sympatico.ca
Bus. Telephone No. (inc. area code) Name of Well Technician (Last Name, First Name)
81382170 Grant, Andrew
Well Technician's Licence No. Signature of Technician and/or Contractor Date Spent 08 30
13438

Results of Well Yield Testing			
After test of well yield, water was:	Draw Down	Recovery	
<input type="checkbox"/> Clear and sand free <input type="checkbox"/> Other, specify Not tested	Time (min)	Water Level (m/ft)	Time (min)
If pumping discontinued, give reason:	Static Level	15.6'	57.7'
Pump intake set at (m/ft) 240'	1	22.6'	1 49.6'
Pumping rate (l/min / GPM) 14	2	27.5'	2 41.8'
Duration of pumping 1 hrs + 0 min	3	31.4'	3 37.5'
Final water level end of pumping (m/ft) 57.7'	4	34.2'	4 34.2'
If flowing give rate (l/min / GPM)	5	35.6'	5 31.8'
Recommended pump depth (m/ft) 150'	10	40.5'	10 24.5'
Recommended pump rate (l/min / GPM) 14	15	45.4'	15 18.2'
Well production (l/min / GPM) 14	20	47.3'	20 15.6'
Disinfected? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	25	48.7'	25 15.6'
	30	50.1'	30 15.6'
	40	52.7'	40 15.6'
	50	55.3'	50 15.6'
	60	57.7'	60 15.6'

Map of Well Location

Please provide a map below following instructions on the back.

West Beach Blvd
#1240 OLD PRESCOTT RD
2KM
MCKEOWN DR
105'

Comments:
1 HP - 10 gpm @ 150'

Well owner's information	Date Package Delivered	Ministry Use Only
Y Y Y Y M M D D 2013 08 19	Y Y Y Y M M D D 2013 08 14	Audit No. 2155193
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Date Work Completed Y Y Y Y M M D D 2013 08 14	Received

Air Rock Drilling

From: Air Rock Drilling <air-rock@sympatico.ca>
Sent: September-06-13 12:39 AM
To: Rob Passmore (rpassmore@patersongroup.ca)
Cc: 'baubin@patersongroup.ca'
Subject: AIR ROCK - test well # 4
Attachments: CCE06092013_00000.pdf

Good Evening

Please find enclosed copy of MOE WWR & Compliance

1384341 Ontario Ltd (Cavanagh Construction)

1240 OLD PRESCOTT ROAD – TEST WELL # 4

Thanks

Debbie



CERTIFICATE OF WELL COMPLIANCE

I, Ken Desaulniers DO HEREBY CERTIFY that I am licensed to drill

wells in the Province of Ontario, and that I have supervised the drilling of a well on the

property of 1384341 ONTARIO LIMITED (c/o Cavanagh Construction)

located at #1240 OLD PRESCOTT ROAD

(Lot/Plan No.) in the City of Ottawa (Geographical Township of Osgoode).

PART LOT 4 CONCAS PLAN# TEST WELL S/L # 4

CERTIFY FURTHER that, I am aware of the well drilling requirements, the guidelines, recommendations and regulations of the Ministry of the Environment governing well installations in the Province of Ontario, and the standards specified in any subdivision agreement and hydrogeological report applicable to this site and City Standards.

AND DO HEREBY CERTIFY THAT the said well has been drilled, cased, grouted (cement or bentonite) as applicable and constructed in strict conformity with the standards required.

Signed this 22ND day of AUGUST 2013

Kenny [Signature] Air Rock Drilling Co. Ltd.
Well Driller/Company

The Engineer on behalf of the landowner set out above Certifies that he/she has inspected the well and it was constructed in accordance with the specifications in O.Reg.903, this report and the Hydrogeological Report with regards to casing length and grouting requirements.

SIGNED this _____ day of _____

Engineer



Measurements recorded in: ☐ Metric ☒ Imperial

Page ____ of ____

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	<input type="checkbox"/> Well Constructed by Well Owner
	1384341 Ontario Limited (c/o Cavanagh Const)		
Mailing Address (Street Number/Name)	Municipality	Province	Postal Code
9094 Cavanagh Road	Ashton	On	K0A 1B0

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
1240 Old Prescott Road	Osgoode	P/L 4	4S
County/District/Municipality	City/Town/Village	Province	Postal Code
Ottawa-Carleton	Greely	Ontario	
UTM Coordinates Zone Easting Northing	Municipal Plan and Sublot Number	Other	
NAD 83 18 454896 5012107			

TEST WELL # 4

Overburden and Bedrock Materials/Abandonment Sealing Record (see instructions on the back of this form)

General Colour	Most Common Material	Other Materials	General Description	Depth (m)
	Sand			0' 20'
	Sand & Gravel	Boulders		20' 48'
Grey	Limestone			48' 89'
Grey	Limestone			89' 139'
Grey & White	Sandstone			139' 147'
Grey & White	Sandstone			147' 170'
Grey & White	Sandstone			170' 180'

TEST WELL # 4

Annular Space			
Depth Set at (m)	Type of Sealant Used (Material and Type)	Volume Placed (m ³)	
From To			
58' 48'	Neat cement	12.5	
48' 0'	Bentonite slurry	29.4	

Method of Construction		Well Use	
<input type="checkbox"/> Cable Tool	<input type="checkbox"/> Diamond	<input type="checkbox"/> Public	<input type="checkbox"/> Commercial
<input type="checkbox"/> Rotary (Conventional)	<input type="checkbox"/> Jetting	<input checked="" type="checkbox"/> Domestic	<input type="checkbox"/> Municipal
<input type="checkbox"/> Rotary (Reverse)	<input type="checkbox"/> Driving	<input type="checkbox"/> Livestock	<input type="checkbox"/> Dewatering
<input type="checkbox"/> Boring	<input type="checkbox"/> Digging	<input type="checkbox"/> Irrigation	<input type="checkbox"/> Cooling & Air Conditioning
<input checked="" type="checkbox"/> Air percussion		<input type="checkbox"/> Industrial	
<input type="checkbox"/> Other, specify		<input type="checkbox"/> Other, specify	

Construction Record - Casing			Status of Well	
Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft)	
			From To	
6 1/4"	Steel	.188"	+2' 58'	
6 1/8"	Open Hole		58' 180'	

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

Water Details		Hole Diameter	
Water found at Depth	Kind of Water: <input type="checkbox"/> Fresh <input checked="" type="checkbox"/> Untested	Depth (m/ft)	Diameter (cm/in)
89 (m/ft) <input type="checkbox"/> Gas <input type="checkbox"/> Other, specify		From To	
Water found at Depth	Kind of Water: <input type="checkbox"/> Fresh <input checked="" type="checkbox"/> Untested	0' 58' 93 1/4"	
147 (m/ft) <input type="checkbox"/> Gas <input type="checkbox"/> Other, specify		58' 180' 6 1/8"	
Water found at Depth	Kind of Water: <input type="checkbox"/> Fresh <input checked="" type="checkbox"/> Untested		
170 (m/ft) <input type="checkbox"/> Gas <input type="checkbox"/> Other, specify			

Business Name of Well Contractor		Well Contractor's Licence No.
Air Rock Drilling Co. Ltd.		1119
Business Address (Street Number/Name)		Municipality
8659 Franktown Road, RR#1		Richmond

Province	Postal Code	Business E-mail Address
ON	K0A 2Z0	air-rock@sympatico.ca
Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)	
6138382170	Hanna, Jeremy	
Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
T 3632		2013 08 30

Results of Well Yield Testing			
After test of well yield, water was:	Draw Down	Recovery	
<input type="checkbox"/> Clear and sand free	Time (min)	Water Level (m/ft)	Time (min)
<input type="checkbox"/> Other, specify Not tested			Water Level (m/ft)
If pumping discontinued, give reason:	Static Level	12'	14.8'
<input checked="" type="checkbox"/> Pump intake set at (m/ft)	1	12.9	1
170	2	13.2	2
Pumping rate (l/min / GPM)	3	13.3	3
20	4	13.5	4
Duration of pumping	5	13.7	5
1 hrs + 0 min	10	14.4	10
Final water level end of pumping (m/ft)	15	14.6	15
14.8'	20	14.8	20
If flowing give rate (l/min / GPM)	25	14.8	25
<input checked="" type="checkbox"/> Recommended pump depth (m/ft)	30	14.8	30
100' (3/4 HP - 15 GPM)	40	14.8	40
Recommended pump rate (l/min / GPM)	50	14.8	50
20	60	14.8	60
Well production (l/min / GPM)			
20			
Disinfected?			
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			

Map of Well Location

Please provide a map below following instructions on the back.

Comments:	
3/4 HP - 15 GPM SET @ 100 FT	
Well owner's information package delivered	Ministry Use Only
Date Package Delivered	Audit No.
2013 08 26	z 155202
Date Work Completed	Received
2013 08 22	



CERTIFICATE OF WELL COMPLIANCE

I, Ken Desaulniers DO HEREBY CERTIFY that I am licensed to drill

wells in the Province of Ontario, and that I have supervised the drilling of a well on the

property of 1384341 Ontario Limited (clo Gavanagh Construction)

located at # 1240 OLD PRESCOTT ROAD

Lot/Plan No.) in the City of Ottawa (Geographical Township of Osgoode).

Port LOT 4 CONC 4S PLAN# X S/L# X

CERTIFY FURTHER that, I am aware of the well drilling requirements, the guidelines, recommendations and regulations of the Ministry of the Environment governing well installations in the Province of Ontario, and the standards specified in any subdivision agreement and hydrogeological report applicable to this site and City Standards.

AND DO HEREBY CERTIFY THAT the said well has been drilled, cased, grouted (cement or bentonite) as applicable and constructed in strict conformity with the standards required.

Signed this 11TH day of SEPTEMBER 2014

Kenny [Signature] Air Rock Drilling Co. Ltd.
Well Driller/Company

The Engineer on behalf of the landowner set out above Certifies that he/she has inspected the well and it was constructed in accordance with the specifications in O.Reg.903, this report and the Hydrogeological Report with regards to casing length and grouting requirements.

SIGNED this _____ day of _____,

Engineer

Test Well #5
2014419
TAS A144876



2001

Measurements recorded in: ☐ Metric ☒ Imperial

Well Owner's Information

First Name _____ Last Name / Organization **1384341 Ontario Limited (c/o Cavanagh Const)** E-mail Address _____
Mailing Address (Street Number/Name) **9094 Cavanagh Road** Municipality **Ashton** Province **On** Postal Code **K0A 1B0** Telephone No. (inc. area code) _____
Well Location
Address of Well Location (Street Number/Name) **1240 Old Prescott Road** Township **Osgoode** Lot **P/L 4** Concession **4S**
County/District/Municipality **Ottawa-Carleton** City/Town/Village **Greely** Province **Ontario** Postal Code _____
UTM Coordinates: Zone _____ Easting _____ Northing _____ Municipal Plan and Sublot Number _____ Other _____

NAD 83 **18 455162 5012266** **TEST WELL #5**
Overburden and Bedrock Materials/Abandonment Sealing Record (see instructions on the back of this form)

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft)
	Sand			0' 30'
	Gravel	+	Sand	30' 58'
Grey	Limestone			58' 141'
Grey	Limestone	9 Grey Sandstone		141' 158'
Grey	Sandstone			158' 291'
Grey	Sandstone			291' 297'

Test Well #5

Annular Space			Volume Placed (m ³)
Depth Set at (m/ft)	Type of Sealant Used (Material and Type)		
132' 122'	Neat cement		9.36
122' 0'	Bentonite slurry		37.8

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

Construction Record - Casing			Status of Well	
Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft)	
6 1/4"	Steel	.188"	+2'	132'
6"	Open Hole		132'	297'

Construction Record - Screen			Status of Well	
Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft)	
			From	To

Water Details		Hole Diameter	
Water found at Depth (m/ft)	Kind of Water: <input type="checkbox"/> Fresh <input checked="" type="checkbox"/> Untested	Depth (m/ft)	Diameter (cm/in)
291' (m/ft)	<input type="checkbox"/> Gas <input checked="" type="checkbox"/> Other, specify _____	From	To
		0'	132' 9 3/4"
		132'	297' 6"

Well Contractor and Well Technician Information
Business Name of Well Contractor **Air Rock Drilling Co. Ltd.** Well Contractor's Licence No. **1119**
Business Address (Street Number/Name) **8859 Franktown Road, RR#1** Municipality **Richmond**

Province **ON** Postal Code **K0A 2Z0** Business E-mail Address **air-rock@sympatico.ca**
Bus. Telephone No. (inc. area code) **6138382170** Name of Well Technician (Last Name, First Name) **Hanna, Jeremy**
Well Technician's Licence No. **T3632** Signature of Technician and/or Contractor **[Signature]** Date Submitted **2014 09 30**

Results of Well Yield Testing					
After test of well yield, water was:		Draw Down		Recovery	
<input type="checkbox"/> Clear and sand free	Not tested	Time (min)	Water Level (m/ft)	Time (min)	Water Level (m/ft)
<input type="checkbox"/> Other, specify		Static Level	33'-8"		166'
If pumping discontinued, give reason:		1	42.7	1	152.3
<input checked="" type="checkbox"/> Pump intake set at (m/ft)		2	49.5	2	145.3
280		3	55.2	3	139.3
Pumping rate (l/min GPM)		4	60.8	4	133.5
12		5	66.4	5	128.0
Duration of pumping		10	89.3	10	104.7
1 hrs + 0 min		15	107.3	15	85.8
Final water level end of pumping (m/ft)		20	121.8	20	70.9
166'		25	133.3	25	59
If flowing give rate (l/min GPM)		30	143	30	50
<input checked="" type="checkbox"/> Recommended pump depth (m/ft)		40	155.8	40	38
250'		50	162.3	50	33.8
Recommended pump rate (l/min GPM)		60	166'	60	33.8'
12					
Well production (l/min GPM)					
12					
Disinfected?					
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No					

Map of Well Location	
Please provide a map below following instructions on the back.	
Comments: 1 HP - 10 GPM SET @ 250 FT TW#5	
Well owner's information package delivered <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Ministry Use Only Audit No. Z 167024 Received _____

APPENDIX 3

- ☐ **WATER LABORATORY TEST RESULTS**
 - ☐ **Water Samples from Test Wells**
 - ☐ **TKN analysis for Test Holes**

Client: Paterson Group
154 Colonnade Rd. South
Nepean, ON
K2E 7T7
Attention: Mr. Robert Passmore
PO#: 13049
Invoice to: Paterson Group

Report Number: 1323190
Date Submitted: 2013-10-18
Date Reported: 2013-10-21
Project: PH2095
COC #: 172594

Page 1 of 2

Dear Robert Passmore:

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

Report Comments:

APPROVAL: _____

Krista Quantrill
Laboratory Supervisor, Microbiology

Exova (Ottawa) is certified and accredited for specific parameters by:

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

Exova (Mississauga) is accredited for specific parameters by:

SCC, Standards Council of Canada (to ISO 17025)

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

Client: Paterson Group
 154 Colonnade Rd. South
 Nepean, ON
 K2E 7T7
 Attention: Mr. Robert Passmore
 PO#: 13049
 Invoice to: Paterson Group

Report Number: 1323190
 Date Submitted: 2013-10-18
 Date Reported: 2013-10-21
 Project: PH2095
 COC #: 172594

					Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1066427 Water 2013-10-18 TW1-WS131017-3	1066428 Water 2013-10-18 TW1-WS131017-6
Group	Analyte	MRL	Units	Guideline			
Microbiology	Escherichia Coli	0	ct/100mL	MAC-0		0	0
	Faecal Coliforms	0	ct/100mL			0	0
	Heterotrophic Plate Count	0	ct/1mL			4	1
	Total Coliforms	0	ct/100mL	MAC-0		0	0

Guideline = ODWSOG

*** = Guideline Exceedence**

** = Analysis completed at Mississauga, Ontario.

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Methods references and/or additional QA/QC information available on request.

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

Client: Paterson Group
154 Colonnade Rd. South
Nepean, ON
K2E 7T7
Attention: Mr. Robert Passmore
PO#: 13049
Invoice to: Paterson Group

Report Number: 1323196
Date Submitted: 2013-10-18
Date Reported: 2013-10-22
Project: PH2095
COC #: 172594

Page 1 of 5

Dear Robert Passmore:

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

Report Comments:

APPROVAL: _____

Diana Cameron
Team Leader, Inorganics

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Client: Paterson Group
 154 Colonnade Rd. South
 Nepean, ON
 K2E 7T7
 Attention: Mr. Robert Passmore
 PO#: 13049
 Invoice to: Paterson Group

Report Number: 1323196
 Date Submitted: 2013-10-18
 Date Reported: 2013-10-22
 Project: PH2095
 COC #: 172594

					Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1066438 Water 2013-10-18 TW1-WS131017-3	1066439 Water 2013-10-18 TW1-WS131017-6
Group	Analyte	MRL	Units	Guideline			
Calculations	Hardness as CaCO ₃	1	mg/L	OG-100		162*	162*
	Ion Balance	0.01				0.93	0.92
	TDS (COND - CALC)	1	mg/L	AO-500		447	450
General Chemistry	Alkalinity as CaCO ₃	5	mg/L	OG-500		209	210
	Cl	1	mg/L	AO-250		66	65
	Colour	2	TCU	AO-5		<2	2
	Conductivity	5	uS/cm			688	692
	F	0.10	mg/L	MAC-1.5		0.65	0.65
	N-NO ₂	0.10	mg/L	MAC-1.0		<0.10	<0.10
	N-NO ₃	0.10	mg/L	MAC-10.0		<0.10	<0.10
	pH	1.00		6.5-8.5		8.19	8.17
	S ₂ -	0.01	mg/L	AO-0.05		<0.01	<0.01
	SO ₄	3	mg/L	AO-500		51	51
	Turbidity	0.1	NTU	MAC-1.0		0.8	0.5
Metals	Ca	1	mg/L			32	32
	Fe	0.03	mg/L	AO-0.3		0.05	0.06
	K	1	mg/L			7	6
	Mg	1	mg/L			20	20
	Mn	0.01	mg/L	AO-0.05		0.01	0.01
	Na	2	mg/L	AO-200		73	72
Nutrients	N-NH ₃	0.02	mg/L			0.20	0.20
	Phenols	0.001	mg/L			<0.001	<0.001
	Tannin & Lignin	0.1	mg/L			<0.1	<0.1
	Total Kjeldahl Nitrogen	0.10	mg/L			0.24	0.19
Subcontract	DOC	0.5	mg/L	AO-5		0.6	<0.5

Guideline = ODWSOG

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 MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable
 Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO
 = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

Client: Paterson Group
 154 Colonnade Rd. South
 Nepean, ON
 K2E 7T7
 Attention: Mr. Robert Passmore
 PO#: 13049
 Invoice to: Paterson Group

Report Number: 1323196
 Date Submitted: 2013-10-18
 Date Reported: 2013-10-22
 Project: PH2095
 COC #: 172594

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 0 Analysis Date 2013-10-22 Method C SM2340B			
Hardness as CaCO ₃			
Ion Balance			
TDS (COND - CALC)			
Run No 259476 Analysis Date 2013-10-19 Method C SM2130B			
Turbidity	<0.1 NTU	100	73-127
Run No 259480 Analysis Date 2013-10-21 Method C SM2120C			
Colour	<2 TCU	100	90-110
Run No 259481 Analysis Date 2013-10-21 Method C SM4500-Norg-C			
Total Kjeldahl Nitrogen	<0.10 mg/L	101	77-123
Run No 259482 Analysis Date 2013-10-21 Method C SM4500-NH ₃ D			
N-NH ₃	<0.02 mg/L	100	85-115
Run No 259483 Analysis Date 2013-10-21 Method SM 4110C			
Cl	<1 mg/L	101	90-112
SO ₄	<3 mg/L	100	90-110

Guideline = ODWSOG

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 MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable
 Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO
 = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

Client: Paterson Group
154 Colonnade Rd. South
Nepean, ON
K2E 7T7
Attention: Mr. Robert Passmore
PO#: 13049
Invoice to: Paterson Group

Report Number: 1323196
Date Submitted: 2013-10-18
Date Reported: 2013-10-22
Project: PH2095
COC #: 172594

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 259484 Analysis Date 2013-10-21 Method C SM5530D			
Phenols	<0.001 mg/L	99	73-127
Run No 259527 Analysis Date 2013-10-21 Method M SM3120B-3500C			
Ca	<1 mg/L	99	80-120
K	<1 mg/L	92	80-120
Mg	<1 mg/L	92	80-120
Run No 259530 Analysis Date 2013-10-21 Method EPA 200.8			
Fe	<0.03 mg/L	112	88-112
Mn	<0.01 mg/L	102	91-109
Run No 259547 Analysis Date 2013-10-21 Method C SM4500-S2-D			
S2-	<0.01 mg/L	113	
Run No 259559 Analysis Date 2013-10-21 Method SM 2320B			
Alkalinity as CaCO ₃	<5 mg/L	100	95-105
Conductivity	<5 uS/cm	101	95-105
F	<0.10 mg/L	98	90-110
pH	5.91	100	90-110
Run No 259561 Analysis Date 2013-10-22 Method C SM4500-Norg-C			

Guideline = ODWSOG

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Client: Paterson Group
 154 Colonnade Rd. South
 Nepean, ON
 K2E 7T7
 Attention: Mr. Robert Passmore
 PO#: 13049
 Invoice to: Paterson Group

Report Number: 1323196
 Date Submitted: 2013-10-18
 Date Reported: 2013-10-22
 Project: PH2095
 COC #: 172594

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Total Kjeldahl Nitrogen	<0.10 mg/L	100	77-123
Run No 259579 Analysis Date 2013-10-21 Method C SM4500-NO3-F			
N-NO2	<0.10 mg/L	110	80-120
N-NO3	<0.10 mg/L	100	80-120
Run No 259597 Analysis Date 2013-10-21 Method SUBCONTRACT P-INORG			
DOC	<0.5 mg/L	340	
Run No 259610 Analysis Date 2013-10-22 Method C SM4500-NO3-F			
N-NO2	<0.10 mg/L	100	80-120
N-NO3	<0.10 mg/L	98	80-120
Run No 259623 Analysis Date 2013-10-22 Method C SM5550B			
Tannin & Lignin	<0.1 mg/L	106	80-120
Run No 259625 Analysis Date 2013-10-22 Method M SM3120B-3500C			
Na	<2 mg/L	100	80-120

Guideline = ODWSOG

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 MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable
 Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO
 = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

Client: Paterson Group
154 Colonnade Rd. South
Nepean, ON
K2E 7T7
Attention: Mr. Robert Passmore
PO#: 13047
Invoice to: Paterson Group

Report Number: 1322638
Date Submitted: 2013-10-11
Date Reported: 2013-10-15
Project: PH 2095
COC #: 174113

Page 1 of 2

Dear Robert Passmore:

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

Report Comments:

APPROVAL: _____

Krista Quantrill
Laboratory Supervisor, Microbiology

Exova (Ottawa) is certified and accredited for specific parameters by:

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

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SCC, Standards Council of Canada (to ISO 17025)

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Client: Paterson Group
 154 Colonnade Rd. South
 Nepean, ON
 K2E 7T7
 Attention: Mr. Robert Passmore
 PO#: 13047
 Invoice to: Paterson Group

Report Number: 1322638
 Date Submitted: 2013-10-11
 Date Reported: 2013-10-15
 Project: PH 2095
 COC #: 174113

					Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1064917 Water 2013-10-10 TW2-WS1 13-10-03	1064918 Water 2013-10-10 TW2-WS2 13-10-03
Group	Analyte	MRL	Units	Guideline			
Microbiology	Escherichia Coli	0	ct/100mL	MAC-0		0	0
	Faecal Coliforms	0	ct/100mL			0	0
	Heterotrophic Plate Count	0	ct/1mL			18	16
	Total Coliforms	0	ct/100mL	MAC-0		0	0

Guideline = ODWSOG

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Methods references and/or additional QA/QC information available on request.

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 MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable
 Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO
 = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

Client: Paterson Group
154 Colonnade Rd. South
Nepean, ON
K2E 7T7
Attention: Mr. Robert Passmore
PO#: 13047
Invoice to: Paterson Group

Report Number: 1322566
Date Submitted: 2013-10-10
Date Reported: 2013-10-21
Project: PH 2095
COC #: 174113

Page 1 of 6

Dear Robert Passmore:

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

Report Comments:

APPROVAL: _____

Diana Cameron
Team Leader, Inorganics

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Client: Paterson Group
 154 Colonnade Rd. South
 Nepean, ON
 K2E 7T7
 Attention: Mr. Robert Passmore
 PO#: 13047
 Invoice to: Paterson Group

Report Number: 1322566
 Date Submitted: 2013-10-10
 Date Reported: 2013-10-21
 Project: PH 2095
 COC #: 174113

					Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1064765 Water 2013-10-10 TW2-WS1	1064766 Water 2013-10-10 TW2-WS2
Group	Analyte	MRL	Units	Guideline			
Calculations	Hardness as CaCO ₃	1	mg/L	OG-100		241*	250*
	Ion Balance	0.01				0.98	1.01
	TDS (COND - CALC)	1	mg/L	AO-500		482	486
General Chemistry	Alkalinity as CaCO ₃	5	mg/L	OG-500		220	218
	Cl	1	mg/L	AO-250		71	70
	Colour	2	TCU	AO-5		<2	<2
	Conductivity	5	uS/cm			741	748
	F	0.10	mg/L	MAC-1.5		0.48	0.48
	N-NO ₂	0.10	mg/L	MAC-1.0		<0.10	<0.10
	N-NO ₃	0.10	mg/L	MAC-10.0		<0.10	<0.10
	pH	1.00		6.5-8.5		7.99	8.03
	S ₂ -	0.01	mg/L	AO-0.05		0.17*	0.14*
	SO ₄	3	mg/L	AO-500		62	60
	Turbidity	0.1	NTU	MAC-1.0		0.5	0.5
Metals	Ca	1	mg/L			52	54
	Fe	0.03	mg/L	AO-0.3		0.06	0.06
	K	1	mg/L			5	6
	Mg	1	mg/L			27	28
	Mn	0.01	mg/L	AO-0.05		0.01	0.01
	Na	2	mg/L	AO-200		60	58
Nutrients	N-NH ₃	0.02	mg/L			0.24	0.23
	Phenols	0.005	mg/L			<0.005	<0.005
	Tannin & Lignin	0.1	mg/L			<0.1	<0.1
	Total Kjeldahl Nitrogen	0.10	mg/L			0.21	0.16
Subcontract	DOC	0.5	mg/L	AO-5		0.9	0.8

Guideline = ODWSOG

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Client: Paterson Group
 154 Colonnade Rd. South
 Nepean, ON
 K2E 7T7
 Attention: Mr. Robert Passmore
 PO#: 13047
 Invoice to: Paterson Group

Report Number: 1322566
 Date Submitted: 2013-10-10
 Date Reported: 2013-10-21
 Project: PH 2095
 COC #: 174113

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 0 Analysis Date 2013-10-17 Method C SM2340B			
Hardness as CaCO ₃			
Ion Balance			
TDS (COND - CALC)			
Run No 259125 Analysis Date 2013-10-11 Method C SM2130B			
Turbidity	<0.1 NTU	100	73-127
Run No 259142 Analysis Date 2013-10-11 Method EPA 200.8			
Fe	<0.03 mg/L	109	88-112
Mn	<0.01 mg/L	96	91-109
Run No 259143 Analysis Date 2013-10-11 Method C SM4500-S2-D			
S2-	<0.01 mg/L	104	
Run No 259157 Analysis Date 2013-10-11 Method C SM4500-NO3-F			
N-NO ₂	<0.10 mg/L	113	80-120
N-NO ₃	<0.10 mg/L	103	80-120
Run No 259172 Analysis Date 2013-10-15 Method C SM2120C			

Guideline = ODWSOG

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 MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable
 Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO
 = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

Client: Paterson Group
 154 Colonnade Rd. South
 Nepean, ON
 K2E 7T7
 Attention: Mr. Robert Passmore
 PO#: 13047
 Invoice to: Paterson Group

Report Number: 1322566
 Date Submitted: 2013-10-10
 Date Reported: 2013-10-21
 Project: PH 2095
 COC #: 174113

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Colour	<2 TCU	100	90-110
Run No 259180 Analysis Date 2013-10-15 Method C SM4500-NH3D			
N-NH3	<0.02 mg/L	99	85-115
Run No 259185 Analysis Date 2013-10-11 Method SM 2320B			
Alkalinity as CaCO3	<5 mg/L	100	95-105
Conductivity	<5 uS/cm	101	95-105
F	<0.10 mg/L	102	90-110
pH	5.83	99	90-110
Run No 259187 Analysis Date 2013-10-15 Method C SM5550B			
Tannin & Lignin	<0.1 mg/L	112	80-120
Run No 259272 Analysis Date 2013-10-15 Method SM 4110C			
Cl	<1 mg/L	101	90-112
SO4	<3 mg/L	101	90-110
Run No 259316 Analysis Date 2013-10-16 Method M SM3120B-3500C			
Ca	<1 mg/L	103	80-120
K	<1 mg/L	104	80-120
Mg	<1 mg/L	104	80-120

Guideline = ODWSOG

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Client: Paterson Group
 154 Colonnade Rd. South
 Nepean, ON
 K2E 7T7
 Attention: Mr. Robert Passmore
 PO#: 13047
 Invoice to: Paterson Group

Report Number: 1322566
 Date Submitted: 2013-10-10
 Date Reported: 2013-10-21
 Project: PH 2095
 COC #: 174113

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Na		103	80-120
Run No 259345 Analysis Date 2013-10-17 Method C SM4500-Norg-C			
Total Kjeldahl Nitrogen	<0.10 mg/L	94	77-123
Run No 259351 Analysis Date 2013-10-17 Method C SM5530D			
Phenols	<0.001 mg/L	103	73-127
Run No 259352 Analysis Date 2013-10-17 Method C SM4500-NH3D			
N-NH3	<0.02 mg/L	94	85-115
Run No 259408 Analysis Date 2013-10-18 Method C SM4500-Norg-C			
Total Kjeldahl Nitrogen	<0.10 mg/L	97	77-123
Run No 259519 Analysis Date 2013-10-18 Method SUBCONTRACT P-INORG			
DOC	<0.5 mg/L	98	

Guideline = ODWSOG

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 Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO
 = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

Client: Paterson Group
154 Colonnade Rd. South
Nepean, ON
K2E 7T7
Attention: Mr. Robert Passmore
PO#: 13047
Invoice to: Paterson Group

Report Number: 1322566
Date Submitted: 2013-10-10
Date Reported: 2013-10-21
Project: PH 2095
COC #: 174113

Sample Comment Summary

Sample ID: 1064765	TW2-WS1	Phenols MRL elevated due to matrix interference (dilution was done). All samples were subcontracted for DOC analysis. Holding time for DOC analysis was exceeded for the entire report.
--------------------	---------	---

Sample ID: 1064766	TW2-WS2	Phenols MRL elevated due to matrix interference (dilution was done). TKN and NH3 results have been confirmed.
--------------------	---------	---

Guideline = ODWSOG

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Client: Paterson Group
154 Colonnade Rd. South
Nepean, ON
K2E 7T7
Attention: Mr. Robert Passmore
PO#: 13045
Invoice to: Paterson Group

Report Number: 1322002
Date Submitted: 2013-10-04
Date Reported: 2013-10-07
Project: PH2095
COC #: 174111

Page 1 of 2

Dear Robert Passmore:

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

Report Comments:

APPROVAL: _____

Krista Quantrill
Laboratory Supervisor, Microbiology

Exova (Ottawa) is certified and accredited for specific parameters by:

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

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Client: Paterson Group
 154 Colonnade Rd. South
 Nepean, ON
 K2E 7T7
 Attention: Mr. Robert Passmore
 PO#: 13045
 Invoice to: Paterson Group

Report Number: 1322002
 Date Submitted: 2013-10-04
 Date Reported: 2013-10-07
 Project: PH2095
 COC #: 174111

					Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1063345 Water Composite 2013-10-04 TW4-WS1	1063346 Water Composite 2013-10-04 TW4-WS2
Group	Analyte	MRL	Units	Guideline			
Microbiology	Escherichia Coli	0	ct/100mL	MAC-0		0	0
	Faecal Coliforms	0	ct/100mL			0	0
	Heterotrophic Plate Count	0	ct/1mL			23	38
	Total Coliforms	0	ct/100mL	MAC-0		0	0

Guideline = ODWSOG

*** = Guideline Exceedence**

** = Analysis completed at Mississauga, Ontario.

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

Client: Paterson Group
154 Colonnade Rd. South
Nepean, ON
K2E 7T7
Attention: Mr. Robert Passmore
PO#: 13045
Invoice to: Paterson Group

Report Number: 1322004
Date Submitted: 2013-10-04
Date Reported: 2013-10-07
Project: PH2095
COC #: 174111

Page 1 of 6

Dear Robert Passmore:

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

Report Comments:

APPROVAL: _____

Lorna Wilson
Laboratory Supervisor, Inorganics

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Client: Paterson Group
 154 Colonnade Rd. South
 Nepean, ON
 K2E 7T7
 Attention: Mr. Robert Passmore
 PO#: 13045
 Invoice to: Paterson Group

Report Number: 1322004
 Date Submitted: 2013-10-04
 Date Reported: 2013-10-07
 Project: PH2095
 COC #: 174111

Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.			
					1063350 Water 2013-10-04 TW4-WS1	1063351 Water 2013-10-04 TW4-WS2	1063352 Water 2013-10-04 TW1-WS131004	1063353 Water 2013-10-04 TW2-WS131004
Calculations	Hardness as CaCO ₃	1	mg/L	OG-100	320*	320*		
	Ion Balance	0.01			0.95	0.96		
	TDS (COND - CALC)	1	mg/L	AO-500	495	496		
General Chemistry	Alkalinity as CaCO ₃	5	mg/L	OG-500	226	225		
	Cl	1	mg/L	AO-250	73	73		
	Colour	2	TCU	AO-5	2	2		
	Conductivity	5	uS/cm		761	763		
	DOC	0.5	mg/L	AO-5	1.3	1.6		
	F	0.10	mg/L	MAC-1.5	0.11	0.11		
	N-NO ₂	0.10	mg/L	MAC-1.0	<0.10	<0.10		
	N-NO ₃	0.10	mg/L	MAC-10.0	<0.10	<0.10		
	pH	1.00		6.5-8.5	7.97	7.93		
	S ₂ -	0.01	mg/L	AO-0.05	<0.01	<0.01		
	SO ₄	3	mg/L	AO-500	68	68		
	Turbidity	0.1	NTU	MAC-1.0	1.3*	1.4*		
Metals	Ca	1	mg/L		87	87		
	Fe	0.03	mg/L	AO-0.3	0.21	0.21		
	K	1	mg/L		2	2		
	Mg	1	mg/L		25	25		
	Mn	0.01	mg/L	AO-0.05	0.03	0.03		
	Na	2	mg/L	AO-200	27	27		
Nutrients	N-NH ₃	0.02	mg/L		0.03	<0.02		
	Phenols	0.001	mg/L		<0.001	<0.001		
	Tannin & Lignin	0.1	mg/L		0.1	<0.1		
	Total Kjeldahl Nitrogen	0.10	mg/L		<0.10	<0.10	<0.10	<0.10

Guideline = ODWSOG

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 Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO
 = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

Client: Paterson Group
154 Colonnade Rd. South
Nepean, ON
K2E 7T7
Attention: Mr. Robert Passmore
PO#: 13045
Invoice to: Paterson Group

Report Number: 1322004
Date Submitted: 2013-10-04
Date Reported: 2013-10-07
Project: PH2095
COC #: 174111

					Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	
Group	Analyte	MRL	Units	Guideline		
Nutrients	Total Kjeldahl Nitrogen	0.10	mg/L		1063354 Water 2013-10-04 TW3-WS131004	1063355 Water 2013-10-04 TW4-WS131004
					<0.10	0.12

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= Interim Provincial Water Quality Objective, TDR = Typical Desired Range

Client: Paterson Group
 154 Colonnade Rd. South
 Nepean, ON
 K2E 7T7
 Attention: Mr. Robert Passmore
 PO#: 13045
 Invoice to: Paterson Group

Report Number: 1322004
 Date Submitted: 2013-10-04
 Date Reported: 2013-10-07
 Project: PH2095
 COC #: 174111

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 0 Analysis Date 2013-10-07 Method C SM2340B			
Hardness as CaCO ₃			
Ion Balance			
TDS (COND - CALC)			
Run No 258787 Analysis Date 2013-10-05 Method C SM2130B			
Turbidity	<0.1 NTU	100	73-127
Run No 258789 Analysis Date 2013-10-07 Method C SM4500-Norg-C			
Total Kjeldahl Nitrogen	<0.10 mg/L	104	77-123
Run No 258791 Analysis Date 2013-10-07 Method SM 4110C			
Cl	<1 mg/L	101	90-112
SO ₄	<3 mg/L	100	90-110
Run No 258793 Analysis Date 2013-10-07 Method C SM2120C			
Colour	<2 TCU	105	90-110
Run No 258794 Analysis Date 2013-10-07 Method C SM4500-NH3D			
N-NH ₃	<0.02 mg/L	101	85-115

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 MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable
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 = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

Client: Paterson Group
 154 Colonnade Rd. South
 Nepean, ON
 K2E 7T7
 Attention: Mr. Robert Passmore
 PO#: 13045
 Invoice to: Paterson Group

Report Number: 1322004
 Date Submitted: 2013-10-04
 Date Reported: 2013-10-07
 Project: PH2095
 COC #: 174111

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 258810 Analysis Date 2013-10-07 Method C SM5530D			
Phenols	<0.001 mg/L	94	73-127
Run No 258814 Analysis Date 2013-10-07 Method C SM5550B			
Tannin & Lignin	<0.1 mg/L	86	80-120
Run No 258816 Analysis Date 2013-10-07 Method C SM4500-S2-D			
S2-	<0.01 mg/L	107	
Run No 258817 Analysis Date 2013-10-07 Method C SM5310C			
DOC	<0.5 mg/L	97	84-116
Run No 258819 Analysis Date 2013-10-07 Method SM 2320B			
Alkalinity as CaCO ₃	<5 mg/L	99	95-105
Conductivity	<5 uS/cm	99	95-105
F	<0.10 mg/L	101	90-110
pH	5.92	100	90-110
Run No 258823 Analysis Date 2013-10-07 Method EPA 200.8			
Fe	<0.03 mg/L	106	88-112
Mn	<0.01 mg/L	102	91-109
Run No 258826 Analysis Date 2013-10-07 Method M SM3120B-3500C			

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 = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

Client: Paterson Group
 154 Colonnade Rd. South
 Nepean, ON
 K2E 7T7
 Attention: Mr. Robert Passmore
 PO#: 13045
 Invoice to: Paterson Group

Report Number: 1322004
 Date Submitted: 2013-10-04
 Date Reported: 2013-10-07
 Project: PH2095
 COC #: 174111

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Ca	<1 mg/L	91	80-120
K	<1 mg/L	96	80-120
Mg	<1 mg/L	90	80-120
Na	<2 mg/L	97	80-120
Run No 258829 Analysis Date 2013-10-07 Method C SM4500-NO3-F			
N-NO2	<0.10 mg/L	100	80-120
N-NO3	<0.10 mg/L	92	80-120

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 Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO
 = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

Client: Paterson Group
154 Colonnade Rd. South
Nepean, ON
K2E 7T7
Attention: Mr. Robert Passmore
PO#: 13032
Invoice to: Paterson Group

Report Number: 1320648
Date Submitted: 2013-09-19
Date Reported: 2013-09-22
Project: PH2095
COC #: 174025

Page 1 of 2

Dear Robert Passmore:

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

Report Comments:

APPROVAL: _____

Dragana Dzeletovic
Team Leader, Microbiology

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Client: Paterson Group
154 Colonnade Rd. South
Nepean, ON
K2E 7T7
Attention: Mr. Robert Passmore
PO#: 13032
Invoice to: Paterson Group

Report Number: 1320648
Date Submitted: 2013-09-19
Date Reported: 2013-09-22
Project: PH2095
COC #: 174025

					Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.
Group	Analyte	MRL	Units	Guideline	
Microbiology	Escherichia Coli	0	ct/100mL	MAC-0	1058964 Water
	Faecal Streptococcus	0	ct/100mL		2013-09-19 TW 4-WS-3HR
	Total Coliforms	0	ct/100mL	MAC-0	

Guideline = ODWSOG

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MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable
Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO =
Interim Provincial Water Quality Objective, TDR = Typical Desired Range

Client: Paterson Group
154 Colonnade Rd. South
Nepean, ON
K2E 7T7
Attention: Mr. Robert Passmore
PO#: 13043
Invoice to: Paterson Group

Report Number: 1320714
Date Submitted: 2013-09-20
Date Reported: 2013-09-23
Project: PH2095
COC #: 172593

Page 1 of 2

Dear Robert Passmore:

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

Report Comments:

APPROVAL: _____

Krista Quantrill
Laboratory Supervisor, Microbiology

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Client: Paterson Group
154 Colonnade Rd. South
Nepean, ON
K2E 7T7
Attention: Mr. Robert Passmore
PO#: 13043
Invoice to: Paterson Group

Report Number: 1320714
Date Submitted: 2013-09-20
Date Reported: 2013-09-23
Project: PH2095
COC #: 172593

					Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.
Group		Analyte	MRL	Units	Guideline
Microbiology		Escherichia Coli	0	ct/100mL	MAC-0
		Faecal Coliforms	0	ct/100mL	
		Total Coliforms	0	ct/100mL	MAC-0

1059217
Water

2013-09-19
TW4-WS-6HR

Guideline = ODWSOG

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MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable
Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO =
Interim Provincial Water Quality Objective, TDR = Typical Desired Range

Client: Paterson Group
154 Colonnade Rd. South
Nepean, ON
K2E 7T7
Attention: Mr. Robert Passmore
PO#: 13043
Invoice to: Paterson Group

Report Number: 1320640
Date Submitted: 2013-09-19
Date Reported: 2013-09-24
Project: PH 2095
COC #: 174025

Page 1 of 5

Dear Robert Passmore:

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

Report Comments:

APPROVAL: _____

Lorna Wilson
Laboratory Supervisor, Inorganics

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Client: Paterson Group
 154 Colonnade Rd. South
 Nepean, ON
 K2E 7T7
 Attention: Mr. Robert Passmore
 PO#: 13043
 Invoice to: Paterson Group

Report Number: 1320640
 Date Submitted: 2013-09-19
 Date Reported: 2013-09-24
 Project: PH 2095
 COC #: 174025

					Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.
					1058954 Water 2013-09-19 TW4 - WS - 3Hr
Group	Analyte	MRL	Units	Guideline	
Calculations	Hardness as CaCO ₃	1	mg/L	OG-100	329*
	Ion Balance	0.01			0.99
	TDS (COND - CALC)	1	mg/L	AO-500	494
General Chemistry	Alkalinity as CaCO ₃	5	mg/L	OG-500	224
	Cl	1	mg/L	AO-250	71
	Colour	2	TCU	AO-5	3
	Conductivity	5	uS/cm		760
	DOC	0.5	mg/L	AO-5	1.6
	F	0.10	mg/L	MAC-1.5	0.11
	N-NO ₂	0.10	mg/L	MAC-1.0	<0.10
	N-NO ₃	0.10	mg/L	MAC-10.0	<0.10
	pH	1.00		6.5-8.5	8.02
	S ₂ -	0.01	mg/L	AO-0.05	<0.01
	SO ₄	3	mg/L	AO-500	66
	Turbidity	0.1	NTU	MAC-1.0	0.3
Metals	Ca	1	mg/L		89
	Fe	0.03	mg/L	AO-0.3	0.15
	K	1	mg/L		2
	Mg	1	mg/L		26
	Mn	0.01	mg/L	AO-0.05	0.02
	Na	2	mg/L	AO-200	26
Nutrients	N-NH ₃	0.02	mg/L		<0.02
	Phenols	0.001	mg/L		<0.001
	Tannin & Lignin	0.1	mg/L		<0.1
	Total Kjeldahl Nitrogen	0.10	mg/L		<0.10

Guideline = ODWSOG

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Client: Paterson Group
 154 Colonnade Rd. South
 Nepean, ON
 K2E 7T7
 Attention: Mr. Robert Passmore
 PO#: 13043
 Invoice to: Paterson Group

Report Number: 1320640
 Date Submitted: 2013-09-19
 Date Reported: 2013-09-24
 Project: PH 2095
 COC #: 174025

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 0 Analysis Date 2013-09-23 Method C SM2340B			
Hardness as CaCO ₃			
Ion Balance			
TDS (COND - CALC)			
Run No 257907 Analysis Date 2013-09-20 Method C SM2120C			
Colour	<2 TCU	100	90-110
Run No 257909 Analysis Date 2013-09-19 Method SM 4110C			
Cl	<1 mg/L	102	90-112
SO ₄	<3 mg/L	101	90-110
Run No 257917 Analysis Date 2013-09-20 Method C SM4500-Norg-C			
Total Kjeldahl Nitrogen	<0.10 mg/L	94	77-123
Run No 257918 Analysis Date 2013-09-20 Method C SM4500-NH3D			
N-NH ₃	<0.02 mg/L	103	85-115
Run No 257919 Analysis Date 2013-09-20 Method C SM2130B			
Turbidity	<0.1 NTU	100	73-127

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Client: Paterson Group
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 K2E 7T7
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 PO#: 13043
 Invoice to: Paterson Group

Report Number: 1320640
 Date Submitted: 2013-09-19
 Date Reported: 2013-09-24
 Project: PH 2095
 COC #: 174025

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 257924 Analysis Date 2013-09-20 Method C SM5530D			
Phenols	<0.001 mg/L	87	73-127
Run No 257928 Analysis Date 2013-09-20 Method M SM3120B-3500C			
Ca	<1 mg/L	95	80-120
K	<1 mg/L	99	80-120
Mg	<1 mg/L	96	80-120
Na	<2 mg/L	100	80-120
Run No 257945 Analysis Date 2013-09-20 Method C SM4500-NO3-F			
N-NO2	<0.10 mg/L	103	80-120
N-NO3	<0.10 mg/L	103	80-120
Run No 257946 Analysis Date 2013-09-20 Method C SM5310C			
DOC	<0.5 mg/L	105	84-116
Run No 257949 Analysis Date 2013-09-21 Method EPA 200.8			
Fe	<0.03 mg/L	108	88-112
Mn	<0.01 mg/L	103	91-109
Run No 257982 Analysis Date 2013-09-20 Method SM 2320B			
Alkalinity as CaCO3	<5 mg/L	99	95-105

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 K2E 7T7
 Attention: Mr. Robert Passmore
 PO#: 13043
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Report Number: 1320640
 Date Submitted: 2013-09-19
 Date Reported: 2013-09-24
 Project: PH 2095
 COC #: 174025

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Conductivity	<5 uS/cm	99	95-105
F	<0.10 mg/L	100	90-110
pH	5.96	100	90-110
Run No 257990 Analysis Date 2013-09-23 Method C SM5550B			
Tannin & Lignin	<0.1 mg/L	99	80-120
Run No 258029 Analysis Date 2013-09-23 Method C SM4500-S2-D			
S2-	<0.01 mg/L	104	

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Client: Paterson Group
154 Colonnade Rd. South
Nepean, ON
K2E 7T7
Attention: Mr. Robert Passmore
PO#: 13043
Invoice to: Paterson Group

Report Number: 1320693
Date Submitted: 2013-09-20
Date Reported: 2013-09-24
Project: PH2095
COC #: 172593

Page 1 of 5

Dear Robert Passmore:

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Report Comments:

APPROVAL: _____

Lorna Wilson
Laboratory Supervisor, Inorganics

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 Nepean, ON
 K2E 7T7
 Attention: Mr. Robert Passmore
 PO#: 13043
 Invoice to: Paterson Group

Report Number: 1320693
 Date Submitted: 2013-09-20
 Date Reported: 2013-09-24
 Project: PH2095
 COC #: 172593

					Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.
					1059112 Water 2013-09-19 TW4 - WS - 6HR
Group	Analyte	MRL	Units	Guideline	
Calculations	Hardness as CaCO ₃	1	mg/L	OG-100	348*
	Ion Balance	0.01			1.01
	TDS (COND - CALC)	1	mg/L	AO-500	492
General Chemistry	Alkalinity as CaCO ₃	5	mg/L	OG-500	237
	Cl	1	mg/L	AO-250	72
	Colour	2	TCU	AO-5	2
	Conductivity	5	uS/cm		757
	DOC	0.5	mg/L	AO-5	1.5
	F	0.10	mg/L	MAC-1.5	0.12
	N-NO ₂	0.10	mg/L	MAC-1.0	<0.10
	N-NO ₃	0.10	mg/L	MAC-10.0	<0.10
	pH	1.00		6.5-8.5	8.21
	S ₂ -	0.01	mg/L	AO-0.05	<0.01
	SO ₄	3	mg/L	AO-500	66
	Turbidity	0.1	NTU	MAC-1.0	0.5
Metals	Ca	1	mg/L		95
	Fe	0.03	mg/L	AO-0.3	0.18
	K	1	mg/L		2
	Mg	1	mg/L		27
	Mn	0.01	mg/L	AO-0.05	0.03
	Na	2	mg/L	AO-200	28
Nutrients	N-NH ₃	0.02	mg/L		0.03
	Phenols	0.001	mg/L		<0.001
	Tannin & Lignin	0.1	mg/L		<0.1
	Total Kjeldahl Nitrogen	0.10	mg/L		0.14

Guideline = ODWSOG

* = Guideline Exceedence

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Client: Paterson Group
 154 Colonnade Rd. South
 Nepean, ON
 K2E 7T7
 Attention: Mr. Robert Passmore
 PO#: 13043
 Invoice to: Paterson Group

Report Number: 1320693
 Date Submitted: 2013-09-20
 Date Reported: 2013-09-24
 Project: PH2095
 COC #: 172593

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 0 Analysis Date 2013-09-24 Method C SM2340B			
Hardness as CaCO ₃			
Ion Balance			
TDS (COND - CALC)			
Run No 257956 Analysis Date 2013-09-20 Method C SM2130B			
Turbidity	<0.1 NTU	100	73-127
Run No 257971 Analysis Date 2013-09-23 Method C SM4500-Norg-C			
Total Kjeldahl Nitrogen	<0.10 mg/L	103	77-123
Run No 257972 Analysis Date 2013-09-23 Method C SM2120C			
Colour	<2 TCU	100	90-110
Run No 257977 Analysis Date 2013-09-23 Method C SM4500-NH ₃ D			
N-NH ₃	<0.02 mg/L	103	85-115
Run No 257990 Analysis Date 2013-09-23 Method C SM5550B			
Tannin & Lignin	<0.1 mg/L	99	80-120
Run No 257995 Analysis Date 2013-09-23 Method C SM5530D			

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 Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO
 = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

Client: Paterson Group
 154 Colonnade Rd. South
 Nepean, ON
 K2E 7T7
 Attention: Mr. Robert Passmore
 PO#: 13043
 Invoice to: Paterson Group

Report Number: 1320693
 Date Submitted: 2013-09-20
 Date Reported: 2013-09-24
 Project: PH2095
 COC #: 172593

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Phenols	<0.001 mg/L	88	73-127
Run No 258018	Analysis Date 2013-09-23	Method EPA 200.8	
Fe	<0.03 mg/L	108	88-112
Mn	<0.01 mg/L	107	91-109
Run No 258019	Analysis Date 2013-09-23	Method M SM3120B-3500C	
Ca	<1 mg/L	99	80-120
K	<1 mg/L	104	80-120
Mg	<1 mg/L	99	80-120
Na	<2 mg/L	103	80-120
Run No 258029	Analysis Date 2013-09-23	Method C SM4500-S2-D	
S2-	<0.01 mg/L	104	
Run No 258030	Analysis Date 2013-09-23	Method C SM4500-NO3-F	
N-NO2	<0.10 mg/L	113	80-120
N-NO3	<0.10 mg/L	110	80-120
Run No 258048	Analysis Date 2013-09-23	Method SM 4110C	
Cl	<1 mg/L	100	90-112
SO4	<3 mg/L	101	90-110

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Client: Paterson Group
 154 Colonnade Rd. South
 Nepean, ON
 K2E 7T7
 Attention: Mr. Robert Passmore
 PO#: 13043
 Invoice to: Paterson Group

Report Number: 1320693
 Date Submitted: 2013-09-20
 Date Reported: 2013-09-24
 Project: PH2095
 COC #: 172593

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 258062 Analysis Date 2013-09-24 Method SM 2320B			
Alkalinity as CaCO ₃	<5 mg/L	101	95-105
Conductivity	<5 uS/cm	100	95-105
F	<0.10 mg/L	97	90-110
pH	5.94	100	90-110
Run No 258091 Analysis Date 2013-09-24 Method C SM5310C			
DOC	<0.5 mg/L	98	84-116

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 MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable
 Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO
 = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

The results of the water quality testing for the consenting residences appear in Table 3 and the laboratory reports appear in Appendix 3.

TABLE 3 Summary of Health Based Water Quality Parameters in Wells at Completed Lots										
PARAMETER	Units	6887 SPW ²	6944 LFW ²	6951 LFW	6892 SPW	6900 SPW	6929 SPW	6930 SPW	6893 SPW	ODWS MAC
Fluoride	mg/L	0.11	0.14	0.90	0.83	0.12	0.10	0.11	0.11	1.5
Ammonia	mg/L	<0.02	0.02	0.17	0.10	0.02	<0.02	<0.02	<0.02	-
Nitrite	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	1
Nitrate	mg/L	0.20	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	10
TKN	mg/L	<0.05	<0.05	<0.33	<0.21	0.10	0.06	0.06	<0.05	
Total Coliform	ct/100 mL	0	0	0	0	0	0	0	0¹	0
E.Coli	ct/100 mL	0	0	0	0	0	0	0	0	0

1. The results of the water quality analysis in the first round of testing resulted in a total coliform concentration of 1 count per 100 mL. Total coliform was not detected in the retesting of that water supply.
2. SPW is the short form for street name Sparkling Lake Way: LFW is the short form for street name Lake Forest Walk.

A review of the summarized data in Table 3 reveals that the water quality is quite satisfactory and no health based parameter tested exceeds the ODWS. Furthermore, the minimal detectable concentrations of nitrate and absence of bacteriological parameters would indicate that the supply aquifer is not being impacted by surface development and associated activities (i.e. fertilizers and effluent dispersal).

EXOVA OTTAWA

Certificate of Analysis



Client: Paterson Group
154 Colonnade Rd. South
Nexsen, ON
K2E 7T7
Attention: Mr. Robert Passmore
PO#: 13045
Invoice to: Paterson Group

Report Number: 1322004
Date Submitted: 2013-10-04
Date Reported: 2013-10-07
Project: PH2085
COC #: 174111

Group	Analyte	MRL	Units	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	Guideline	1063350 Water 2013-10-04 TW4-WS1	1063351 Water 2013-10-04 TW4-WS2	1063352 Water 2013-10-04 TW4-WS1004 TH1	1063353 Water 2013-10-04 TW2-WS131004 TH2
Calculations	Hardness as CaCO3	1	mg/L	OG-100		320*	320*		
	Ion Balance	0.01				0.95	0.96		
	TDS (COND - CALC)	1	mg/L	AO-500		495	496		
	Alkalinity as CaCO3	5	mg/L	OG-500		226	225		
	Cl	1	mg/L	AO-250		73	73		
	Colour	2	TCU	AO-5		2	2		
	Conductivity	5	uS/cm			761	763		
	DOC	0.5	mg/L	AO-5		1.3	1.6		
	F	0.10	mg/L	MAC-1.5		0.11	0.11		
	N-NO2	0.10	mg/L	MAC-1.0		<0.10	<0.10		
General Chemistry	N-NO3	0.10	mg/L	MAC-10.0		<0.10	<0.10		
	pH	1.00		6.5-8.5		7.97	7.93		
	S2-	0.01	mg/L	AO-0.05		<0.01	<0.01		
	SO4	3	mg/L	AO-500		68	68		
	Turbidity	0.1	NTU	MAC-1.0		1.3*	1.4*		
	Ca	1	mg/L			87	87		
	Fe	0.03	mg/L	AO-0.3		0.21	0.21		
	K	1	mg/L			2	2		
	Mg	1	mg/L			25	25		
	Mn	0.01	mg/L	AO-0.05		0.03	0.03		
Metals	Na	2	mg/L	AO-200		27	27		
	N-NH3	0.02	mg/L			0.03	<0.02		
	Phenols	0.001	mg/L			<0.001	<0.001		
	Tannin & Lignin	0.1	mg/L			0.1	<0.1		
	Total Kjeldahl Nitrogen	0.10	mg/L			<0.10	<0.10		
Nutrients									

Guideline = obwsog
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EXOVA OTTAWA

Certificate of Analysis



Client: Paterson Group
154 Colonnade Rd. South
Nepean, ON
K2E 7T7
Attention: Mr. Robert Passmore
PO#: 13045
Invoice to: Paterson Group

Report Number: 1322004
Date Submitted: 2013-10-04
Date Reported: 2013-10-07
Project: PH2095
COC #: 174111

Group	Analyte	MRL	Units	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	Guideline
Nutrients	Total Kjeldahl Nitrogen	0.10	mg/L	1063354 Water 2013-10-04 TW4-WS131004 TH3	1063355 Water 2013-10-04 TW4-WS131004 TH4
				<0.10	0.12

Guideline = * = Guideline Exceedence
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MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable
Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO

Client: Fieldstone Engineering
150 Moorhead Dr.
Fitzroy Harbor, ON
K0A 1X0
Attention: Robert Passmore
PO#:
Invoice to: Cavanagh Construction Ltd.

Report Number: 1421341
Date Submitted: 2014-10-06
Date Reported: 2014-10-14
Project: PH2095
COC #: 176998

Page 1 of 12

Dear Robert Passmore:

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

Report Comments:

APPROVAL:

Lorna Wilson
Laboratory Supervisor, Inorganics

APPROVAL:

Charlie (Long) Qu
Laboratory Supervisor, Organics

All analysis is completed in Ottawa, Ontario (unless otherwise indicated).

Exova Ottawa is accredited by CALA, Canadian Association for Laboratory Accreditation to ISO/IEC 17025 for tests which appear on our CALA scope of accreditation. It can be found at <http://www.cala.ca/scopes/2602.pdf>.

Exova (Ottawa) is certified and accredited for specific parameters by OMAFRA, Ontario Ministry of Agriculture, Food and Rural Affairs (for farm soils). Licensed by Ontario MOE for specific tests in drinking water.

Exova (Mississauga) is accredited for specific parameters by SCC, Standards Council of Canada (to ISO 17025)

Please note: Field data, where presented on the report, has been provided by the client and is presented for informational purposes only. Guideline values listed on this report are provided for ease of use (informational purposes) only. Exova recommends consulting the official provincial or federal guideline as required.

Client: Fieldstone Engineering
150 Moorhead Dr.
Fitzroy Harbor, ON
K0A 1X0
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PO#:
Invoice to: Cavanagh Construction Ltd.

Report Number: 1421341
Date Submitted: 2014-10-06
Date Reported: 2014-10-14
Project: PH2095
COC #: 176998

					Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.
					1138015 Water 2014-10-06 1359 Coker
Group	Analyte	MRL	Units	Guideline	
Calculations	Hardness as CaCO ₃	1	mg/L	OG-100	328*
	Ion Balance	0.01			1.03
	TDS (COND - CALC)	1	mg/L	AO-500	437
General Chemistry	Alkalinity as CaCO ₃	5	mg/L	OG-500	212
	Cl	1	mg/L	AO-250	55
	Colour	2	TCU	AO-5	2
	Conductivity	5	uS/cm		672
	DOC	0.5	mg/L	AO-5	2.0
	F	0.10	mg/L	MAC-1.5	0.12
	N-NO ₂	0.10	mg/L	MAC-1.0	<0.10
	N-NO ₃	0.10	mg/L	MAC-10.0	<0.10
	pH	1.00		6.5-8.5	7.97
	S ₂ -	0.01	mg/L	AO-0.05	<0.01
	SO ₄	1	mg/L	AO-500	63
	Turbidity	0.1	NTU	MAC-1.0	1.0
Metals	Ca	1	mg/L		90
	Fe	0.03	mg/L	AO-0.3	0.27
	K	1	mg/L		2
	Mg	1	mg/L		25
	Mn	0.05	mg/L	AO-0.05	<0.05
	Na	2	mg/L	AO-200	17
Nutrients	N-NH ₃	0.02	mg/L		0.10
	Phenols	0.001	mg/L		<0.001
	Tannin & Lignin	0.1	mg/L		<0.1
	Total Kjeldahl Nitrogen	0.10	mg/L		<0.10
Semi-Volatiles	1-methylnaphthalene	0.1	ug/L		<0.1

Guideline = ODWSOG * = Guideline Exceedence

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					Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.
					1138015 Water 2014-10-06 1359 Coker
Group	Analyte	MRL	Units	Guideline	
Semi-Volatiles	2-methylnaphthalene	0.1	ug/L		<0.1
	Acenaphthene	0.1	ug/L		<0.1
	Acenaphthylene	0.1	ug/L		<0.1
	Anthracene	0.1	ug/L		<0.1
	Benzo(a)anthracene	0.1	ug/L		<0.1
	Benzo(a)pyrene	0.01	ug/L	MAC-0.01	<0.01
	Benzo(b)fluoranthene	0.05	ug/L		<0.05
	Benzo(g,h,i)perylene	0.1	ug/L		<0.1
	Benzo(k)fluoranthene	0.05	ug/L		<0.05
	Chrysene	0.05	ug/L		<0.05
	Dibenzo(a,h)anthracene	0.1	ug/L		<0.1
	Fluoranthene	0.1	ug/L		<0.1
	Fluorene	0.1	ug/L		<0.1
	Indeno(1,2,3-c,d)pyrene	0.1	ug/L		<0.1
	Naphthalene	0.1	ug/L		<0.1
	Phenanthrene	0.1	ug/L		<0.1
	Pyrene	0.1	ug/L		<0.1
VOCs	1,1,1,2-tetrachloroethane	0.5	ug/L		<0.5
	1,1,1-trichloroethane	0.4	ug/L		<0.4
	1,1,2,2-tetrachloroethane	0.5	ug/L		<0.5
	1,1,2-trichloroethane	0.4	ug/L		<0.4
	1,1-dichloroethane	0.4	ug/L		<0.4
	1,1-dichloroethylene	0.5	ug/L	MAC-14	<0.5
	1,2-dibromoethane	0.2	ug/L		<0.2
	1,2-dichlorobenzene	0.4	ug/L	MAC-200	<0.4
	1,2-dichloroethane	0.2	ug/L	IMAC-5	<0.2

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K0A 1X0
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Invoice to: Cavanagh Construction Ltd.

Report Number: 1421341
Date Submitted: 2014-10-06
Date Reported: 2014-10-14
Project: PH2095
COC #: 176998

					Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.
					1138015 Water 2014-10-06 1359 Coker
Group	Analyte	MRL	Units	Guideline	
VOCs	1,2-dichloropropane	0.5	ug/L		<0.5
	1,3,5-trimethylbenzene	0.3	ug/L		<0.3
	1,3-dichlorobenzene	0.4	ug/L		<0.4
	1,4-dichlorobenzene	0.4	ug/L	MAC-5	<0.4
	Benzene	0.5	ug/L	MAC-5	<0.5
	Bromodichloromethane	0.3	ug/L		<0.3
	Bromoform	0.4	ug/L		<0.4
	Bromomethane	0.5	ug/L		<0.5
	c-1,2-Dichloroethylene	0.4	ug/L		<0.4
	c-1,3-Dichloropropylene	0.2	ug/L		<0.2
	Carbon Tetrachloride	0.2	ug/L	MAC-5	<0.2
	Chloroethane	0.2	ug/L		<0.2
	Chloroform	0.5	ug/L		<0.5
	Chloromethane	0.2	ug/L		<0.2
	Dibromochloromethane	0.3	ug/L		<0.3
	Dichlorodifluoromethane	0.5	ug/L		<0.5
	Dichloromethane	4.0	ug/L	MAC-50	<4.0
	Ethylbenzene	0.5	ug/L	AO-2.4	<0.5
	m/p-xylene	0.5	ug/L		<0.5
	Monochlorobenzene	0.2	ug/L	MAC-80	<0.2
	o-xylene	0.5	ug/L		<0.5
	Styrene	0.5	ug/L		<0.5
	t-1,2-Dichloroethylene	0.4	ug/L		<0.4
	t-1,3-Dichloropropylene	0.2	ug/L		<0.2
	Tetrachloroethylene	0.3	ug/L	MAC-30	<0.3
	Toluene	0.5	ug/L	AO-24	<0.5

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 150 Moorhead Dr.
 Fitzroy Harbor, ON
 K0A 1X0
 Attention: Robert Passmore
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 Date Submitted: 2014-10-06
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					Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.
					1138015 Water 2014-10-06 1359 Coker
Group	Analyte	MRL	Units	Guideline	
VOCs	Trichloroethylene	0.3	ug/L	MAC-5	<0.3
	Trichlorofluoromethane	0.5	ug/L		<0.5
	Vinyl Chloride	0.2	ug/L	MAC-2	<0.2
	Xylene; total	1.0	ug/L	AO-300	<1.0
VOCs Surrogates (%REC)	1,2-dichloroethane-d4	0	%		105
	4-bromofluorobenzene	0	%		113
	Toluene-d8	0	%		100

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PO#:
Invoice to: Cavanagh Construction Ltd.

Report Number: 1421341
Date Submitted: 2014-10-06
Date Reported: 2014-10-14
Project: PH2095
COC #: 176998

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 0 Analysis Date 2014-10-14 Method C SM2340B			
Hardness as CaCO ₃			
Ion Balance			
TDS (COND - CALC)			
Xylene; total			
Run No 277396 Analysis Date 2014-10-06 Method C SM4500-NH3D			
N-NH ₃	<0.02 mg/L	99	85-115
Run No 277400 Analysis Date 2014-10-06 Method C SM5550B			
Tannin & Lignin	<0.1 mg/L	89	80-120
Run No 277453 Analysis Date 2014-10-06 Method C SM2130B			
Turbidity	0.1 NTU	100	70-130
Run No 277465 Analysis Date 2014-10-07 Method C SM4500-Norg-C			
Total Kjeldahl Nitrogen	<0.10 mg/L	103	77-123
Run No 277468 Analysis Date 2014-10-07 Method C SM2120C			
Colour	<2 TCU	100	90-110

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Fitzroy Harbor, ON
K0A 1X0
Attention: Robert Passmore
PO#:
Invoice to: Cavanagh Construction Ltd.

Report Number: 1421341
Date Submitted: 2014-10-06
Date Reported: 2014-10-14
Project: PH2095
COC #: 176998

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 277486 Analysis Date 2014-10-06 Method P 8270			
1-methylnaphthalene	<0.1 ug/L	66	20-140
2-methylnaphthalene	<0.1 ug/L	64	20-140
Acenaphthene	<0.1 ug/L	66	20-140
Acenaphthylene	<0.1 ug/L	64	20-140
Anthracene	<0.1 ug/L	72	20-140
Benzo(a)anthracene	<0.1 ug/L	80	20-140
Benzo(a)pyrene	<0.01 ug/L	82	20-140
Benzo(b)fluoranthene	<0.05 ug/L	84	20-140
Benzo(g,h,i)perylene	<0.1 ug/L	82	20-140
Benzo(k)fluoranthene	<0.05 ug/L	76	20-140
Chrysene	<0.05 ug/L	78	20-140
Dibenzo(a,h)anthracene	<0.1 ug/L	80	20-140
Fluoranthene	<0.1 ug/L	78	20-140
Fluorene	<0.1 ug/L	68	20-140
Indeno(1,2,3-c,d)pyrene	<0.1 ug/L	80	20-140
Naphthalene	<0.1 ug/L	62	20-140

Guideline = ODWSOG*** = Guideline Exceedence**

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Client: Fieldstone Engineering
150 Moorhead Dr.
Fitzroy Harbor, ON
K0A 1X0
Attention: Robert Passmore
PO#:
Invoice to: Cavanagh Construction Ltd.

Report Number: 1421341
Date Submitted: 2014-10-06
Date Reported: 2014-10-14
Project: PH2095
COC #: 176998

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Phenanthrene	<0.1 ug/L	72	20-140
Pyrene	<0.1 ug/L	80	20-140
Run No 277512 Analysis Date 2014-10-07 Method SM 2320B			
Alkalinity as CaCO ₃	<5 mg/L	97	95-105
Conductivity	<5 uS/cm	99	95-105
F	<0.10 mg/L	99	90-110
pH	5.85	100	90-110
Run No 277528 Analysis Date 2014-10-07 Method M SM3120B-3500C			
K	<1 mg/L	106	80-120
Run No 277530 Analysis Date 2014-10-07 Method C SM4500-NO3-F			
N-NO ₂	<0.10 mg/L	87	80-120
N-NO ₃	<0.10 mg/L	110	80-120
Run No 277544 Analysis Date 2014-10-08 Method C SM5530D			
Phenols	<0.001 mg/L	91	73-127
Run No 277565 Analysis Date 2014-10-07 Method SM 4110			
Cl	<1 mg/L	100	90-110
SO ₄	<1 mg/L	106	90-110

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Client: Fieldstone Engineering
150 Moorhead Dr.
Fitzroy Harbor, ON
K0A 1X0
Attention: Robert Passmore
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Invoice to: Cavanagh Construction Ltd.

Report Number: 1421341
Date Submitted: 2014-10-06
Date Reported: 2014-10-14
Project: PH2095
COC #: 176998

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 277621 Analysis Date 2014-10-08 Method C SM5310C			
DOC	<0.5 mg/L	98	84-116
Run No 277743 Analysis Date 2014-10-10 Method V 8260B			
1,1,1,2-tetrachloroethane	<0.5 ug/L	109	80-120
1,1,1-trichloroethane	<0.4 ug/L	105	80-120
1,1,2,2-tetrachloroethane	<0.5 ug/L	106	80-120
1,1,2-trichloroethane	<0.4 ug/L	105	80-120
1,1-dichloroethane	<0.4 ug/L	110	80-120
1,1-dichloroethylene	<0.5 ug/L	99	80-120
1,2-dibromoethane	<0.2 ug/L	105	80-120
1,2-dichlorobenzene	<0.4 ug/L	104	80-120
1,2-dichloroethane	<0.2 ug/L	102	80-120
1,2-dichloroethane-d4	106 %	102	80-120
1,2-dichloropropane	<0.5 ug/L	109	80-120
1,3,5-trimethylbenzene	<0.3 ug/L	100	80-120
1,3-dichlorobenzene	<0.4 ug/L	102	80-120
1,4-dichlorobenzene	<0.4 ug/L	97	80-120

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Client: Fieldstone Engineering
 150 Moorhead Dr.
 Fitzroy Harbor, ON
 K0A 1X0
 Attention: Robert Passmore
 PO#:
 Invoice to: Cavanagh Construction Ltd.

Report Number: 1421341
 Date Submitted: 2014-10-06
 Date Reported: 2014-10-14
 Project: PH2095
 COC #: 176998

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Benzene	<0.5 ug/L	98	80-120
Bromodichloromethane	<0.3 ug/L	97	80-120
Bromoform	<0.4 ug/L	100	80-120
Bromomethane	<0.5 ug/L	116	70-130
c-1,2-Dichloroethylene	<0.4 ug/L	98	80-120
c-1,3-Dichloropropylene	<0.2 ug/L	107	80-120
Carbon Tetrachloride	<0.2 ug/L	104	80-120
Chloroethane	<0.2 ug/L	88	70-130
Chloroform	<0.5 ug/L	99	80-120
Chloromethane	<0.2 ug/L	95	70-130
Dibromochloromethane	<0.3 ug/L	97	80-120
Dichlorodifluoromethane	<0.5 ug/L	95	70-130
Dichloromethane	<4.0 ug/L	105	60-200
Ethylbenzene	<0.5 ug/L	98	80-120
m/p-xylene	<0.5 ug/L	93	80-120
Monochlorobenzene	<0.2 ug/L	96	80-120
o-xylene	<0.5 ug/L	97	80-120

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Client: Fieldstone Engineering
150 Moorhead Dr.
Fitzroy Harbor, ON
K0A 1X0
Attention: Robert Passmore
PO#:
Invoice to: Cavanagh Construction Ltd.

Report Number: 1421341
Date Submitted: 2014-10-06
Date Reported: 2014-10-14
Project: PH2095
COC #: 176998

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Styrene	<0.5 ug/L	99	80-120
t-1,2-Dichloroethylene	<0.4 ug/L	94	80-120
t-1,3-Dichloropropylene	<0.2 ug/L	106	80-120
Tetrachloroethylene	<0.3 ug/L	96	80-120
Toluene	<0.5 ug/L	96	80-120
Toluene-d8	97 %	100	80-120
Trichloroethylene	<0.3 ug/L	97	80-120
Trichlorofluoromethane	<0.5 ug/L	100	80-120
Vinyl Chloride	<0.2 ug/L	98	70-130
Run No 277773 Analysis Date 2014-10-09 Method M SM3120B-3500C			
Fe	<0.03 mg/L	100	88-112
Mn	<0.05 mg/L	98	92-108
Run No 277782 Analysis Date 2014-10-10 Method M SM3120B-3500C			
Ca	<1 mg/L	100	80-120
Mg	<1 mg/L	99	80-120
Na	<2 mg/L	100	80-120
Run No 277842 Analysis Date 2014-10-14 Method C SM4500-S2-D			

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Client: Fieldstone Engineering
150 Moorhead Dr.
Fitzroy Harbor, ON
K0A 1X0
Attention: Robert Passmore
PO#:
Invoice to: Cavanagh Construction Ltd.

Report Number: 1421341
Date Submitted: 2014-10-06
Date Reported: 2014-10-14
Project: PH2095
COC #: 176998

QC Summary

Analyte	Blank	QC % Rec	QC Limits
S2-	<0.01 mg/L	98	

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Client: Fieldstone Engineering
150 Moorhead Dr.
Fitzroy Harbor, ON
K0A 1X0
Attention: Robert Passmore
PO#:
Invoice to: Cavanagh Construction Ltd.

Report Number: 1421344
Date Submitted: 2014-10-06
Date Reported: 2014-10-08
Project: PH2095
COC #: 176998

Page 1 of 2

Dear Robert Passmore:

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

Report Comments:

APPROVAL:

Krista Quantrill
Laboratory Supervisor, Microbiology

All analysis is completed in Ottawa, Ontario (unless otherwise indicated).

Exova Ottawa is accredited by CALA, Canadian Association for Laboratory Accreditation to ISO/IEC 17025 for tests which appear on our CALA scope of accreditation. It can be found at <http://www.cala.ca/scopes/2602.pdf>.

Exova (Ottawa) is certified and accredited for specific parameters by OMAFRA, Ontario Ministry of Agriculture, Food and Rural Affairs (for farm soils). Licensed by Ontario MOE for specific tests in drinking water.

Exova (Mississauga) is accredited for specific parameters by SCC, Standards Council of Canada (to ISO 17025)

Please note: Field data, where presented on the report, has been provided by the client and is presented for informational purposes only. Guideline values listed on this report are provided for ease of use (informational purposes) only. Exova recommends consulting the official provincial or federal guideline as required.

Client: Fieldstone Engineering
150 Moorhead Dr.
Fitzroy Harbor, ON
K0A 1X0
Attention: Robert Passmore
PO#:
Invoice to: Cavanagh Construction Ltd.

Report Number: 1420694
Date Submitted: 2014-09-26
Date Reported: 2014-09-30
Project: PH2095
COC #: 500488

Page 1 of 5

Dear Robert Passmore:

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

Report Comments:

APPROVAL: _____

Lorna Wilson
Laboratory Supervisor, Inorganics

All analysis is completed in Ottawa, Ontario (unless otherwise indicated).

Exova (Ottawa) is certified and accredited for specific parameters by:

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

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Client: Fieldstone Engineering
150 Moorhead Dr.
Fitzroy Harbor, ON
K0A 1X0
Attention: Robert Passmore
PO#:
Invoice to: Cavanagh Construction Ltd.

Report Number: 1420694
Date Submitted: 2014-09-26
Date Reported: 2014-09-30
Project: PH2095
COC #: 500488

					Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1136279 Water 2014-09-26 1308 South Beach	1136280 Water 2014-09-26 1320 South Beach	1136281 Water 2014-09-26 6961 McKeown
Group	Analyte	MRL	Units	Guideline				
Calculations	Hardness as CaCO ₃	1	mg/L	OG-100		393*	386*	345*
	Ion Balance	0.01				1.08	1.04	1.08
	TDS (COND - CALC)	1	mg/L	AO-500		593*	582*	447
General Chemistry	Alkalinity as CaCO ₃	5	mg/L	OG-500		247	253	218
	Cl	1	mg/L	AO-250		109	105	62
	Colour	2	TCU	AO-5		<2	2	3
	Conductivity	5	uS/cm			913	896	687
	DOC	0.5	mg/L	AO-5		1.5	1.2	2.6
	F	0.10	mg/L	MAC-1.5		0.11	0.12	0.17
	N-NO ₂	0.10	mg/L	MAC-1.0		<0.10	<0.10	<0.10
	N-NO ₃	0.10	mg/L	MAC-10.0		<0.10	<0.10	<0.10
	pH	1.00		6.5-8.5		7.92	7.97	7.97
	S ₂ -	0.01	mg/L	AO-0.05		<0.01	<0.01	<0.01
	SO ₄	1	mg/L	AO-500		72	71	54
	Turbidity	0.1	NTU	MAC-1.0		0.1	4.3*	3.6*
Metals	Ca	1	mg/L			103	100	92
	Fe	0.03	mg/L	AO-0.3		<0.03	0.56*	0.44*
	K	1	mg/L			3	3	2
	Mg	1	mg/L			33	33	28
	Mn	0.01	mg/L	AO-0.05		<0.01	0.03	0.02
	Na	2	mg/L	AO-200		53	49	20
Nutrients	N-NH ₃	0.02	mg/L			0.05	0.08	0.08
	Phenols	0.001	mg/L			<0.001	<0.001	<0.001
	Tannin & Lignin	0.1	mg/L			<0.1	<0.1	<0.1
	Total Kjeldahl Nitrogen	0.10	mg/L			<0.10	<0.10	0.30

Guideline = ODWSOG*** = Guideline Exceedence**

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146 Colonnade Rd. Unit 8, Ottawa, ON K2E 7Y1

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Client: Fieldstone Engineering
 150 Moorhead Dr.
 Fitzroy Harbor, ON
 K0A 1X0
 Attention: Robert Passmore
 PO#:
 Invoice to: Cavanagh Construction Ltd.

Report Number: 1420694
 Date Submitted: 2014-09-26
 Date Reported: 2014-09-30
 Project: PH2095
 COC #: 500488

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 0 Analysis Date 2014-09-30 Method C SM2340B			
Hardness as CaCO ₃			
Ion Balance			
TDS (COND - CALC)			
Run No 276945 Analysis Date 2014-09-29 Method C SM5550B			
Tannin & Lignin	<0.1 mg/L	104	80-120
Run No 276970 Analysis Date 2014-09-27 Method C SM2130B			
Turbidity	<0.1 NTU	100	70-130
Run No 276983 Analysis Date 2014-09-29 Method C SM4500-Norg-C			
Total Kjeldahl Nitrogen	<0.10 mg/L	103	77-123
Run No 276988 Analysis Date 2014-09-29 Method C SM4500-NH3D			
N-NH ₃	<0.02 mg/L	96	85-115
Run No 277001 Analysis Date 2014-09-29 Method C SM5530D			
Phenols	<0.001 mg/L	83	73-127
Run No 277003 Analysis Date 2014-09-29 Method C SM4500-NO3-F			

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Client: Fieldstone Engineering
150 Moorhead Dr.
Fitzroy Harbor, ON
K0A 1X0
Attention: Robert Passmore
PO#:
Invoice to: Cavanagh Construction Ltd.

Report Number: 1420694
Date Submitted: 2014-09-26
Date Reported: 2014-09-30
Project: PH2095
COC #: 500488

QC Summary

Analyte	Blank	QC % Rec	QC Limits
N-NO2	<0.10 mg/L	100	80-120
N-NO3	<0.10 mg/L	102	80-120
Run No 277017 Analysis Date 2014-09-29 Method C SM4500-S2-D			
S2-	<0.01 mg/L	110	
Run No 277021 Analysis Date 2014-09-29 Method EPA 200.8			
Fe	<0.03 mg/L	97	92-107
Mn	<0.01 mg/L	100	94-106
Run No 277033 Analysis Date 2014-09-29 Method M SM3120B-3500C			
Ca	<1 mg/L	100	80-120
K	<1 mg/L	108	80-120
Mg	<1 mg/L	99	80-120
Na	<2 mg/L	102	80-120
Run No 277072 Analysis Date 2014-09-29 Method SM 2320B			
Alkalinity as CaCO3	<5 mg/L	97	95-105
Conductivity	<5 uS/cm	99	95-105
F	<0.10 mg/L	96	90-110
pH	5.76	100	90-110

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Report Number: 1420694
 Date Submitted: 2014-09-26
 Date Reported: 2014-09-30
 Project: PH2095
 COC #: 500488

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 277087 Analysis Date 2014-09-29 Method SM 4110			
Cl	<1 mg/L	100	90-110
SO4	<1 mg/L	106	90-110
Run No 277093 Analysis Date 2014-09-30 Method C SM2120C			
Colour	<2 TCU	100	90-110
Run No 277128 Analysis Date 2014-09-29 Method C SM5310C			
DOC	<0.5 mg/L	100	84-116

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Client: Fieldstone Engineering
150 Moorhead Dr.
Ashton, ON
K0A 1X0
Attention: Mr. Robert Passmore
PO#:
Invoice to: Thomas Cavanagh Construction

Report Number: 1420713
Date Submitted: 2014-09-26
Date Reported: 2014-09-29
Project: PH2095
COC #: 500488

Page 1 of 2

Dear Robert Passmore:

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Report Comments:

APPROVAL: _____

Krista Quantrill
Laboratory Supervisor, Microbiology

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 150 Moorhead Dr.
 Ashton, ON
 K0A 1X0
 Attention: Mr. Robert Passmore
 PO#:
 Invoice to: Thomas Cavanagh Construction

Report Number: 1420713
 Date Submitted: 2014-09-26
 Date Reported: 2014-09-29
 Project: PH2095
 COC #: 500488

					Lab I.D.	Sample Matrix	Sample Type	Sampling Date	Sample I.D.
					1136313	Water	1136314	Water	1136315
					2014-09-26	1308 South Beach	2014-09-26	1320 South Beach	2014-09-26
Group	Analyte	MRL	Units	Guideline					
Microbiology	Escherichia Coli	0	ct/100mL	MAC-0	0	0	0	0	0
	Faecal Coliforms	0	ct/100mL		0	0	0	0	0
	Faecal Streptococcus	0	ct/100mL		0	0	0	0	0
	Heterotrophic Plate Count	0	ct/1mL		6	1	1	1	1
	Total Coliforms	0	ct/100mL	MAC-0	0	0	0	0	0

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Client: Fieldstone Engineering
 150 Moorhead Dr.
 Fitzroy Harbor, ON
 K0A 1X0
 Attention: Robert Passmore
 PO#:
 Invoice to: Cavanagh Construction Ltd.

Report Number: 1421344
 Date Submitted: 2014-10-06
 Date Reported: 2014-10-08
 Project: PH2095
 COC #: 176998

					Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.
					1138023 Water 2014-10-06 1359 Coker
Group	Analyte	MRL	Units	Guideline	
Microbiology	Escherichia Coli	0	ct/100mL	MAC-0	0
	Faecal Coliforms	0	ct/100mL		0
	Faecal Streptococcus	0	ct/100mL		0
	Heterotrophic Plate Count	0	ct/1mL		2
	Total Coliforms	0	ct/100mL	MAC-0	0

Guideline = ODWSOG*** = Guideline Exceedence**

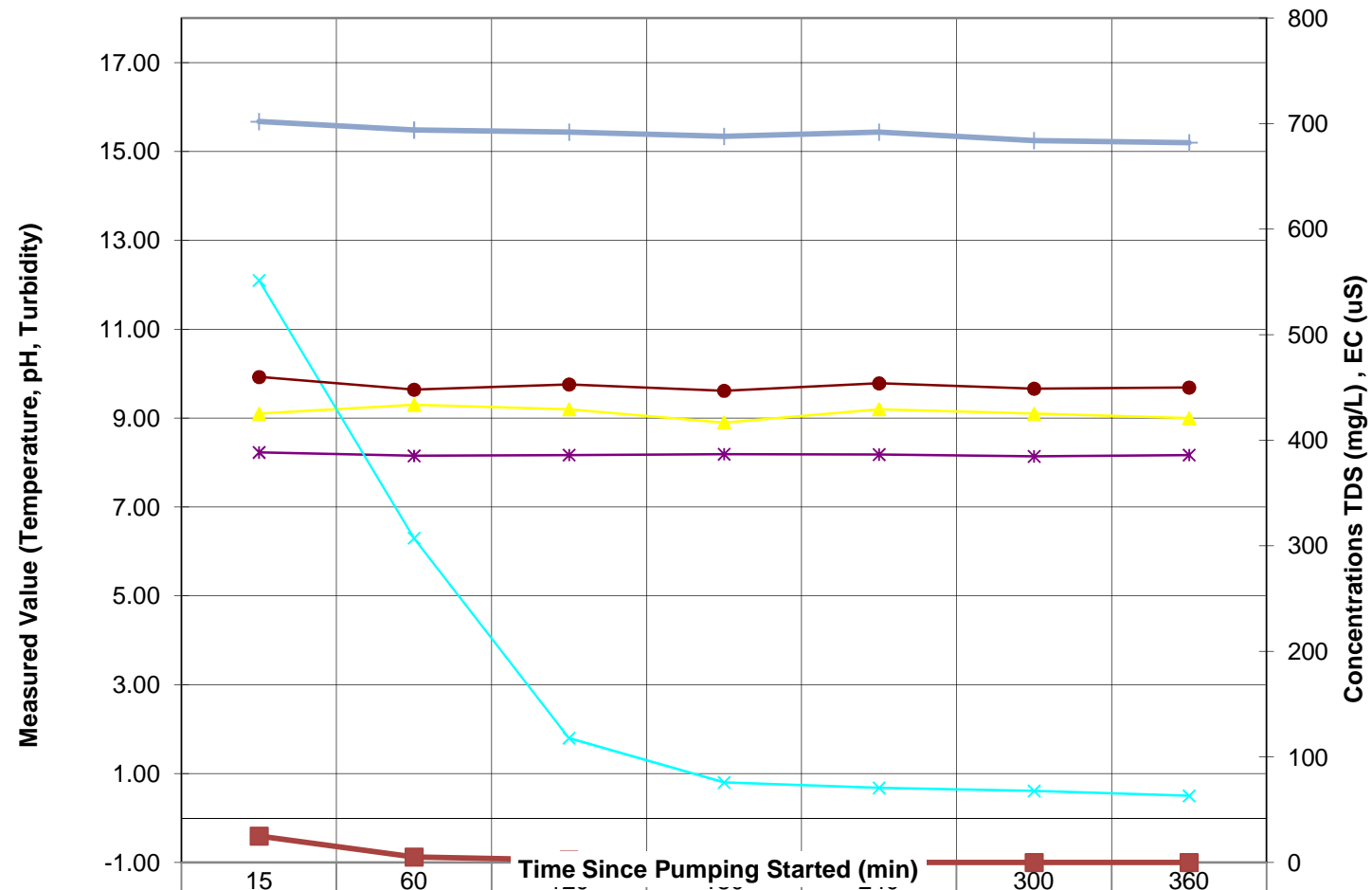
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Methods references and/or additional QA/QC information available on request.

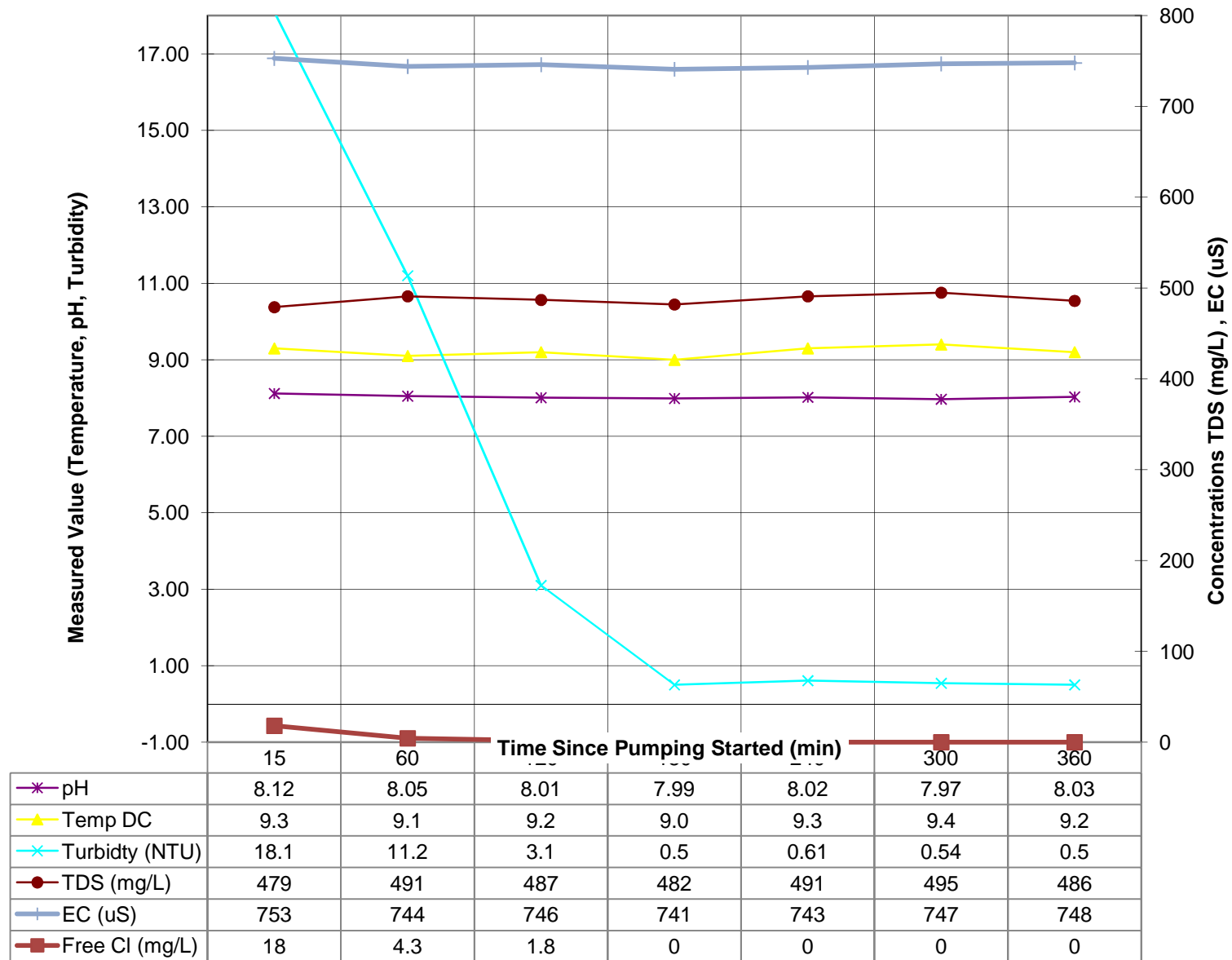
MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired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

Field Measurements During Constant Rate Pumping Test of TW1

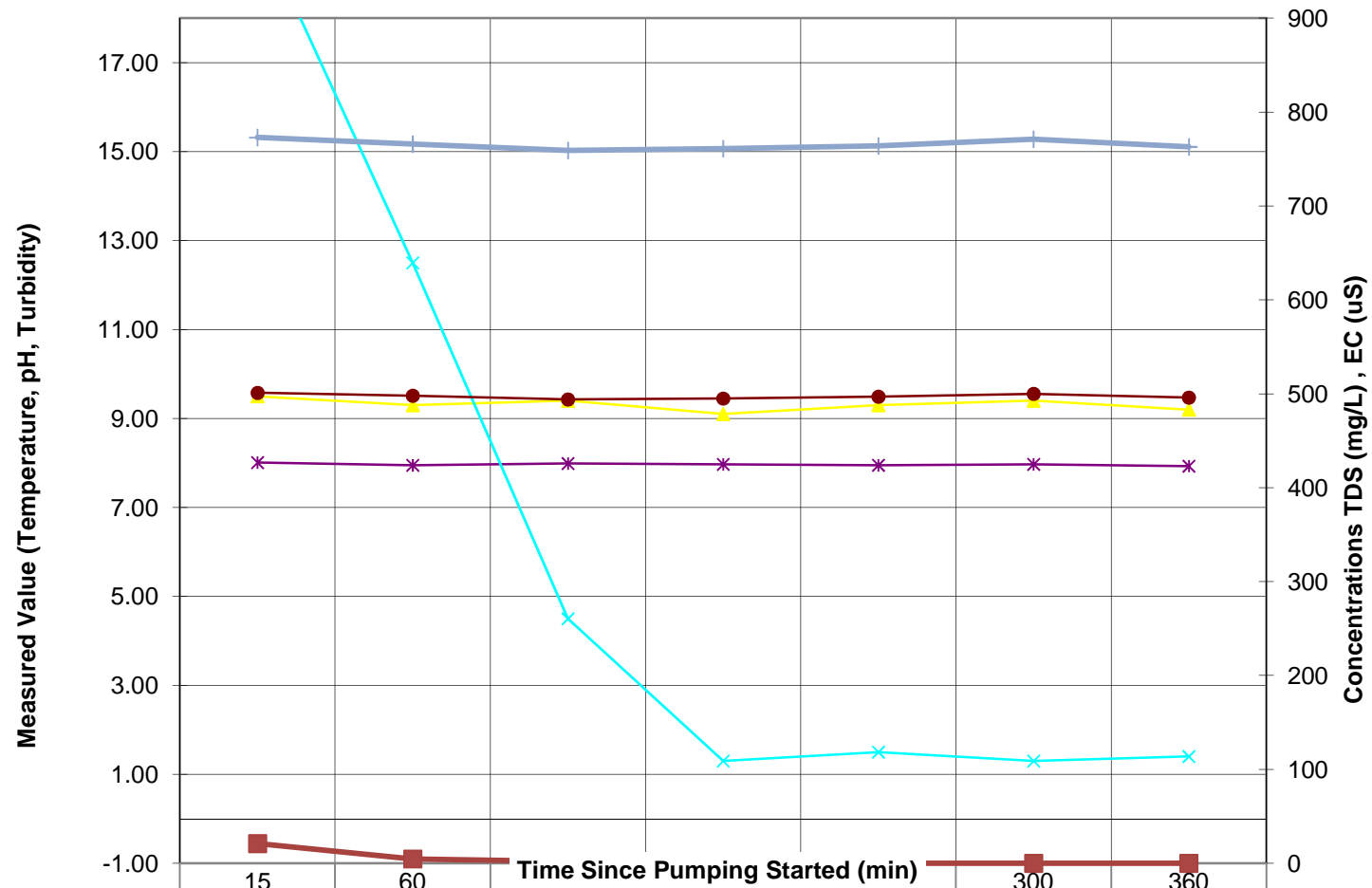


* pH	8.23	8.15	8.17	8.19	8.18	8.14	8.17
▲ Temp DC	9.1	9.3	9.2	8.9	9.2	9.1	9.0
× Turbidity (NTU)	12.1	6.3	1.8	0.8	0.68	0.61	0.5
● TDS (mg/L)	460	448	453	447	454	449	450
+ EC (uS)	702	694	692	688	692	684	682
■ Free Cl (mg/L)	25	5.2	2.2	0	0	0	0

Field Measurements During Constant Rate Pumping Test of TW2

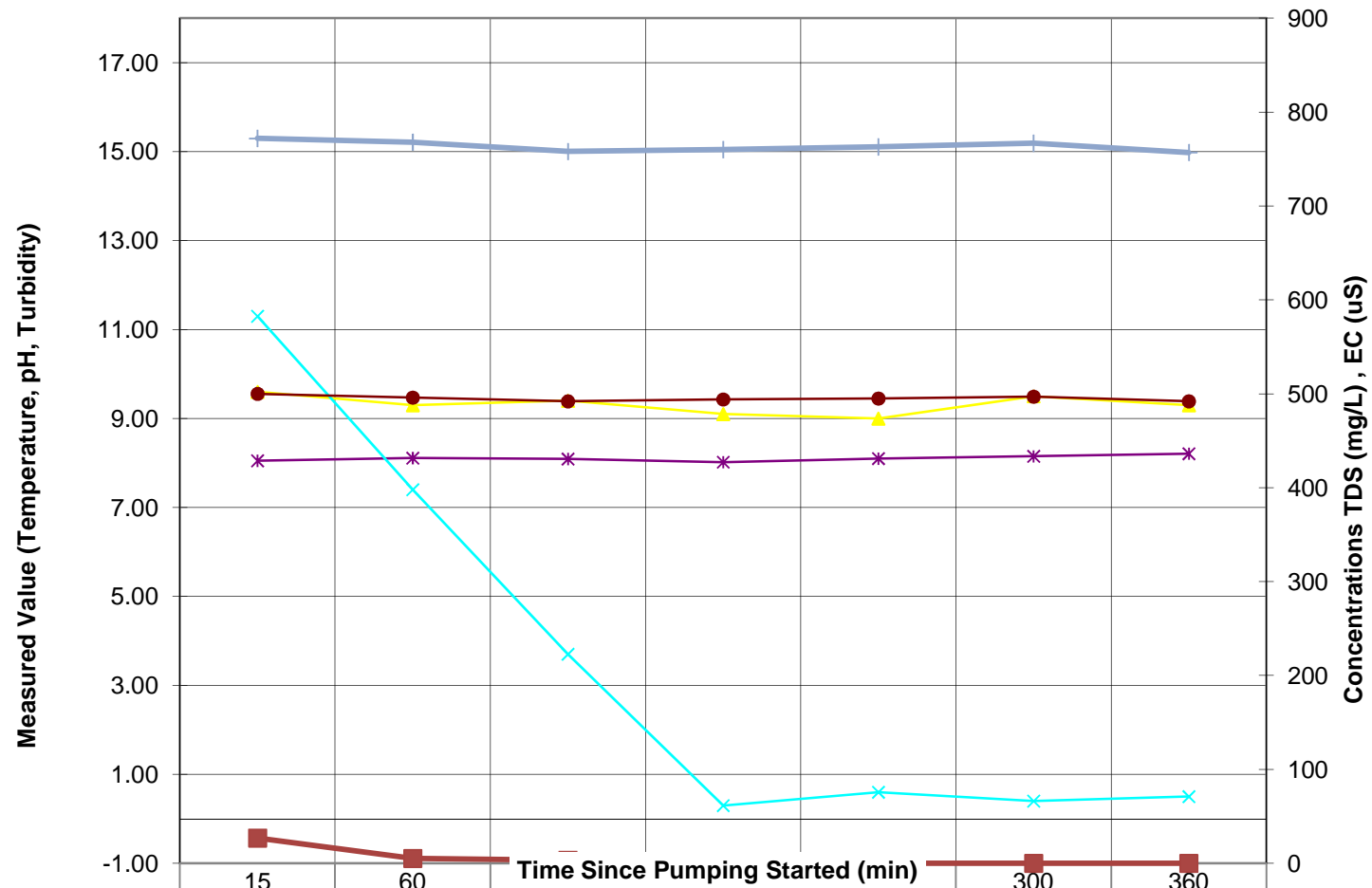


Field Measurements During Constant Rate Pumping Test of TW3



* pH	8.01	7.95	7.99	7.97	7.95	7.97	7.93
▲ Temp DC	9.5	9.3	9.4	9.1	9.3	9.4	9.2
× Turbidity (NTU)	20.1	12.5	4.5	1.3	1.5	1.3	1.4
● TDS (mg/L)	501	498	494	495	497	500	496
+ EC (uS)	773	766	759	761	764	771	763
■ Free Cl (mg/L)	21	4.7	2.1	0	0	0	0

Field Measurements During Constant Rate Pumping Test of TW4



✱ pH	8.05	8.11	8.09	8.02	8.10	8.15	8.21
▲ Temp DC	9.6	9.3	9.4	9.1	9.0	9.5	9.3
✕ Turbidty (NTU)	11.3	7.4	3.7	0.3	0.6	0.4	0.5
● TDS (mg/L)	500	496	492	494	495	497	492
+ EC (uS)	772	768	758	760	763	767	757
■ Free Cl (mg/L)	27	5.2	3.4	0	0	0	0

APPENDIX 4

- ☐ **AQUIFER ANALYSIS DATA FOR TEST WELLS**
- ☐ **PREDICTIVE IMPACT ASSESSMENT AND WATER BUDGET ANALYSIS**

Paterson Group Inc.
154 Colonnade Road South
Ottawa, Ontario K2E 7J5

Pumping Test Analysis Report

4-1

Project: 1240 Old Prescott Road

Number: PH2095

Client:

Location:

Pumping Test: TW1

Pumping Well: Well 1

Test Conducted by:

Test Date: 1/20/2014

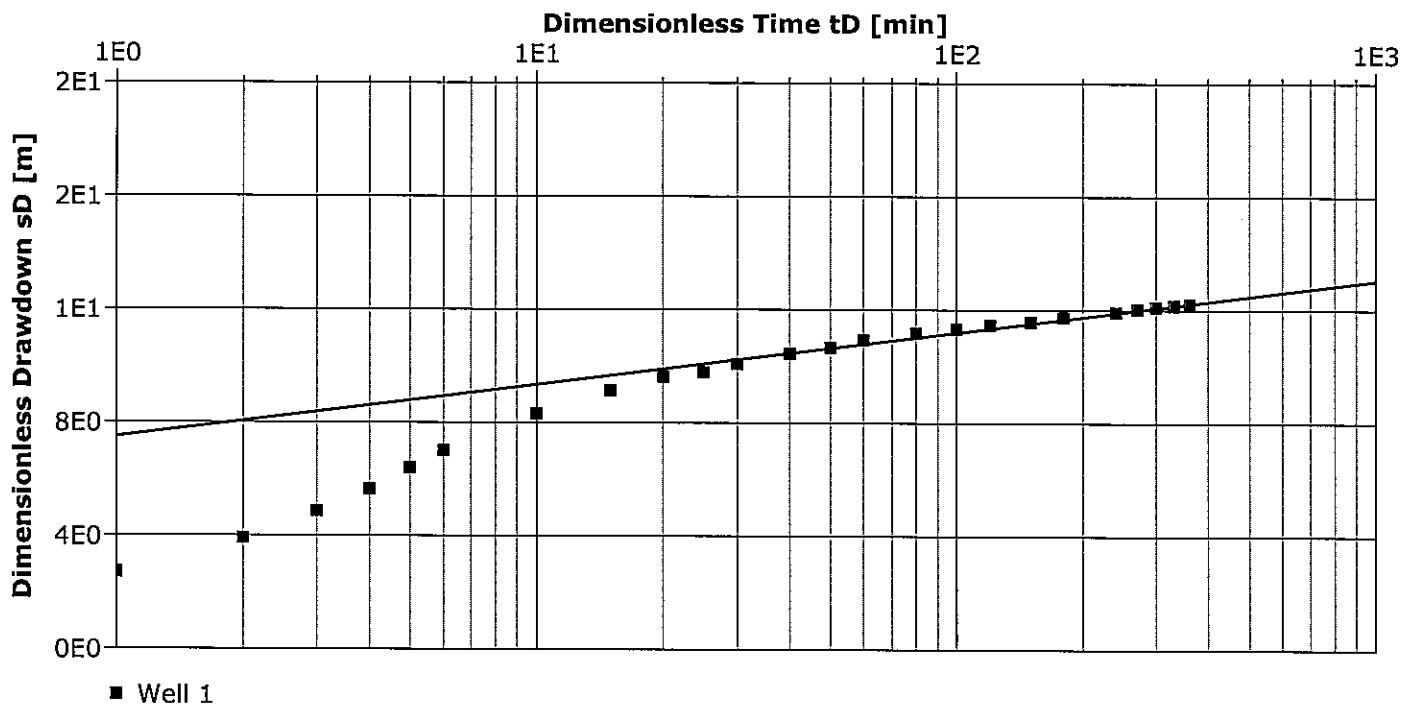
Analysis Performed by: RAP

New analysis 1

Analysis Date: 10/1/2013

Aquifer Thickness:

Discharge Rate: 0.63 [l/s]



Calculation using COOPER & JACOB

Observation Well

Transmissivity
[m²/d]

Storage coefficient

Radial Distance to PW
[m]

Well 1

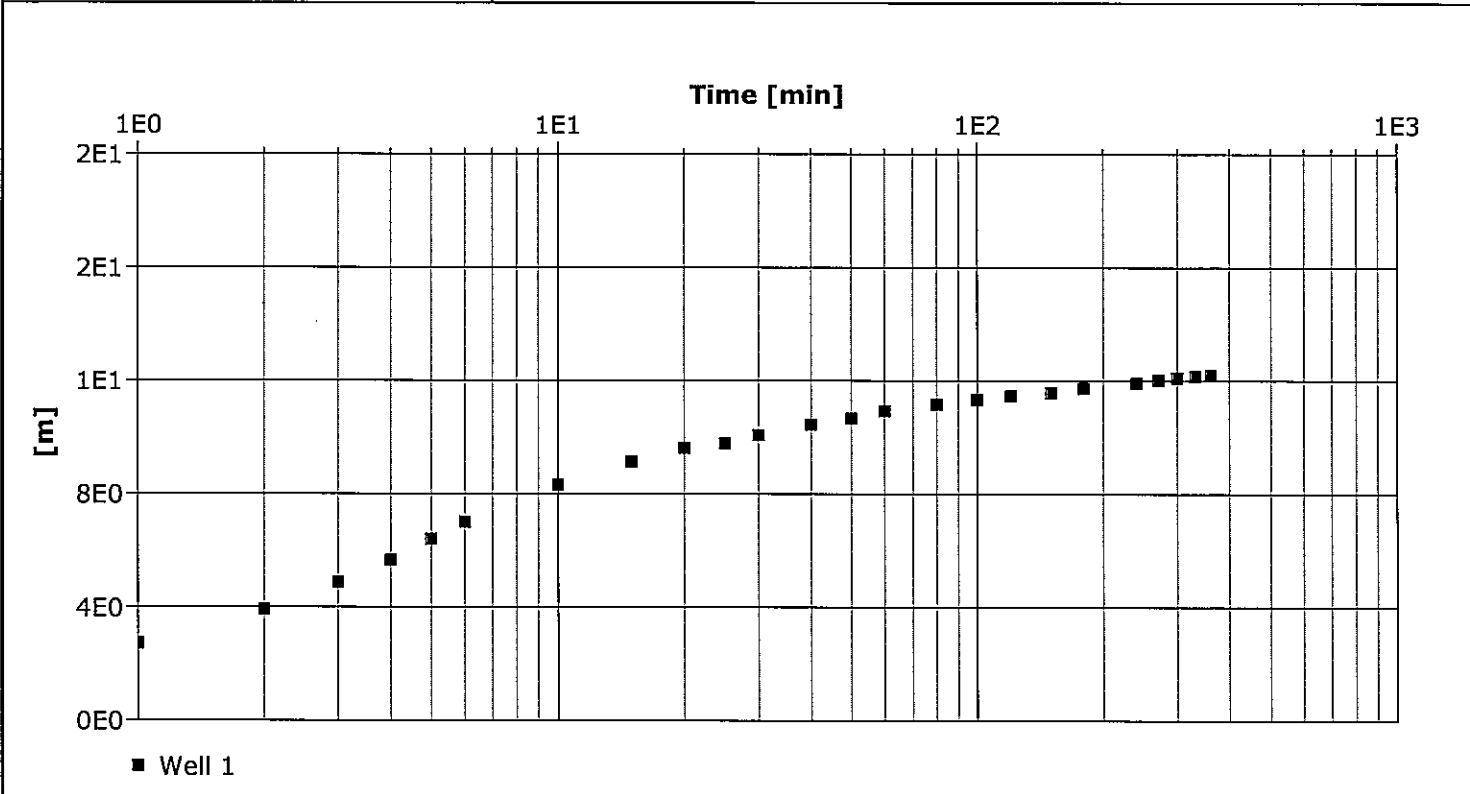
5.40×10^0

1.32×10^{-4}

0.07

Paterson Group Inc. 154 Colonnade Road South Ottawa, Ontario K2E 7J5	Pumping Test Analysis Report		4-1
	Project: 1240 Old Prescott Road		
	Number: PH2095		
	Client:		

Location:	Pumping Test: TW1	Pumping Well: Well 1
Test Conducted by:		Test Date: 1/20/2014
Analysis Performed by:	Cooper Jacobs	Analysis Date: 10/15/2013
Aquifer Thickness:	Discharge Rate: 0.63 [l/s]	



Calculation using Theis with Jacob Correction				
Observation Well	Transmissivity [m ² /d]	Storage coefficient	Radial Distance to PW [m]	
Well 1	4.34 × 10 ⁻¹	5.00 × 10 ⁻¹	0.07	

Paterson Group Inc.
154 Colonnade Road South
Ottawa, Ontario K2E 7J5

Pumping Test Analysis Report

Project: 1240 Old Prescott Road

Number: PH2095

Client:

Location:

Pumping Test: TW1

Pumping Well: Well 1

Test Conducted by:

Test Date: 1/20/2014

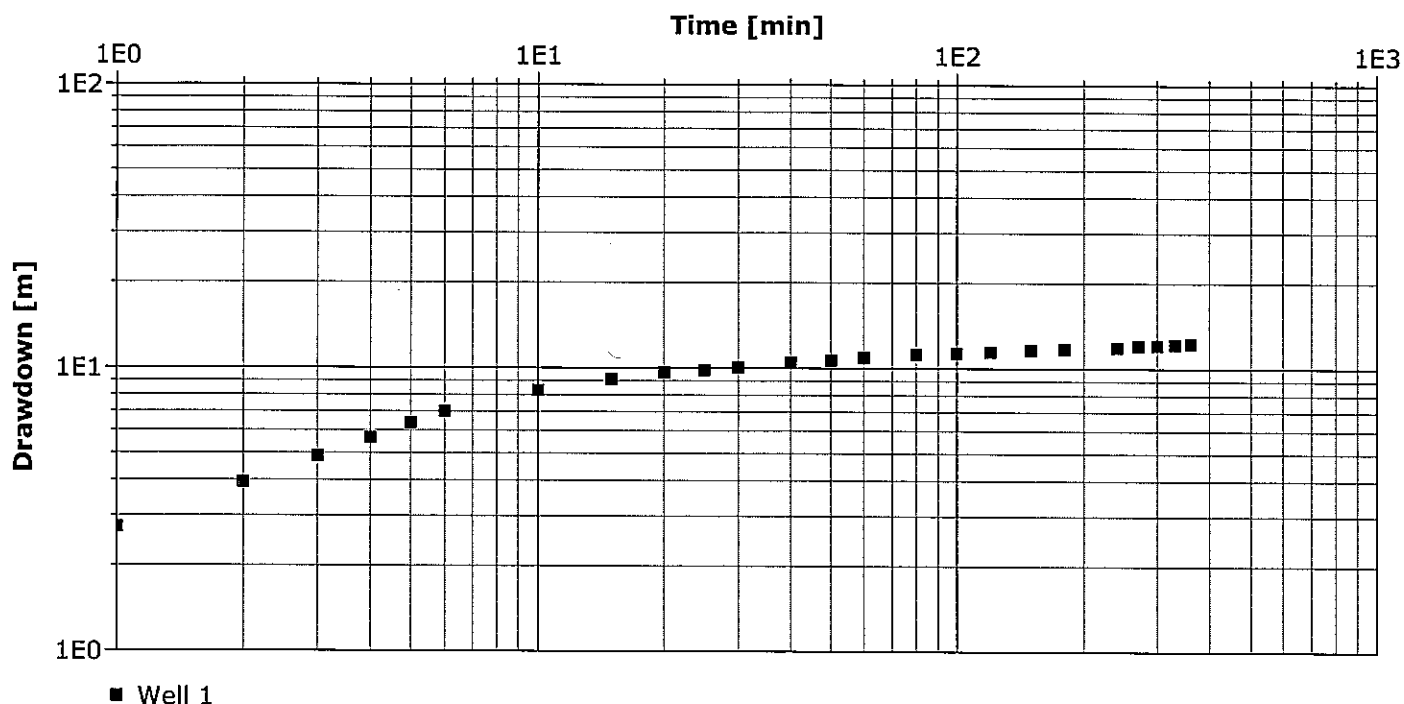
Analysis Performed by:

Cooper & Jacobs 1

Analysis Date: 10/8/2013

Aquifer Thickness:

Discharge Rate: 0.63 [l/s]



Calculation using COOPER & JACOB

Observation Well

Transmissivity
[m²/d]

Storage coefficient

Radial Distance to PW
[m]

Well 1

5.28×10^0

1.61×10^{-4}

0.07

Paterson Group Inc. 154 Colonnade Road South Ottawa, Ontario K2E 7J5				Pumping Test Analysis Report				
				Project: 1240 Old Prescott Road				
				Number: PH2095				
				Client:				
Location:		Pumping Test: TW1		Pumping Well: Well 1				
Test Conducted by:				Test Date: 1/20/2014				
Aquifer Thickness:		Discharge Rate: 0.63 [l/s]						
	Analysis Name	Analysis Performed by	Analysis Date	Method name	Well	T [m²/d]	S	
1	New analysis 1	RAP	10/1/2013	Cooper & Jacob I	Well 1	5.40×10^0	1.32×10^{-4}	
2	Cooper Jacobs		10/15/2013	Theis with Jacob Correction	Well 1	4.34×10^1	5.00×10^{-1}	
3	Cooper & Jacobs 1		10/8/2013	Cooper & Jacob I	Well 1	5.28×10^0	1.61×10^{-4}	
						Average	1.80×10^1	1.67×10^{-1}

Paterson Group Inc.
154 Colonnade Road South
Ottawa, Ontario K2E 7J5

Pumping Test - Water Level Data

Page 1 of 1

Project: 1240 Old Prescott Road

Number: PH2095

Client:

Location:

Pumping Test: TW1

Pumping Well: Well 1

Test Conducted by:

Test Date: 1/20/2014

Discharge Rate: 0.63 [l/s]

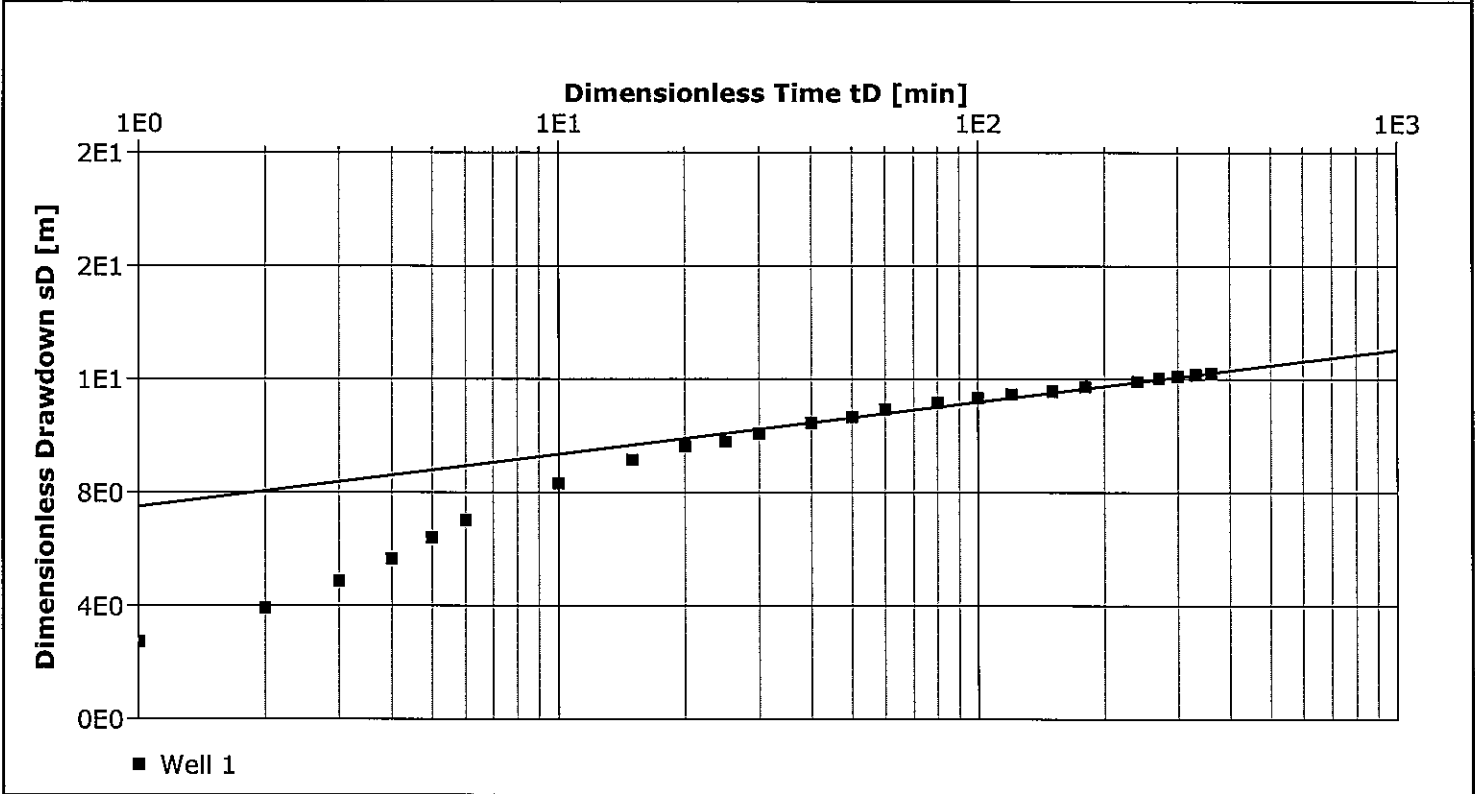
Observation Well: Well 1

Static Water Level [m]: 10.42

Radial Distance to PW [m]: -

	Time [min]	Water Level [m]	Drawdown [m]
1	0	10.42	0.00
2	1	13.15	2.73
3	2	14.35	3.93
4	3	15.29	4.87
5	4	16.08	5.66
6	5	16.81	6.39
7	6	17.42	7.00
8	10	18.73	8.31
9	15	19.56	9.14
10	20	20.04	9.62
11	25	20.22	9.80
12	30	20.50	10.08
13	40	20.87	10.45
14	50	21.08	10.66
15	60	21.35	10.93
16	80	21.60	11.18
17	100	21.75	11.33
18	120	21.90	11.48
19	150	21.99	11.57
20	180	22.15	11.73
21	240	22.33	11.91
22	270	22.46	12.04
23	300	22.52	12.10
24	330	22.58	12.16
25	360	22.64	12.22
26	361	16.36	5.94
27	362	15.11	4.69
28	363	13.35	2.93
29	364	12.27	1.85
30	365	11.91	1.49
31	366	11.70	1.28
32	367	11.42	1.00
33	368	11.17	0.75
34	369	10.90	0.48
35	370	10.78	0.36
36	375	10.57	0.15
37	380	10.50	0.08
38	390	10.47	0.05
39	400	10.44	0.02
40	410	10.43	0.01
41	420	10.42	0.00

Paterson Group Inc. 154 Colonnade Road South Ottawa, Ontario K2E 7J5		Pumping Test Analysis Report		4-1
		Project: 1240 Old Prescott Road		
		Number: PH2095		
		Client:		
Location:		Pumping Test: TW1		Pumping Well: Well 1
Test Conducted by:			Test Date: 1/20/2014	
Analysis Performed by: RAP		New analysis 1		Analysis Date: 10/1/2013
Aquifer Thickness:		Discharge Rate: 0.63 [l/s]		



Calculation using COOPER & JACOB				
Observation Well	Transmissivity [m ² /d]	Storage coefficient	Radial Distance to PW [m]	
Well 1	5.40 × 10 ⁰	1.32 × 10 ⁻⁴	0.07	

Paterson Group Inc.
154 Colonnade Road South
Ottawa, Ontario K2E 7J5

Pumping Test Analysis Report

4-1

Project: 1240 Old Prescott Road

Number: PH2095

Client:

Location:

Pumping Test: TW1

Pumping Well: Well 1

Test Conducted by:

Test Date: 1/20/2014

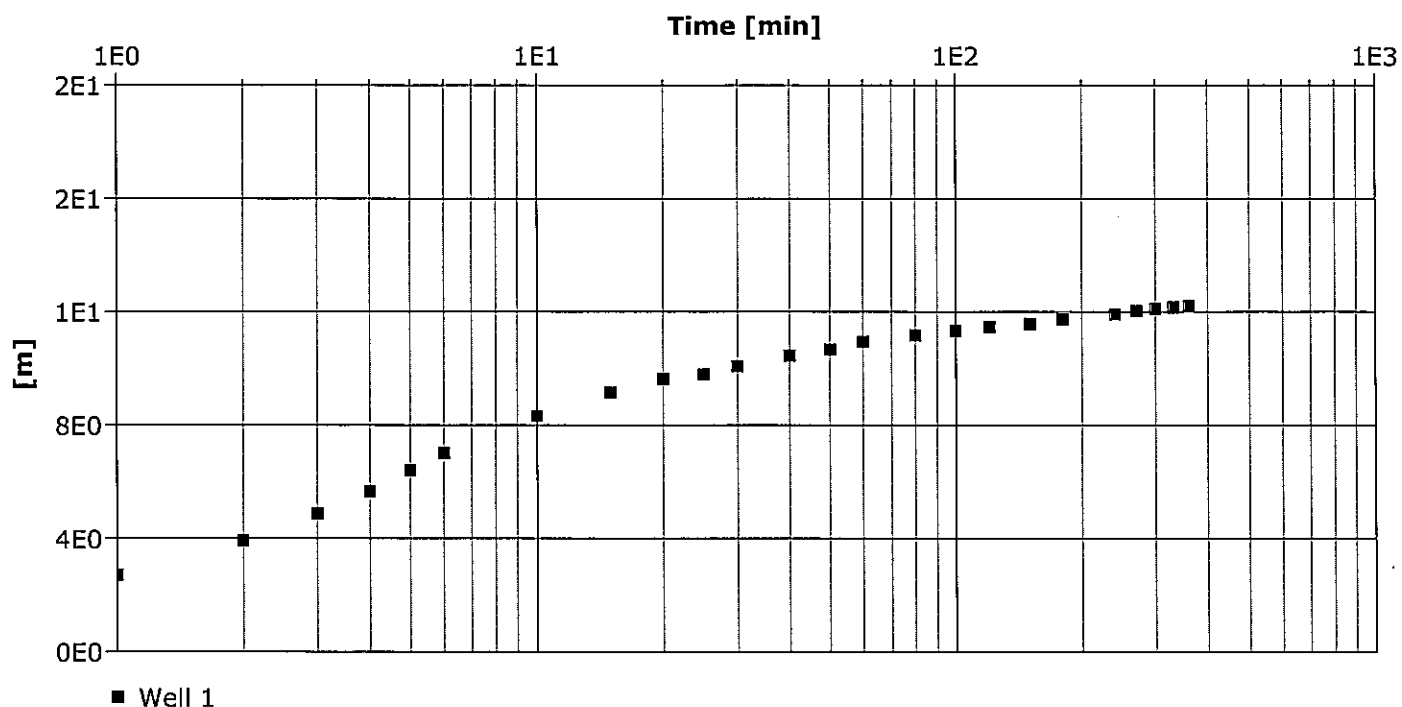
Analysis Performed by:

Cooper Jacobs

Analysis Date: 10/15/2013

Aquifer Thickness:

Discharge Rate: 0.63 [l/s]



Calculation using Theis with Jacob Correction

Observation Well	Transmissivity [m ² /d]	Storage coefficient	Radial Distance to PW [m]	
Well 1	4.34×10^{-1}	5.00×10^{-1}	0.07	

Paterson Group Inc.
154 Colonnade Road South
Ottawa, Ontario K2E 7J5

Pumping Test Analysis Report

Project: 1240 Old Prescott Road

Number: PH2095

Client:

Location:

Pumping Test: TW1

Pumping Well: Well 1

Test Conducted by:

Test Date: 1/20/2014

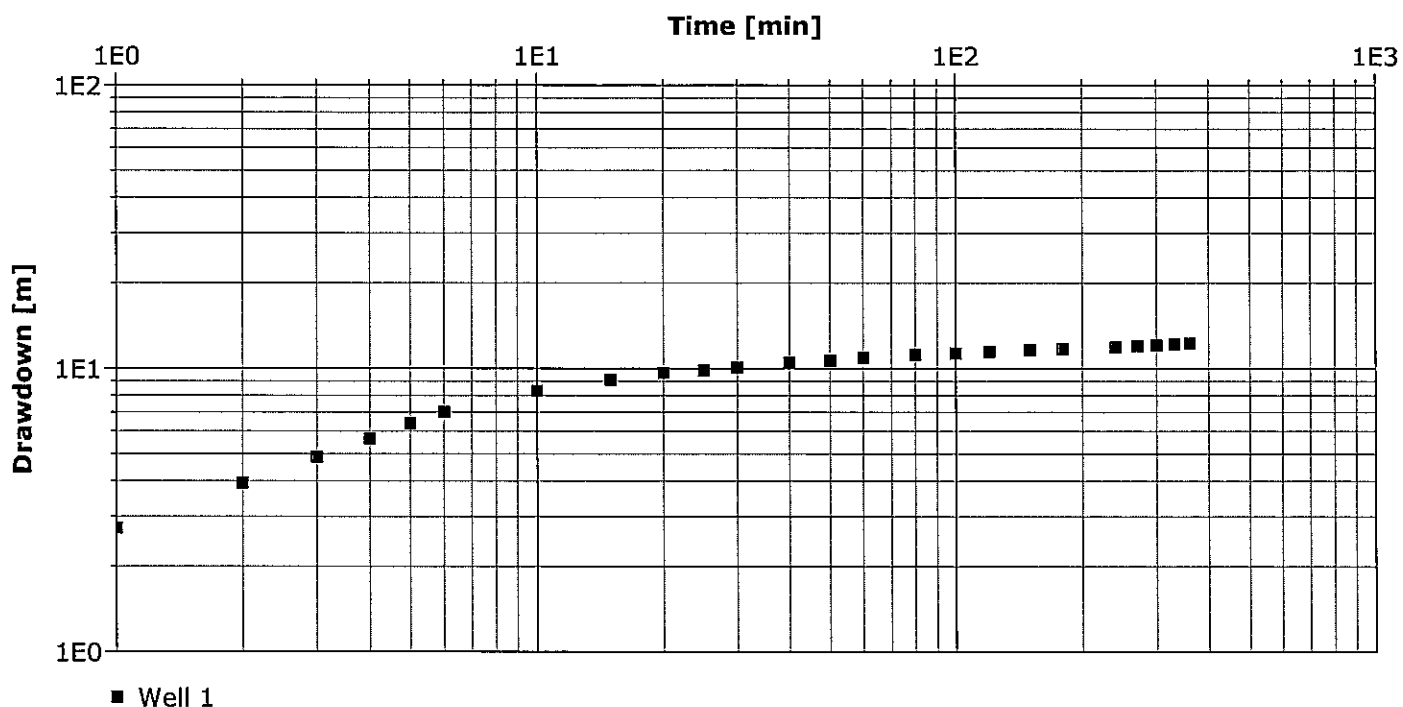
Analysis Performed by:

Cooper & Jacobs 1

Analysis Date: 10/8/2013

Aquifer Thickness:

Discharge Rate: 0.63 [l/s]



Calculation using COOPER & JACOB

Observation Well	Transmissivity [m ² /d]	Storage coefficient	Radial Distance to PW [m]	
Well 1	5.28×10^0	1.61×10^{-4}	0.07	

Paterson Group Inc. 154 Colonnade Road South Ottawa, Ontario K2E 7J5				Pumping Test Analysis Report			
				Project: 1240 Old Prescott Road			
				Number: PH2095			
				Client:			
Location:		Pumping Test: TW1		Pumping Well: Well 1			
Test Conducted by:				Test Date: 1/20/2014			
Aquifer Thickness:		Discharge Rate: 0.63 [l/s]					
	Analysis Name	Analysis Performed by	Analysis Date	Method name	Well	T [m ² /d]	S
1	New analysis 1	RAP	10/1/2013	Cooper & Jacob I	Well 1	5.40×10^0	1.32×10^{-4}
2	Cooper Jacobs		10/15/2013	Theis with Jacob Correction	Well 1	4.34×10^1	5.00×10^{-1}
3	Cooper & Jacobs 1		10/8/2013	Cooper & Jacob I	Well 1	5.28×10^0	1.61×10^{-4}
Average						1.80×10^1	1.67×10^{-1}

Paterson Group Inc.
154 Colonnade Road South
Ottawa, Ontario K2E 7J5

Pumping Test - Water Level Data

Page 1 of 1

Project:

Number: PH2095

Client:

Location:

Pumping Test: TW2

Pumping Well: Well 1

Test Conducted by:

Test Date: 10/17/2013

Discharge Rate: 0.5 [l/s]

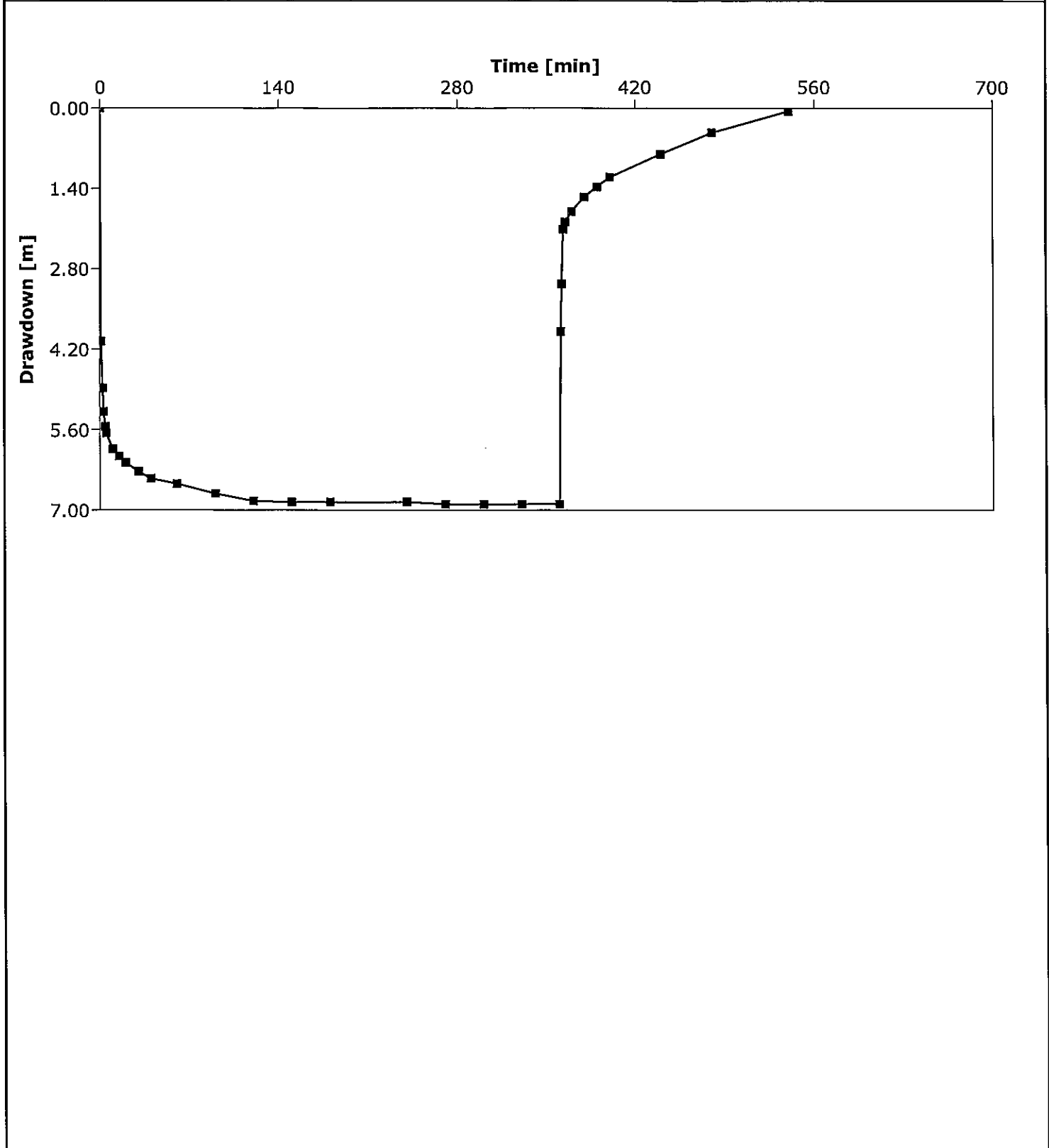
Observation Well: Well 1

Static Water Level [m]: 10.45

Radial Distance to PW [m]: -

	Time [min]	Water Level [m]	Drawdown [m]
1	0	10.45	0.00
2	1	14.51	4.06
3	2	15.32	4.87
4	3	15.73	5.28
5	4	15.99	5.54
6	5	16.11	5.66
7	10	16.39	5.94
8	15	16.51	6.06
9	20	16.62	6.17
10	30	16.78	6.33
11	40	16.90	6.45
12	60	16.99	6.54
13	90	17.16	6.71
14	120	17.29	6.84
15	150	17.31	6.86
16	180	17.31	6.86
17	240	17.31	6.86
18	270	17.35	6.90
19	300	17.35	6.90
20	330	17.35	6.90
21	360	17.35	6.90
22	361	14.34	3.89
23	362	13.51	3.06
24	363	12.56	2.11
25	365	12.44	1.99
26	370	12.25	1.80
27	380	12.00	1.55
28	390	11.82	1.37
29	400	11.65	1.20
30	440	11.25	0.80
31	480	10.88	0.43
32	540	10.51	0.06

Paterson Group Inc. 154 Colonnade Road South Ottawa, Ontario K2E 7J5		Pumping Test Analysis Report		4-2
		Project:		
		Number: PH2095		
		Client:		
Location:		Pumping Test: TW2		Pumping Well: Well 1
Test Conducted by:			Test Date: 10/17/2013	
Analysis Performed by:		Time-Drawdown		Analysis Date: 10/23/2013
Aquifer Thickness:		Discharge Rate: 0.5 [l/s]		



Paterson Group Inc.
154 Colonnade Road South
Ottawa, Ontario K2E 7J5

Pumping Test Analysis Report

Project:

Number: PH2095

Client:

Location:

Pumping Test: TW2

Pumping Well: Well 1

Test Conducted by:

Test Date: 10/17/2013

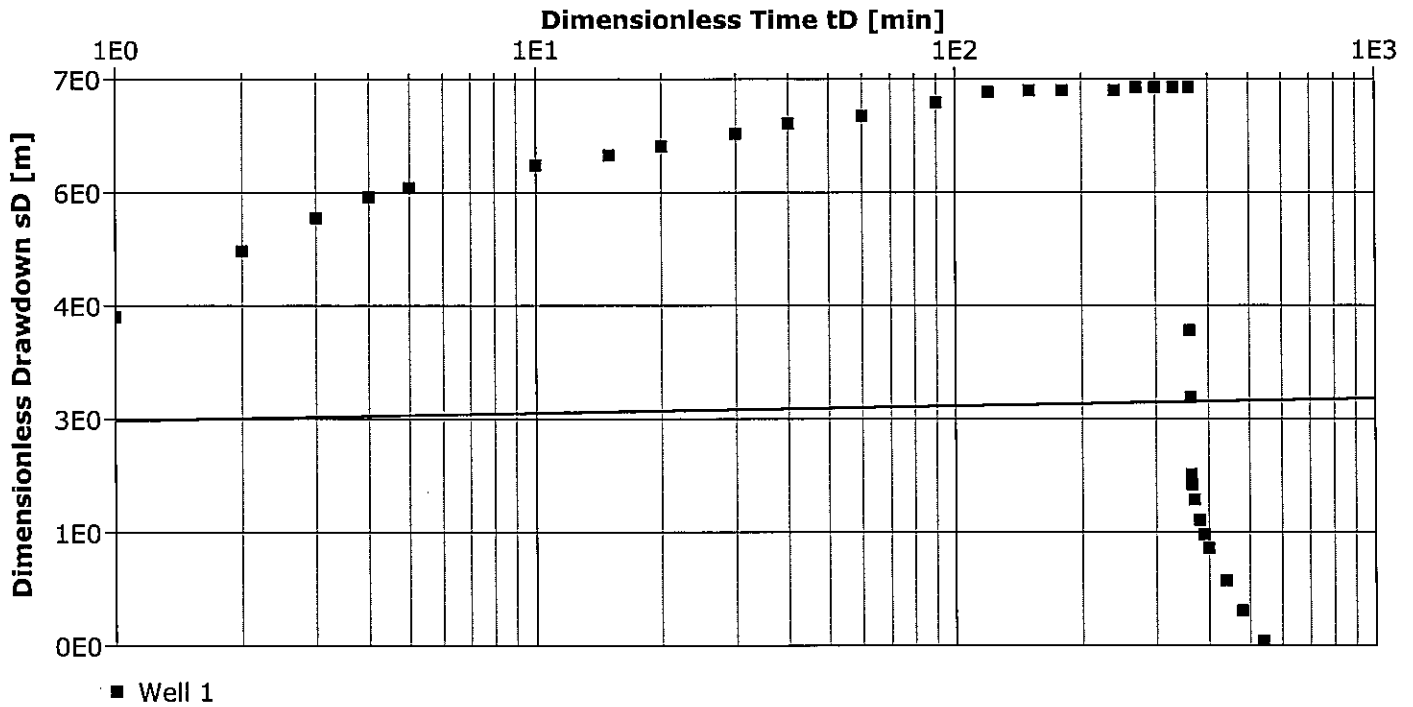
Analysis Performed by:

Cooper- Jacobs

Analysis Date: 10/23/2013

Aquifer Thickness:

Discharge Rate: 0.5 [l/s]



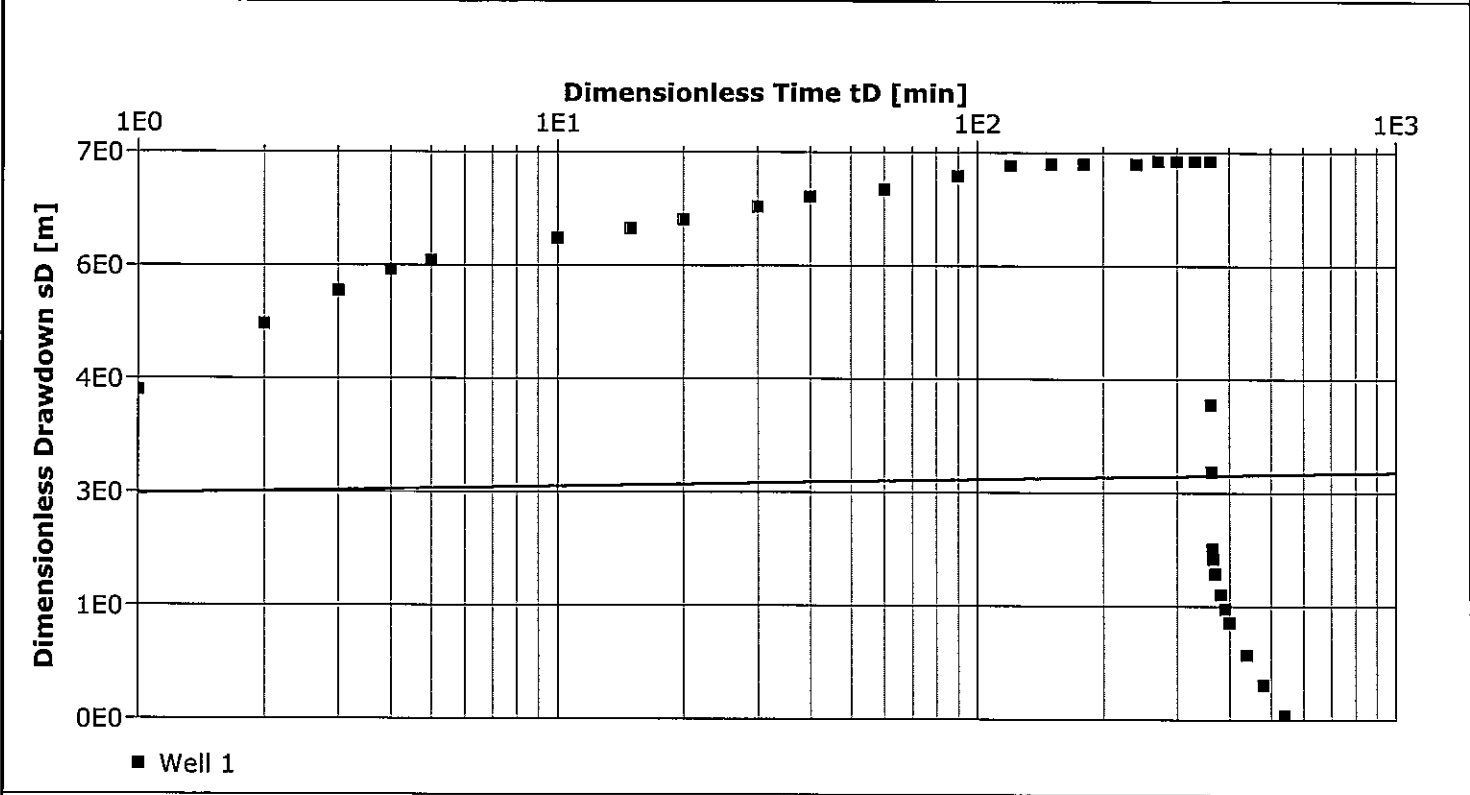
Calculation using COOPER & JACOB

Observation Well	Transmissivity [m ² /d]	Storage coefficient	Radial Distance to PW [m]	
Well 1	8.64×10^{-1}	1.00×10^{-29}	0.07	

Paterson Group Inc. 154 Colonnade Road South Ottawa, Ontario K2E 7J5				Pumping Test Analysis Report			
				Project:			
				Number: PH2095			
				Client:			
Location:		Pumping Test: TW2		Pumping Well: Well 1			
Test Conducted by:				Test Date: 10/17/2013			
Aquifer Thickness:		Discharge Rate: 0.5 [l/s]					
	Analysis Name	Analysis Performed by	Analysis Date	Method name	Well	T [m ² /d]	S
1	Cooper- Jacobs		10/23/2013	Cooper & Jacob I	Well 1	8.64 × 10 ¹	1.00 × 10 ⁻²⁹

Paterson Group Inc. 154 Colonnade Road South Ottawa, Ontario K2E 7J5	Pumping Test Analysis Report		
	Project:		
	Number: PH2095		
	Client:		

Location:	Pumping Test: TW4	Pumping Well: Well 1
Test Conducted by:	Test Date: 10/17/2013	
Analysis Performed by:	Cooper- Jacobs	Analysis Date: 10/23/2013
Aquifer Thickness:	Discharge Rate: 0.5 [l/s]	



Calculation using COOPER & JACOB				
Observation Well	Transmissivity [m ² /d]	Storage coefficient	Radial Distance to PW [m]	
Well 1	8.64 × 10 ⁻¹	1.00 × 10 ⁻²⁹	0.07	

Paterson Group Inc.
154 Colonnade Road South
Ottawa, Ontario K2E 7J5

Pumping Test - Water Level Data

Page 1 of 1

Project:

Number: PH2095

Client:

Location:

Pumping Test: Pumping Test 1

Pumping Well: TW3

Test Conducted by:

Test Date: 10/16/2013

Discharge Rate: 0.5 [l/s]

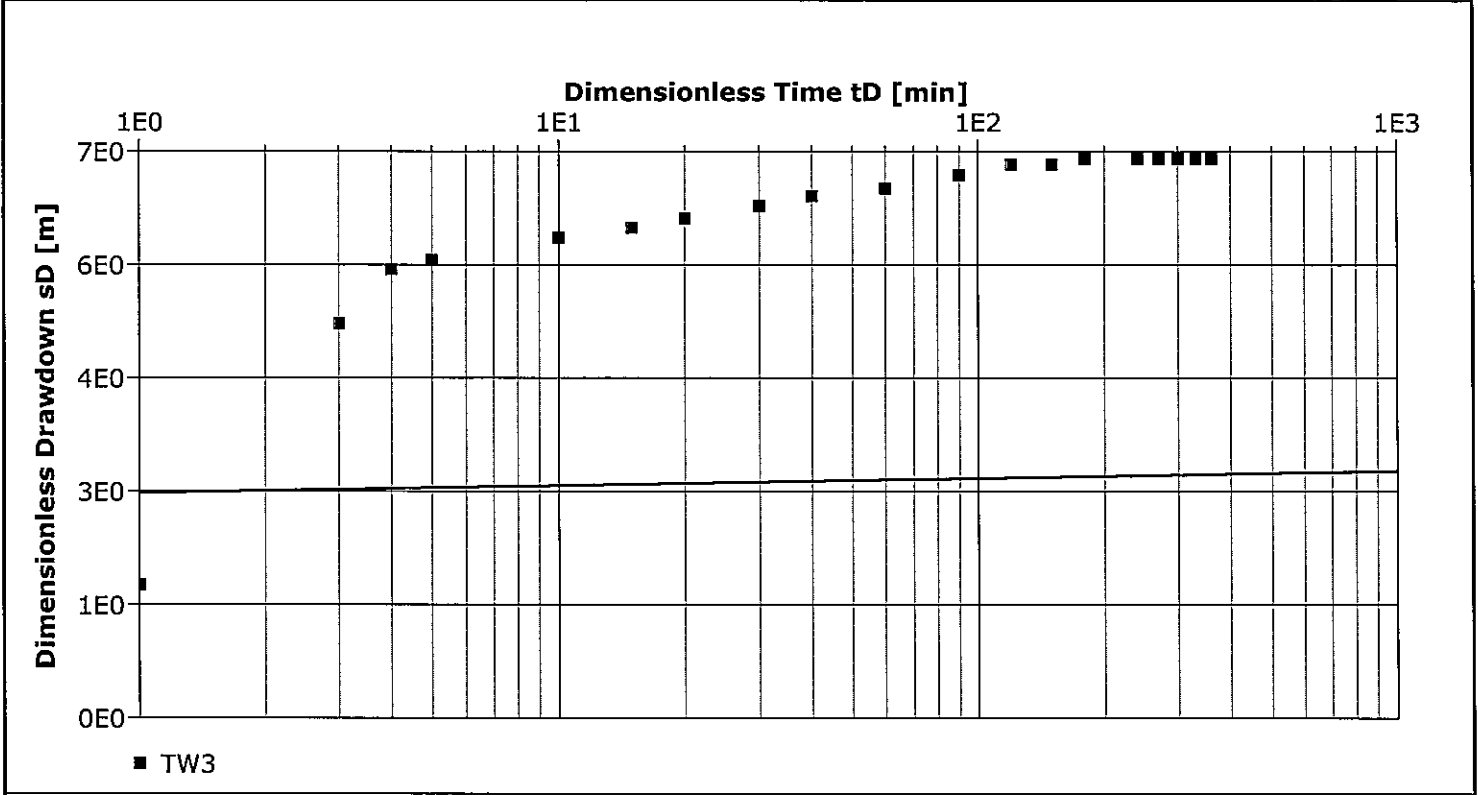
Observation Well: TW3

Static Water Level [m]: 4.75

Radial Distance to PW [m]: -

	Time [min]	Water Level [m]	Drawdown [m]
1	0	4.75	0.00
2	1	6.39	1.64
3	3	9.62	4.87
4	4	10.29	5.54
5	5	10.41	5.66
6	10	10.69	5.94
7	15	10.81	6.06
8	20	10.92	6.17
9	30	11.08	6.33
10	40	11.20	6.45
11	60	11.29	6.54
12	90	11.46	6.71
13	120	11.59	6.84
14	150	11.59	6.84
15	180	11.67	6.92
16	240	11.67	6.92
17	270	11.67	6.92
18	300	11.67	6.92
19	330	11.67	6.92
20	360	11.67	6.92
21	361	8.94	4.19
22	362	7.77	3.02
23	363	6.83	2.08
24	364	6.73	1.98
25	365	6.70	1.95
26	370	6.57	1.82
27	400	6.48	1.73
28	440	6.43	1.68

Paterson Group Inc. 154 Colonnade Road South Ottawa, Ontario K2E 7J5		Pumping Test Analysis Report	
		Project:	
		Number: PH2095	
		Client:	
Location:	Pumping Test: Pumping Test 1		Pumping Well: TW3
Test Conducted by:			Test Date: 10/16/2013
Analysis Performed by:	Time Drawdown		Analysis Date: 10/16/2013
Aquifer Thickness:	Discharge Rate: 0.5 [l/s]		



Calculation using COOPER & JACOB				
Observation Well	Transmissivity [m ² /d]	Storage coefficient	Radial Distance to PW [m]	
TW3	8.64 × 10 ⁻¹	1.00 × 10 ⁻²⁹	0.07	

Paterson Group Inc.
154 Colonnade Road South
Ottawa, Ontario K2E 7J5

Pumping Test Analysis Report

Project:

Number: PH2095

Client:

Location:

Pumping Test: Pumping Test 1

Pumping Well: TW3

Test Conducted by:

Test Date: 10/16/2013

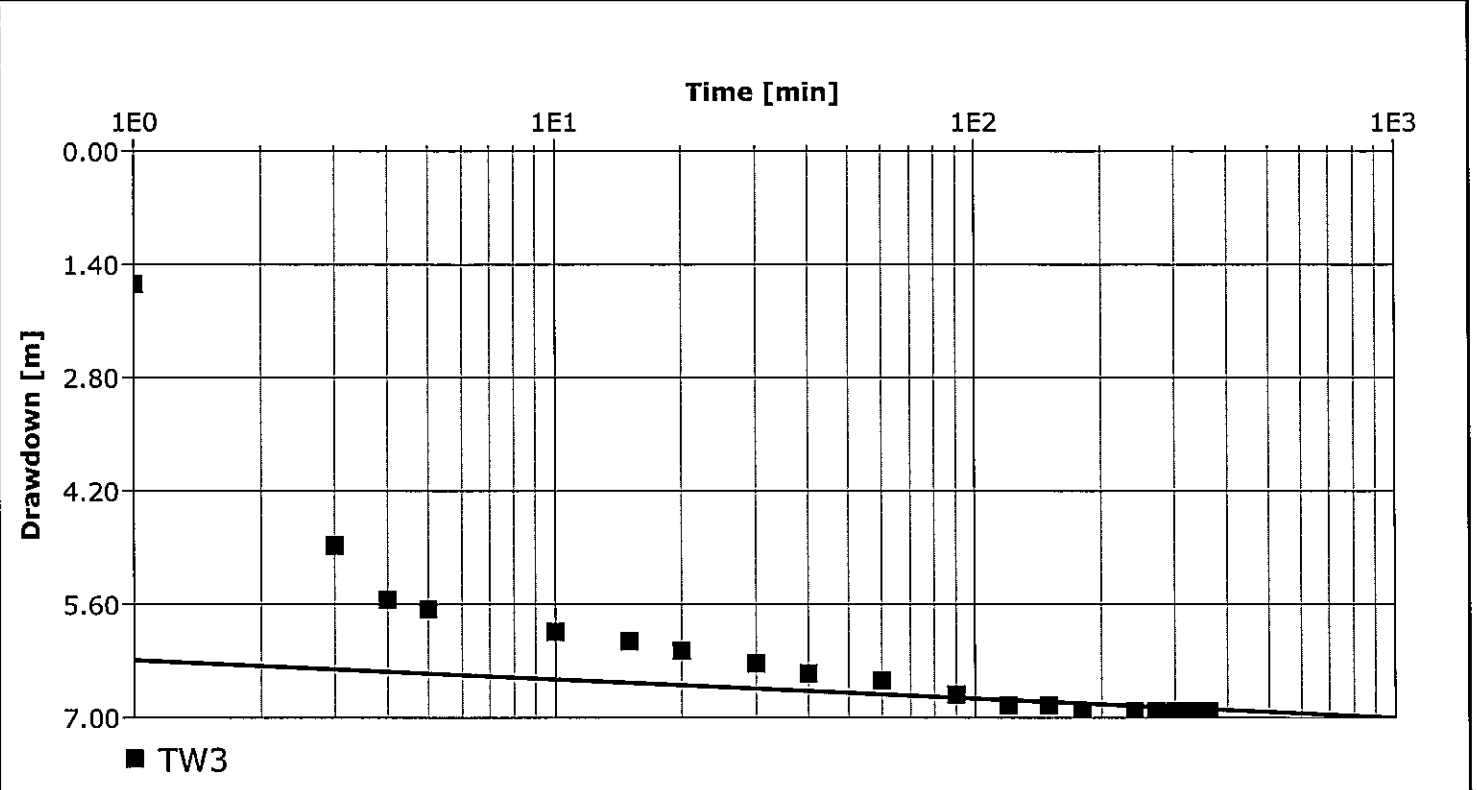
Analysis Performed by:

Cooper & Jacobs

Analysis Date: 10/16/2013

Aquifer Thickness:

Discharge Rate: 0.5 [l/s]



Calculation using COOPER & JACOB

Observation Well	Transmissivity [m ² /d]	Storage coefficient	Radial Distance to PW [m]	
TW3	3.32×10^1	3.52×10^{-26}	0.07	

Paterson Group Inc. 154 Colonnade Road South Ottawa, Ontario K2E 7J5				Pumping Test Analysis Report			
				Project:			
				Number: PH2095			
				Client:			
Location:		Pumping Test: Pumping Test 1		Pumping Well: TW3			
Test Conducted by:				Test Date: 10/16/2013			
Aquifer Thickness:		Discharge Rate: 0.5 [l/s]					
	Analysis Name	Analysis Performed by	Analysis Date	Method name	Well	T [m ² /d]	S
1	Time Drawdown		10/16/2013	Cooper & Jacob I	TW3	8.64 × 10 ¹	1.00 × 10 ⁻²⁹
2	Cooper & Jacobs		10/16/2013	Cooper & Jacob I	TW3	3.32 × 10 ¹	3.52 × 10 ⁻²⁶
Average						5.98 × 10 ¹	1.76 × 10 ⁻²⁶

Paterson Group Inc. 154 Colonnade Road South Ottawa, Ontario K2E 7J5			Pumping Test - Water Level Data		Page 1 of 13
			Project: Old Prescott Road		
			Number: PH2095		
			Client:		
Location:		Pumping Test: TW4		Pumping Well: TW4	
Test Conducted by:		Test Date: 10/8/2013		Discharge Rate: 1.39 [l/s]	
Observation Well: TW4		Static Water Level [m]: 8.22		Radial Distance to PW [m]: -	
	Time [min]	Water Level [m]	Drawdown [m]		
1	0	8.22	0.00		
2	1	10.82	2.60		
3	2	11.66	3.44		
4	3	11.69	3.47		
5	4	11.45	3.23		
6	5	11.71	3.49		
7	6	11.72	3.50		
8	7	11.72	3.50		
9	8	11.74	3.52		
10	9	11.73	3.51		
11	10	11.74	3.52		
12	11	11.74	3.52		
13	12	11.74	3.52		
14	13	11.74	3.52		
15	14	11.74	3.52		
16	15	11.75	3.53		
17	16	11.74	3.52		
18	17	11.75	3.53		
19	18	11.75	3.53		
20	19	11.74	3.52		
21	20	11.62	3.40		
22	21	11.50	3.28		
23	22	11.49	3.27		
24	23	11.48	3.26		
25	24	11.48	3.26		
26	25	11.47	3.25		
27	26	11.46	3.24		
28	27	11.46	3.24		
29	28	11.46	3.24		
30	29	11.44	3.22		
31	30	11.45	3.23		
32	31	11.45	3.23		
33	32	11.45	3.23		
34	33	11.45	3.23		
35	34	11.44	3.22		
36	35	11.44	3.22		
37	36	11.45	3.23		
38	37	11.44	3.22		
39	38	11.44	3.22		
40	39	11.44	3.22		
41	40	11.43	3.21		
42	41	11.44	3.22		
43	42	11.44	3.22		
44	43	11.43	3.21		
45	44	11.43	3.21		
46	45	11.44	3.22		
47	46	11.43	3.21		
48	47	11.43	3.21		
49	48	11.41	3.19		
50	49	11.42	3.20		
51	50	11.41	3.19		
52	51	11.42	3.20		
53	52	11.43	3.21		
54	53	11.42	3.20		
55	54	11.42	3.20		
56	55	11.42	3.20		
57	56	11.42	3.20		

Paterson Group Inc.
154 Colonnade Road South
Ottawa, Ontario K2E 7J5

Pumping Test - Water Level Data

Page 2 of 13

Project: Old Prescott Road

Number: PH2095

Client:

	Time [min]	Water Level [m]	Drawdown [m]
58	57	11.41	3.19
59	58	11.41	3.19
60	59	11.42	3.20
61	60	11.42	3.20
62	61	11.42	3.20
63	62	11.42	3.20
64	63	11.41	3.19
65	64	11.42	3.20
66	65	11.41	3.19
67	66	11.41	3.19
68	67	11.41	3.19
69	68	11.41	3.19
70	69	11.42	3.20
71	70	11.40	3.18
72	71	11.40	3.18
73	72	11.40	3.18
74	73	11.40	3.18
75	74	11.40	3.18
76	75	11.40	3.18
77	76	11.41	3.19
78	77	11.41	3.19
79	78	11.40	3.18
80	79	11.40	3.18
81	80	11.40	3.18
82	81	11.40	3.18
83	82	11.40	3.18
84	83	11.40	3.18
85	84	11.40	3.18
86	85	11.40	3.18
87	86	11.40	3.18
88	87	11.39	3.17
89	88	11.38	3.16
90	89	11.39	3.17
91	90	11.39	3.17
92	91	11.40	3.18
93	92	11.39	3.17
94	93	11.40	3.18
95	94	11.40	3.18
96	95	11.40	3.18
97	96	11.40	3.18
98	97	11.39	3.17
99	98	11.40	3.18
100	99	11.39	3.17
101	100	11.39	3.17
102	101	11.39	3.17
103	102	11.40	3.18
104	103	11.38	3.16
105	104	11.40	3.18
106	105	11.39	3.17
107	106	11.40	3.18
108	107	11.39	3.17
109	108	11.39	3.17
110	109	11.39	3.17
111	110	11.38	3.16
112	111	11.39	3.17
113	112	11.38	3.16
114	113	11.40	3.18
115	114	11.38	3.16
116	115	11.37	3.15
117	116	11.39	3.17
118	117	11.37	3.15
119	118	11.39	3.17
120	119	11.37	3.15

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Pumping Test - Water Level Data

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Project: Old Prescott Road

Number: PH2095

Client:

	Time [min]	Water Level [m]	Drawdown [m]
121	120	11.39	3.17
122	121	11.40	3.18
123	122	11.40	3.18
124	123	11.40	3.18
125	124	11.40	3.18
126	125	11.39	3.17
127	126	11.40	3.18
128	127	11.40	3.18
129	128	11.39	3.17
130	129	11.40	3.18
131	130	11.40	3.18
132	131	11.41	3.19
133	132	11.41	3.19
134	133	11.40	3.18
135	134	11.40	3.18
136	135	11.40	3.18
137	136	11.40	3.18
138	137	11.40	3.18
139	138	11.41	3.19
140	139	11.39	3.17
141	140	11.40	3.18
142	141	11.41	3.19
143	142	11.40	3.18
144	143	11.40	3.18
145	144	11.39	3.17
146	145	11.40	3.18
147	146	11.40	3.18
148	147	11.39	3.17
149	148	11.40	3.18
150	149	11.39	3.17
151	150	11.39	3.17
152	151	11.39	3.17
153	152	11.40	3.18
154	153	11.40	3.18
155	154	11.40	3.18
156	155	11.40	3.18
157	156	11.40	3.18
158	157	11.40	3.18
159	158	11.40	3.18
160	159	11.40	3.18
161	160	11.38	3.16
162	161	11.39	3.17
163	162	11.39	3.17
164	163	11.40	3.18
165	164	11.41	3.19
166	165	11.40	3.18
167	166	11.40	3.18
168	167	11.39	3.17
169	168	11.39	3.17
170	169	11.40	3.18
171	170	11.40	3.18
172	171	11.40	3.18
173	172	11.40	3.18
174	173	11.38	3.16
175	174	11.39	3.17
176	175	11.39	3.17
177	176	11.39	3.17
178	177	11.39	3.17
179	178	11.40	3.18
180	179	11.38	3.16
181	180	11.38	3.16
182	181	11.39	3.17
183	182	11.39	3.17

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Pumping Test - Water Level Data

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Project: Old Prescott Road

Number: PH2095

Client:

	Time [min]	Water Level [m]	Drawdown [m]
184	183	11.39	3.17
185	184	11.38	3.16
186	185	11.39	3.17
187	186	11.38	3.16
188	187	11.38	3.16
189	188	11.38	3.16
190	189	11.39	3.17
191	190	11.38	3.16
192	191	11.39	3.17
193	192	11.37	3.15
194	193	11.38	3.16
195	194	11.38	3.16
196	195	11.39	3.17
197	196	11.39	3.17
198	197	11.39	3.17
199	198	11.40	3.18
200	199	11.40	3.18
201	200	11.40	3.18
202	201	11.40	3.18
203	202	11.40	3.18
204	203	11.39	3.17
205	204	11.38	3.16
206	205	11.39	3.17
207	206	11.38	3.16
208	207	11.38	3.16
209	208	11.39	3.17
210	209	11.39	3.17
211	210	11.38	3.16
212	211	11.39	3.17
213	212	11.39	3.17
214	213	11.38	3.16
215	214	11.38	3.16
216	215	11.40	3.18
217	216	11.40	3.18
218	217	11.39	3.17
219	218	11.38	3.16
220	219	11.39	3.17
221	220	11.38	3.16
222	221	11.39	3.17
223	222	11.38	3.16
224	223	11.40	3.18
225	224	11.39	3.17
226	225	11.39	3.17
227	226	11.40	3.18
228	227	11.40	3.18
229	228	11.40	3.18
230	229	11.39	3.17
231	230	11.40	3.18
232	231	11.40	3.18
233	232	11.40	3.18
234	233	11.40	3.18
235	234	11.40	3.18
236	235	11.40	3.18
237	236	11.40	3.18
238	237	11.40	3.18
239	238	11.40	3.18
240	239	11.40	3.18
241	240	11.41	3.19
242	241	11.40	3.18
243	242	11.40	3.18
244	243	11.40	3.18
245	244	11.40	3.18
246	245	11.39	3.17

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Pumping Test - Water Level Data

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Project: Old Prescott Road

Number: PH2095

Client:

	Time [min]	Water Level [m]	Drawdown [m]
247	246	11.41	3.19
248	247	11.40	3.18
249	248	11.39	3.17
250	249	11.39	3.17
251	250	11.39	3.17
252	251	11.39	3.17
253	252	11.40	3.18
254	253	11.39	3.17
255	254	11.39	3.17
256	255	11.39	3.17
257	256	11.40	3.18
258	257	11.40	3.18
259	258	11.40	3.18
260	259	11.39	3.17
261	260	11.38	3.16
262	261	11.39	3.17
263	262	11.39	3.17
264	263	11.39	3.17
265	264	11.40	3.18
266	265	11.39	3.17
267	266	11.39	3.17
268	267	11.39	3.17
269	268	11.38	3.16
270	269	11.39	3.17
271	270	11.40	3.18
272	271	11.39	3.17
273	272	11.39	3.17
274	273	11.40	3.18
275	274	11.39	3.17
276	275	11.39	3.17
277	276	11.39	3.17
278	277	11.40	3.18
279	278	11.39	3.17
280	279	11.39	3.17
281	280	11.38	3.16
282	281	11.39	3.17
283	282	11.39	3.17
284	283	11.39	3.17
285	284	11.39	3.17
286	285	11.39	3.17
287	286	11.38	3.16
288	287	11.39	3.17
289	288	11.38	3.16
290	289	11.38	3.16
291	290	11.37	3.15
292	291	11.37	3.15
293	292	11.38	3.16
294	293	11.37	3.15
295	294	11.37	3.15
296	295	11.37	3.15
297	296	11.37	3.15
298	297	11.37	3.15
299	298	11.37	3.15
300	299	11.37	3.15
301	300	11.37	3.15
302	301	11.37	3.15
303	302	11.38	3.16
304	303	11.38	3.16
305	304	11.38	3.16
306	305	11.39	3.17
307	306	11.37	3.15
308	307	11.38	3.16
309	308	11.39	3.17

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Pumping Test - Water Level Data

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Project: Old Prescott Road

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Client:

	Time [min]	Water Level [m]	Drawdown [m]
310	309	11.38	3.16
311	310	11.38	3.16
312	311	11.39	3.17
313	312	11.39	3.17
314	313	11.38	3.16
315	314	11.39	3.17
316	315	11.39	3.17
317	316	11.38	3.16
318	317	11.39	3.17
319	318	11.39	3.17
320	319	11.38	3.16
321	320	11.38	3.16
322	321	11.39	3.17
323	322	11.39	3.17
324	323	11.38	3.16
325	324	11.37	3.15
326	325	11.37	3.15
327	326	11.37	3.15
328	327	11.38	3.16
329	328	11.38	3.16
330	329	11.37	3.15
331	330	11.38	3.16
332	331	11.38	3.16
333	332	11.38	3.16
334	333	11.38	3.16
335	334	11.38	3.16
336	335	11.38	3.16
337	336	11.38	3.16
338	337	11.39	3.17
339	338	11.38	3.16
340	339	11.39	3.17
341	340	11.39	3.17
342	341	11.40	3.18
343	342	11.38	3.16
344	343	11.39	3.17
345	344	11.38	3.16
346	345	11.40	3.18
347	346	11.39	3.17
348	347	11.39	3.17
349	348	11.38	3.16
350	349	11.38	3.16
351	350	11.39	3.17
352	351	11.39	3.17
353	352	11.38	3.16
354	353	11.39	3.17
355	354	11.38	3.16
356	355	11.39	3.17
357	356	11.39	3.17
358	357	11.40	3.18
359	358	11.40	3.18
360	359	11.38	3.16
361	360	11.39	3.17
362	361	11.39	3.17
363	362	11.39	3.17
364	363	11.40	3.18
365	364	11.38	3.16
366	365	11.40	3.18
367	366	11.40	3.18
368	367	11.39	3.17
369	368	11.39	3.17
370	369	11.39	3.17
371	370	11.40	3.18
372	371	11.39	3.17

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Pumping Test - Water Level Data

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Project: Old Prescott Road

Number: PH2095

Client:

	Time [min]	Water Level [m]	Drawdown [m]
373	372	11.40	3.18
374	373	11.40	3.18
375	374	11.40	3.18
376	375	11.40	3.18
377	376	11.40	3.18
378	377	11.40	3.18
379	378	11.40	3.18
380	379	11.40	3.18
381	380	11.39	3.17
382	381	11.40	3.18
383	382	11.40	3.18
384	383	11.39	3.17
385	384	11.39	3.17
386	385	11.40	3.18
387	386	11.40	3.18
388	387	11.40	3.18
389	388	11.39	3.17
390	389	11.40	3.18
391	390	11.40	3.18
392	391	11.40	3.18
393	392	11.39	3.17
394	393	11.39	3.17
395	394	11.41	3.19
396	395	11.39	3.17
397	396	11.40	3.18
398	397	11.40	3.18
399	398	11.40	3.18
400	399	11.40	3.18
401	400	11.40	3.18
402	401	11.39	3.17
403	402	11.39	3.17
404	403	11.38	3.16
405	404	11.39	3.17
406	405	11.39	3.17
407	406	11.37	3.15
408	407	11.38	3.16
409	408	11.38	3.16
410	409	11.38	3.16
411	410	11.38	3.16
412	411	11.38	3.16
413	412	11.37	3.15
414	413	11.38	3.16
415	414	11.38	3.16
416	415	11.38	3.16
417	416	11.38	3.16
418	417	11.39	3.17
419	418	11.38	3.16
420	419	11.39	3.17
421	420	11.39	3.17
422	421	11.38	3.16
423	422	11.38	3.16
424	423	11.37	3.15
425	424	11.38	3.16
426	425	11.38	3.16
427	426	11.38	3.16
428	427	11.37	3.15
429	428	11.37	3.15
430	429	11.37	3.15
431	430	11.38	3.16
432	431	11.39	3.17
433	432	11.38	3.16
434	433	11.38	3.16
435	434	11.38	3.16

Project: Old Prescott Road

Number: PH2095

Client:

	Time [min]	Water Level [m]	Drawdown [m]
436	435	11.39	3.17
437	436	11.38	3.16
438	437	11.38	3.16
439	438	11.38	3.16
440	439	11.38	3.16
441	440	11.38	3.16
442	441	11.38	3.16
443	442	11.38	3.16
444	443	11.38	3.16
445	444	11.37	3.15
446	445	11.38	3.16
447	446	11.37	3.15
448	447	11.38	3.16
449	448	11.39	3.17
450	449	11.38	3.16
451	450	11.37	3.15
452	451	11.38	3.16
453	452	11.39	3.17
454	453	11.38	3.16
455	454	11.38	3.16
456	455	11.38	3.16
457	456	11.38	3.16
458	457	11.39	3.17
459	458	11.38	3.16
460	459	11.37	3.15
461	460	11.38	3.16
462	461	11.38	3.16
463	462	11.38	3.16
464	463	11.36	3.14
465	464	11.37	3.15
466	465	11.38	3.16
467	466	11.37	3.15
468	467	11.37	3.15
469	468	11.37	3.15
470	469	11.38	3.16
471	470	11.37	3.15
472	471	11.37	3.15
473	472	11.37	3.15
474	473	11.37	3.15
475	474	11.38	3.16
476	475	11.38	3.16
477	476	11.38	3.16
478	477	11.37	3.15
479	478	11.37	3.15
480	479	11.38	3.16
481	480	11.37	3.15
482	481	11.64	3.42
483	482	11.66	3.44
484	483	11.65	3.43
485	484	11.66	3.44
486	485	11.66	3.44
487	486	11.65	3.43
488	487	11.67	3.45
489	488	11.67	3.45
490	489	11.68	3.46
491	490	11.66	3.44
492	491	11.69	3.47
493	492	11.68	3.46
494	493	11.68	3.46
495	494	11.69	3.47
496	495	11.68	3.46
497	496	11.68	3.46
498	497	11.70	3.48

Project: Old Prescott Road

Number: PH2095

Client:

	Time [min]	Water Level [m]	Drawdown [m]
499	498	11.68	3.46
500	499	11.69	3.47
501	500	11.68	3.46
502	501	11.70	3.48
503	502	11.69	3.47
504	503	11.70	3.48
505	504	11.70	3.48
506	505	11.70	3.48
507	506	11.70	3.48
508	507	11.70	3.48
509	508	11.70	3.48
510	509	11.71	3.49
511	510	11.71	3.49
512	511	11.71	3.49
513	512	11.71	3.49
514	513	11.70	3.48
515	514	11.72	3.50
516	515	11.72	3.50
517	516	11.73	3.51
518	517	11.72	3.50
519	518	11.72	3.50
520	519	11.72	3.50
521	520	11.72	3.50
522	521	11.73	3.51
523	522	11.73	3.51
524	523	11.72	3.50
525	524	11.73	3.51
526	525	11.73	3.51
527	526	11.73	3.51
528	527	11.74	3.52
529	528	11.74	3.52
530	529	11.74	3.52
531	530	11.74	3.52
532	531	11.75	3.53
533	532	11.74	3.52
534	533	11.74	3.52
535	534	11.74	3.52
536	535	11.75	3.53
537	536	11.74	3.52
538	537	11.74	3.52
539	538	11.74	3.52
540	539	11.75	3.53
541	540	11.75	3.53
542	541	11.74	3.52
543	542	11.75	3.53
544	543	11.75	3.53
545	544	11.74	3.52
546	545	11.75	3.53
547	546	11.76	3.54
548	547	11.76	3.54
549	548	11.75	3.53
550	549	11.76	3.54
551	550	11.75	3.53
552	551	11.75	3.53
553	552	11.74	3.52
554	553	11.75	3.53
555	554	11.75	3.53
556	555	11.75	3.53
557	556	11.75	3.53
558	557	11.75	3.53
559	558	11.76	3.54
560	559	11.76	3.54
561	560	11.76	3.54

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Number: PH2095

Client:

	Time [min]	Water Level [m]	Drawdown [m]
562	561	11.76	3.54
563	562	11.77	3.55
564	563	11.76	3.54
565	564	11.76	3.54
566	565	11.77	3.55
567	566	11.75	3.53
568	567	11.76	3.54
569	568	11.77	3.55
570	569	11.76	3.54
571	570	11.78	3.56
572	571	11.78	3.56
573	572	11.76	3.54
574	573	11.76	3.54
575	574	11.76	3.54
576	575	11.76	3.54
577	576	11.77	3.55
578	577	11.76	3.54
579	578	11.76	3.54
580	579	11.74	3.52
581	580	11.75	3.53
582	581	11.75	3.53
583	582	11.76	3.54
584	583	11.76	3.54
585	584	11.76	3.54
586	585	11.76	3.54
587	586	11.76	3.54
588	587	11.77	3.55
589	588	11.76	3.54
590	589	11.77	3.55
591	590	11.78	3.56
592	591	11.76	3.54
593	592	11.77	3.55
594	593	11.76	3.54
595	594	11.76	3.54
596	595	11.77	3.55
597	596	11.76	3.54
598	597	11.76	3.54
599	598	11.76	3.54
600	599	11.76	3.54
601	600	11.76	3.54
602	601	11.77	3.55
603	602	11.78	3.56
604	603	11.76	3.54
605	604	11.76	3.54
606	605	11.77	3.55
607	606	11.76	3.54
608	607	11.77	3.55
609	608	11.77	3.55
610	609	11.77	3.55
611	610	11.77	3.55
612	611	11.77	3.55
613	612	11.77	3.55
614	613	11.76	3.54
615	614	11.77	3.55
616	615	11.77	3.55
617	616	11.77	3.55
618	617	11.76	3.54
619	618	11.76	3.54
620	619	11.77	3.55
621	620	11.77	3.55
622	621	11.77	3.55
623	622	11.77	3.55
624	623	11.77	3.55

Project: Old Prescott Road

Number: PH2095

Client:

	Time [min]	Water Level [m]	Drawdown [m]
625	624	11.77	3.55
626	625	11.77	3.55
627	626	11.78	3.56
628	627	11.77	3.55
629	628	11.78	3.56
630	629	11.77	3.55
631	630	11.78	3.56
632	631	11.78	3.56
633	632	11.78	3.56
634	633	11.77	3.55
635	634	11.78	3.56
636	635	11.77	3.55
637	636	11.76	3.54
638	637	11.78	3.56
639	638	11.78	3.56
640	639	11.78	3.56
641	640	11.78	3.56
642	641	11.77	3.55
643	642	11.78	3.56
644	643	11.78	3.56
645	644	11.78	3.56
646	645	11.78	3.56
647	646	11.77	3.55
648	647	11.78	3.56
649	648	11.77	3.55
650	649	11.79	3.57
651	650	11.78	3.56
652	651	11.79	3.57
653	652	11.79	3.57
654	653	11.79	3.57
655	654	11.79	3.57
656	655	11.79	3.57
657	656	11.78	3.56
658	657	11.78	3.56
659	658	11.78	3.56
660	659	11.79	3.57
661	660	11.77	3.55
662	661	11.78	3.56
663	662	11.78	3.56
664	663	11.77	3.55
665	664	11.78	3.56
666	665	11.79	3.57
667	666	11.79	3.57
668	667	11.79	3.57
669	668	11.80	3.58
670	669	11.79	3.57
671	670	11.79	3.57
672	671	11.79	3.57
673	672	11.79	3.57
674	673	11.79	3.57
675	674	11.79	3.57
676	675	11.79	3.57
677	676	11.77	3.55
678	677	11.78	3.56
679	678	11.77	3.55
680	679	11.77	3.55
681	680	11.77	3.55
682	681	11.77	3.55
683	682	11.77	3.55
684	683	11.79	3.57
685	684	11.79	3.57
686	685	11.79	3.57
687	686	11.77	3.55

Project: Old Prescott Road

Number: PH2095

Client:

	Time [min]	Water Level [m]	Drawdown [m]
688	687	11.79	3.57
689	688	11.79	3.57
690	689	11.80	3.58
691	690	11.80	3.58
692	691	11.79	3.57
693	692	11.80	3.58
694	693	11.80	3.58
695	694	11.79	3.57
696	695	11.77	3.55
697	696	11.78	3.56
698	697	11.80	3.58
699	698	11.80	3.58
700	699	11.79	3.57
701	700	11.79	3.57
702	701	11.79	3.57
703	702	11.78	3.56
704	703	11.78	3.56
705	704	11.80	3.58
706	705	11.79	3.57
707	706	11.77	3.55
708	707	11.79	3.57
709	708	11.79	3.57
710	709	11.77	3.55
711	710	11.79	3.57
712	711	11.80	3.58
713	712	11.78	3.56
714	713	11.80	3.58
715	714	11.80	3.58
716	715	11.80	3.58
717	716	11.80	3.58
718	717	11.79	3.57
719	718	11.79	3.57
720	719	11.79	3.57
721	720	11.78	3.56
722	721	11.76	3.54
723	722	11.77	3.55
724	723	11.79	3.57
725	724	11.79	3.57
726	725	11.79	3.57
727	726	11.77	3.55
728	727	11.77	3.55
729	728	11.78	3.56
730	729	11.78	3.56
731	730	11.78	3.56
732	731	11.78	3.56
733	732	11.79	3.57
734	733	11.78	3.56
735	734	11.78	3.56
736	735	11.78	3.56
737	736	11.77	3.55
738	737	11.76	3.54
739	738	11.77	3.55
740	739	11.77	3.55
741	740	11.76	3.54
742	741	11.77	3.55
743	742	11.77	3.55
744	743	11.76	3.54
745	744	11.77	3.55
746	745	11.78	3.56
747	746	11.78	3.56
748	747	11.77	3.55
749	748	11.76	3.54
750	749	11.76	3.54

Paterson Group Inc.
154 Colonnade Road South
Ottawa, Ontario K2E 7J5

Pumping Test - Water Level Data

Page 13 of 13

Project: Old Prescott Road

Number: PH2095

Client:

	Time [min]	Water Level [m]	Drawdown [m]
751	750	11.76	3.54
752	751	11.76	3.54
753	752	11.76	3.54
754	753	11.77	3.55
755	754	11.76	3.54
756	755	11.76	3.54
757	756	11.76	3.54
758	757	11.76	3.54
759	758	11.77	3.55
760	759	11.76	3.54
761	760	11.75	3.53
762	761	11.75	3.53
763	762	11.76	3.54
764	763	11.76	3.54

Paterson Group Inc.
154 Colonnade Road South
Ottawa, Ontario K2E 7J5

Pumping Test Analysis Report

Project: Old Prescott Road

Number: PH2095

Client:

Location:

Pumping Test: TW4

Pumping Well: TW4

Test Conducted by:

Test Date: 10/8/2013

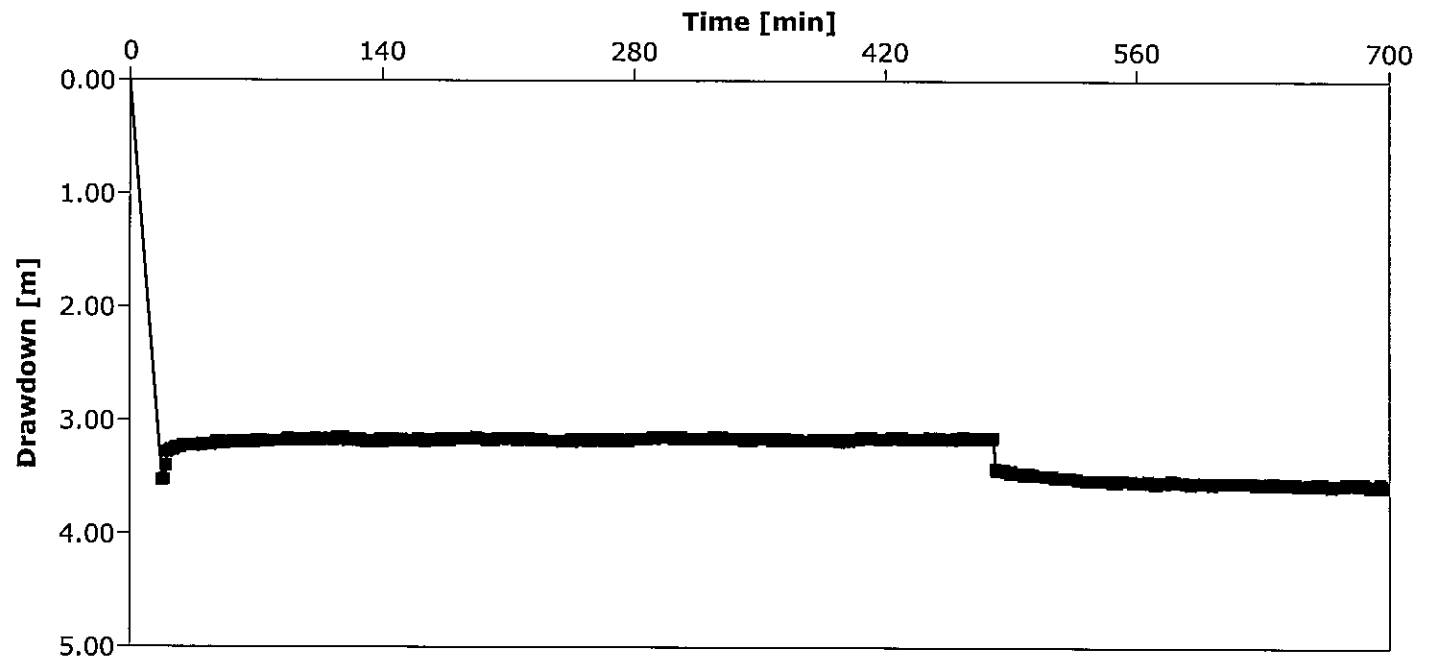
Analysis Performed by:

Time- Drawdown

Analysis Date: 10/16/2013

Aquifer Thickness:

Discharge Rate: 1.39 [l/s]



Paterson Group Inc.
154 Colonnade Road South
Ottawa, Ontario K2E 7J5

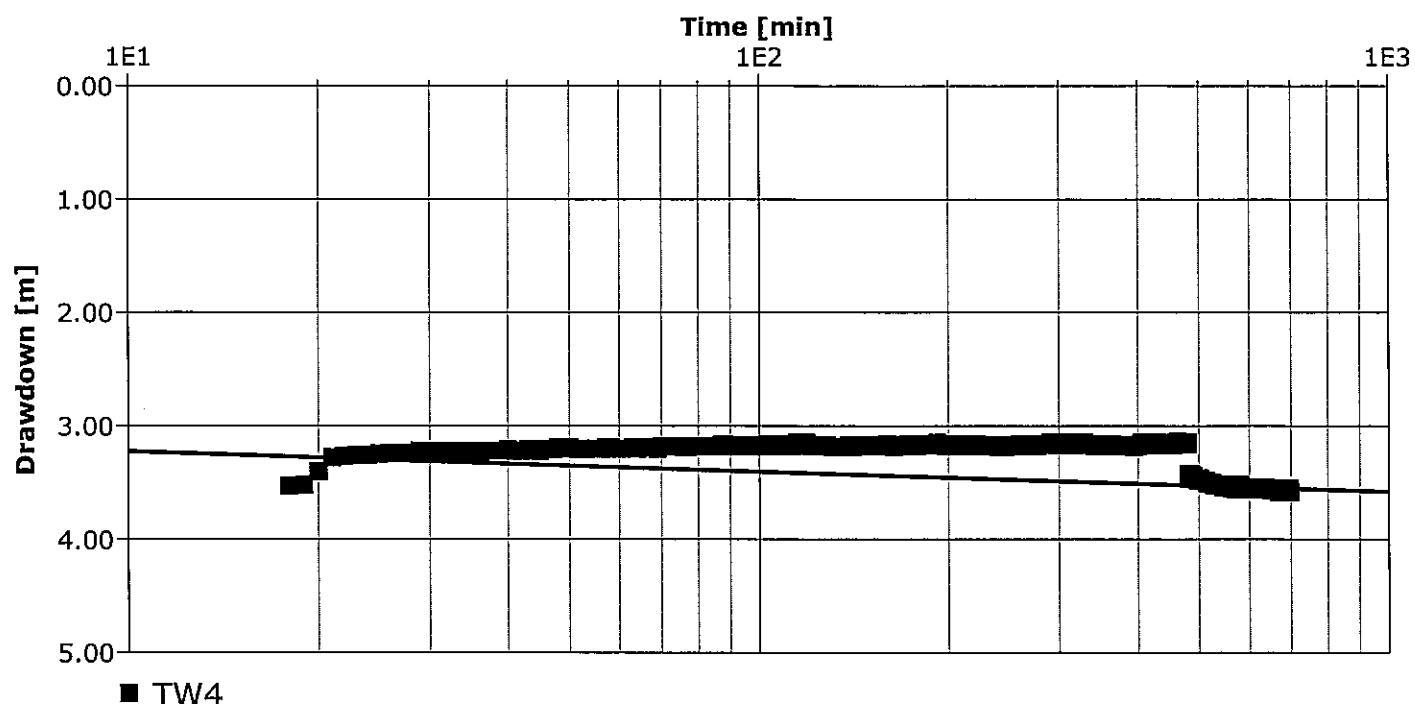
Pumping Test Analysis Report

Project: Old Prescott Road

Number: PH2095

Client:

Location:	Pumping Test: TW4	Pumping Well: TW4
Test Conducted by:		Test Date: 10/8/2013
Analysis Performed by:	New analysis 2	Analysis Date: 1/20/2014
Aquifer Thickness:	Discharge Rate: 1.39 [l/s]	



Calculation using COOPER & JACOB

Observation Well	Transmissivity [m ² /d]	Storage coefficient	Radial Distance to PW [m]	
TW4	1.24×10^2	2.02×10^{-16}	0.07	

Paterson Group Inc. 154 Colonnade Road South Ottawa, Ontario K2E 7J5				Pumping Test Analysis Report			
				Project: Old Prescott Road			
				Number: PH2095			
				Client:			
Location:		Pumping Test: TW4		Pumping Well: TW4			
Test Conducted by:				Test Date: 10/8/2013			
Aquifer Thickness:		Discharge Rate: 1.39 [l/s]					
	Analysis Name	Analysis Performed by	Analysis Date	Method name	Well	T [m²/d]	S
1	New analysis 2		1/20/2014	Cooper & Jacob I	TW4	1.24×10^2	2.02×10^{-16}

Predevelopment Water Budget

Project: 1240 Old Prescott Road
File: PH2095
Condition: Predevelopment

Groundwater Flow Calculation

Background Nitrate Concentration (C_b) =	0 mg/L
Hydraulic Conductivity (k) =	0 m/s
Horizontal Gradient (i) =	0
Length (L) =	0 m
Aquifer Thickness (t) =	0 m
Groundwater Flow (Q_b) =	0 m ³ /day

Weighted Infiltration Factors

Topography	0.221
Soil	0.4
Cover	<u>0.19</u>
Total	0.811

Infiltration Calculation

Nitrate Concentration in Precipitation (C_i) =	0 mg/L
Surplus Water (Environment Canada)	376 mm/yr
Factored Water Surplus =	304.94 mm/yr
Additional Surplus from Landscape Runoff =	0 mm/yr
Infiltration Flow Entering the System (Q_i) =	168.76 m ³ /day
Total volume of Infiltration	61597.072 m ³ /year

Site Characteristics

Area of Site :	202000 m ²
Roof and Driveway Areas:	0 m ²
Length of Roadways:	0 m

Impervious Area	0 m ²
Percent Impervious Area =	0.00 %
Infiltration Area =	202000 m ²

Nitrate Impact Assessment

Project: 1240 Old Prescott Road
File: PH2095
Condition: Scenario No. 1: Straight Dilution (no infiltration through SWM - 46 lots)

Groundwater Flow Calculation

Background Nitrate Concentration (C_b) = 0 mg/L
 Hydraulic Conductivity (k) = 0 m/s
 Horizontal Gradient (i) = 0
 Length (L) = 0 m
 Aquifer Thickness (t) = 0 m
 Groundwater Flow (Q_b) = 0 m³/day

Infiltration Calculation

Nitrate Concentration in Precipitation (C_i) = 0 mg/L
 Surplus Water (Environment Canada) 394 mm/yr
 Factored Water Surplus = 287.62 mm/yr
 Additional Surplus from Landscape Runoff = 0 mm/yr
 Infiltration Flow Entering the System (Q_i) = 139.55 m³/day

Mass Balance Model (MOEE 1995)

$$C_T = (Q_b C_b + Q_e C_e + Q_i C_i) / (Q_b + Q_e + Q_i) = \text{Cumulative Nitrate Concentration}$$

where: Q_b = flow entering the system across the upgradient area = 0 m³/day
 C_b = background nitrate concentration = 0 mg/L
 Q_e = flow entering the system from the septic drainfield = 46 m³/day
 C_e = concentration of nitrates in the septic effluent = 40 mg/L
 Q_i = flow entering the system from infiltration = 139.55 m³/day
 C_i = Concentration of nitrates in the infiltrate = 0 mg/L

Therefore: C_T = **9.916 mg/L**

Weighted Infiltration Factors

Topography 0.20
 Soil 0.4
 Cover 0.13
Total 0.73

Septic Effluent

Concentration of Effluent (C_s) = 40 mg/L
 Number of Lots: 46
 Daily Sewage Flow (Q_s) = 46 m³

Site Characteristics

Area of Site : 202000 m²
 Roof and Driveway Areas: 420 m²
 Length of Street (6 m wide): 930 m

Impervious Area 24900 m²
 Percent Impervious Area = 12.33 %
 Infiltration Area = 177100 m²

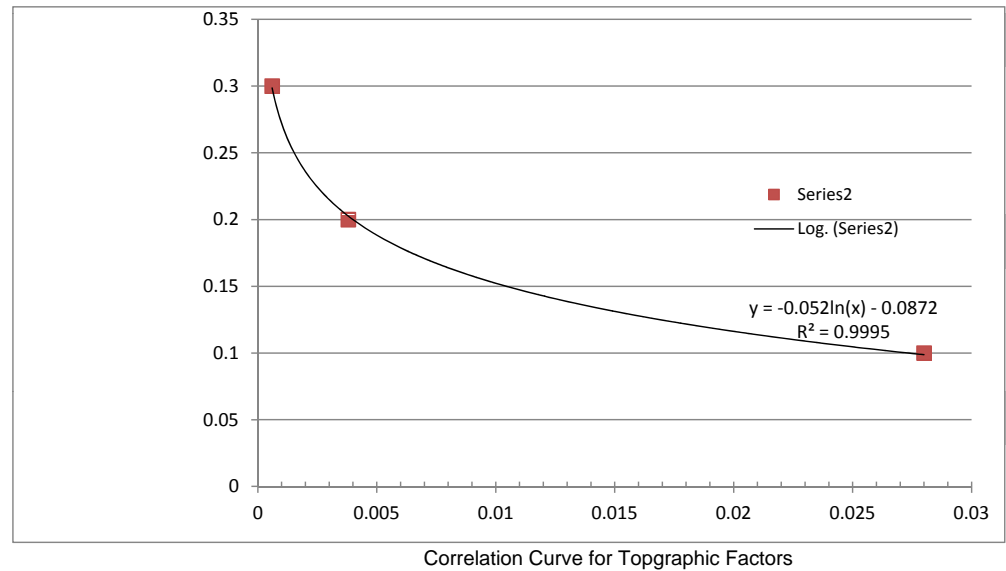
TOPGRAPHY FACTOR							COVER FACTOR	
Predevelopment							Predevelopment	
area	20.2 ha						Cover	Weighted factor)
Area	Area (ha)	slope M/M	%	factor				
A1	4.8	0.01875	0.237624	0.2	0.047525	0.2	0.047524752	
A2	0.5	0.169230769	0.024752	0.1	0.002475	0.1	0.002475248	
A3	13.1	0.00109375	0.648515	0.25	0.162129	0.2	0.12970297	
A4	1.8	0.042465753	0.089109	0.1	0.008911	0.1	0.008910891	
	20.2				0.22104		0.188613861	

MOE Values for Table 3.1 SWMPM

		%	Factor
Flat	0.6m/1000	0.0006	0.3
Rolling	3.8m/1000	0.0038	0.2
Hilly	28m/1000r	0.028	0.1

Post Development Topography Factor						
Typical water travel distance	Lenght (m)	delta H	slope	factor	factor(w)	
house to sideyard swale	5	1	0.2	-0.00351	-4.44206E-05	
in swale to roadside ditch	30	1	0.033333	0.089662	0.006809792	
in roadside ditch to outlet	360		0.003	0.214875	0.19583584	
	395			0.301028	0.202601212	

Post Development Cover Factor				
Average lot area	0.287 ha			
%retained trees	30 %			
retained tree area	0.0861 ha	Weighted Factor		
Weighted Cover Factc	0.0861	0.2	0.06	
	0.2009	0.1	0.07	
			0.13	



Ottawa Int'l A, ON WATER BUDGET MEANS FOR THE PERIOD 1939-2009 DC20492

LAT.... 45.32 WATER HOLDING CAPACITY... 45 MM HEAT INDEX... 36.38
 LONG... 75.67 LOWER ZONE..... 27 MM A..... 1.075

DATE	TEMP (C)	PCPN	RAIN	MELT	PE	AE	DEF	SURP	SNOW	SOIL	ACC P
31- 1	-10.8	63	11	13	0	0	0	24	87	45	297
28- 2	-9.1	56	10	15	0	0	0	24	119	45	354
31- 3	-2.9	67	30	80	5	5	0	105	75	45	421
30- 4	5.7	71	66	80	31	31	0	115	0	45	492
31- 5	12.9	76	76	0	80	78	-2	15	0	29	568
30- 6	18.3	82	82	0	116	95	-22	4	0	12	650
31- 7	20.8	88	88	0	135	93	-43	2	0	5	737
31- 8	19.5	82	82	0	117	80	-38	1	0	6	820
30- 9	14.7	82	82	0	75	65	-10	7	0	17	903
31-10	8.2	76	75	0	37	36	-1	24	0	33	76
30-11	1.3	79	61	8	10	10	0	48	10	44	155
31-12	-7.1	80	26	15	1	1	0	38	50	45	235
AVE	6.0 TTL	902	689	211	607	494	-116	407			

Ottawa Int'l A, ON STANDARD DEVIATIONS FOR THE PERIOD 1939-2009 DC20492

DATE	TEMP (C)	PCPN	RAIN	MELT	PE	AE	DEF	SURP	SNOW	SOIL	ACC P
31- 1	2.9	26	15	18	1	1	0	29	45	0	61
28- 2	2.5	27	14	26	1	1	0	35	60	0	64
31- 3	2.5	28	22	51	5	5	0	58	90	0	71
30- 4	1.8	30	30	92	9	9	0	91	3	2	78
31- 5	1.8	33	33	3	12	10	6	23	0	17	90
30- 6	1.2	38	38	0	8	26	27	17	0	17	102
31- 7	1.1	40	40	0	8	30	31	11	0	12	104
31- 8	1.3	37	37	0	9	29	32	5	0	13	118
30- 9	1.4	39	39	0	8	17	16	17	0	19	126
31-10	1.5	37	37	1	7	7	3	27	0	17	37
30-11	1.7	27	27	8	4	4	0	29	13	5	45
31-12	2.9	30	22	14	1	1	0	30	35	0	57

Ottawa Int'l A, ON WATER BUDGET MEANS FOR THE PERIOD 1939-2009 DC20492

LAT.... 45.32 WATER HOLDING CAPACITY... 60 MM HEAT INDEX... 36.38
 LONG... 75.67 LOWER ZONE..... 36 MM A..... 1.075

DATE	TEMP (C)	PCPN	RAIN	MELT	PE	AE	DEF	SURP	SNOW	SOIL	ACC P
31- 1	-10.8	63	11	13	0	0	0	24	87	60	297
28- 2	-9.1	56	10	15	0	0	0	24	119	60	354
31- 3	-2.9	67	30	80	5	5	0	105	75	60	421
30- 4	5.7	71	66	80	31	31	0	115	0	60	492
31- 5	12.9	76	76	0	80	79	-1	15	0	43	568
30- 6	18.3	82	82	0	116	101	-15	4	0	19	650
31- 7	20.8	88	88	0	135	98	-37	2	0	7	737
31- 8	19.5	82	82	0	117	80	-37	1	0	8	820
30- 9	14.7	82	82	0	75	65	-10	4	0	21	903
31-10	8.2	76	75	0	37	36	-1	19	0	42	76
30-11	1.3	79	61	8	10	10	0	44	10	57	155
31-12	-7.1	80	26	15	1	1	0	37	50	60	235
AVE	6.0 TTL	902	689	211	607	506	-101	394			

Ottawa Int'l A, ON STANDARD DEVIATIONS FOR THE PERIOD 1939-2009 DC20492

DATE	TEMP (C)	PCPN	RAIN	MELT	PE	AE	DEF	SURP	SNOW	SOIL	ACC P
31- 1	2.9	26	15	18	1	1	0	29	45	1	61
28- 2	2.5	27	14	26	1	1	0	35	60	1	64
31- 3	2.5	28	22	51	5	5	0	58	90	0	71
30- 4	1.8	30	30	92	9	9	0	91	3	2	78
31- 5	1.8	33	33	3	12	11	3	23	0	20	90
30- 6	1.2	38	38	0	8	22	23	17	0	23	102
31- 7	1.1	40	40	0	8	29	31	11	0	17	104
31- 8	1.3	37	37	0	9	29	32	4	0	17	118
30- 9	1.4	39	39	0	8	17	16	15	0	24	126
31-10	1.5	37	37	1	7	7	2	25	0	23	37
30-11	1.7	27	27	8	4	4	0	31	13	9	45
31-12	2.9	30	22	14	1	1	0	30	35	1	57

Ottawa Int'l A, ON WATER BUDGET MEANS FOR THE PERIOD 1939-2009 DC20492

LAT.... 45.32 WATER HOLDING CAPACITY... 80 MM HEAT INDEX... 36.38
 LONG... 75.67 LOWER ZONE..... 48 MM A..... 1.075

DATE	TEMP (C)	PCPN	RAIN	MELT	PE	AE	DEF	SURP	SNOW	SOIL	ACC P
31- 1	-10.8	63	11	13	0	0	0	23	87	79	297
28- 2	-9.1	56	10	15	0	0	0	24	119	79	354
31- 3	-2.9	67	30	80	5	5	0	104	75	80	421
30- 4	5.7	71	66	80	31	31	0	115	0	80	492
31- 5	12.9	76	76	0	80	80	0	15	0	62	568
30- 6	18.3	82	82	0	116	108	-9	4	0	32	650
31- 7	20.8	88	88	0	135	106	-29	2	0	11	737
31- 8	19.5	82	82	0	117	82	-35	1	0	11	820
30- 9	14.7	82	82	0	75	65	-10	3	0	25	903
31-10	8.2	76	75	0	37	36	-1	13	0	53	76
30-11	1.3	79	61	8	10	10	0	38	10	74	155
31-12	-7.1	80	26	15	1	1	0	34	50	79	235
AVE	6.0 TTL	902	689	211	607	524	-84	376			

Ottawa Int'l A, ON STANDARD DEVIATIONS FOR THE PERIOD 1939-2009 DC20492

DATE	TEMP (C)	PCPN	RAIN	MELT	PE	AE	DEF	SURP	SNOW	SOIL	ACC P
31- 1	2.9	26	15	18	1	1	0	28	45	4	61
28- 2	2.5	27	14	26	1	1	0	35	60	4	64
31- 3	2.5	28	22	51	5	5	0	57	90	0	71
30- 4	1.8	30	30	92	9	9	0	91	3	2	78
31- 5	1.8	33	33	3	12	12	0	23	0	21	90
30- 6	1.2	38	38	0	8	17	17	17	0	30	102
31- 7	1.1	40	40	0	8	29	30	11	0	23	104
31- 8	1.3	37	37	0	9	29	32	4	0	22	118
30- 9	1.4	39	39	0	8	17	16	13	0	30	126
31-10	1.5	37	37	1	7	7	2	21	0	30	37
30-11	1.7	27	27	8	4	4	0	33	13	14	45
31-12	2.9	30	22	14	1	1	0	31	35	5	57

Ottawa Int'l A, ON WATER BUDGET MEANS FOR THE PERIOD 1939-2009 DC20492

LAT.... 45.32 WATER HOLDING CAPACITY...265 MM HEAT INDEX... 36.38
 LONG... 75.67 LOWER ZONE.....159 MM A..... 1.075

DATE	TEMP (C)	PCPN	RAIN	MELT	PE	AE	DEF	SURP	SNOW	SOIL	ACC P
31- 1	-10.8	63	11	13	0	0	0	17	87	242	297
28- 2	-9.1	56	10	15	0	0	0	19	119	247	354
31- 3	-2.9	67	30	80	5	5	0	91	75	261	421
30- 4	5.7	71	66	80	31	31	0	110	0	265	492
31- 5	12.9	76	76	0	80	80	0	15	0	247	568
30- 6	18.3	82	82	0	116	116	0	4	0	208	650
31- 7	20.8	88	88	0	135	134	-1	2	0	160	737
31- 8	19.5	82	82	0	117	111	-6	1	0	130	820
30- 9	14.7	82	82	0	75	72	-3	2	0	138	903
31-10	8.2	76	75	0	37	36	0	6	0	171	76
30-11	1.3	79	61	8	10	10	0	15	10	215	155
31-12	-7.1	80	26	15	1	1	0	18	50	236	235
AVE	6.0 TTL	902	689	211	607	596	-10	300			

Ottawa Int'l A, ON STANDARD DEVIATIONS FOR THE PERIOD 1939-2009 DC20492

DATE	TEMP (C)	PCPN	RAIN	MELT	PE	AE	DEF	SURP	SNOW	SOIL	ACC P
31- 1	2.9	26	15	18	1	1	0	27	45	39	61
28- 2	2.5	27	14	26	1	1	0	34	60	36	64
31- 3	2.5	28	22	51	5	5	0	57	90	15	71
30- 4	1.8	30	30	92	9	9	0	88	3	2	78
31- 5	1.8	33	33	3	12	12	0	23	0	21	90
30- 6	1.2	38	38	0	8	8	0	17	0	41	102
31- 7	1.1	40	40	0	8	8	4	11	0	52	104
31- 8	1.3	37	37	0	9	13	13	4	0	61	118
30- 9	1.4	39	39	0	8	9	7	13	0	68	126
31-10	1.5	37	37	1	7	7	1	18	0	64	37
30-11	1.7	27	27	8	4	4	0	27	13	53	45
31-12	2.9	30	22	14	1	1	0	27	35	42	57

APPENDIX 5

- ☐ **FIGURE 1 - SITE LOCATION PLAN**
- ☐ **FIGURE 2- TERRAIN UNIT DELINEATION**
- ☐ **FIGURE 3- BEDROCK MAPPING**
- ☐ **TEST HOLE LOCATION PLAN - Drawing No. PH2095-1**
- ☐ **LOT DEVELOPMENT PLAN - Drawing No. PH2095-2**



Client:

1384341 ONTARIO LTD.

Consultant:

patersongroup
consulting engineers

Project:

**OLD PRESCOTT ROAD
SUBDIVISION**
1240 OLD PRESCOTT ROAD
OTTAWA (GREELY), ONTARIO

Drawing:

**SITE LOCATION
PLAN**

Scale:

N.T.S

Seal:

Date:

09/2013

Drawn by:

BA

Checked by:

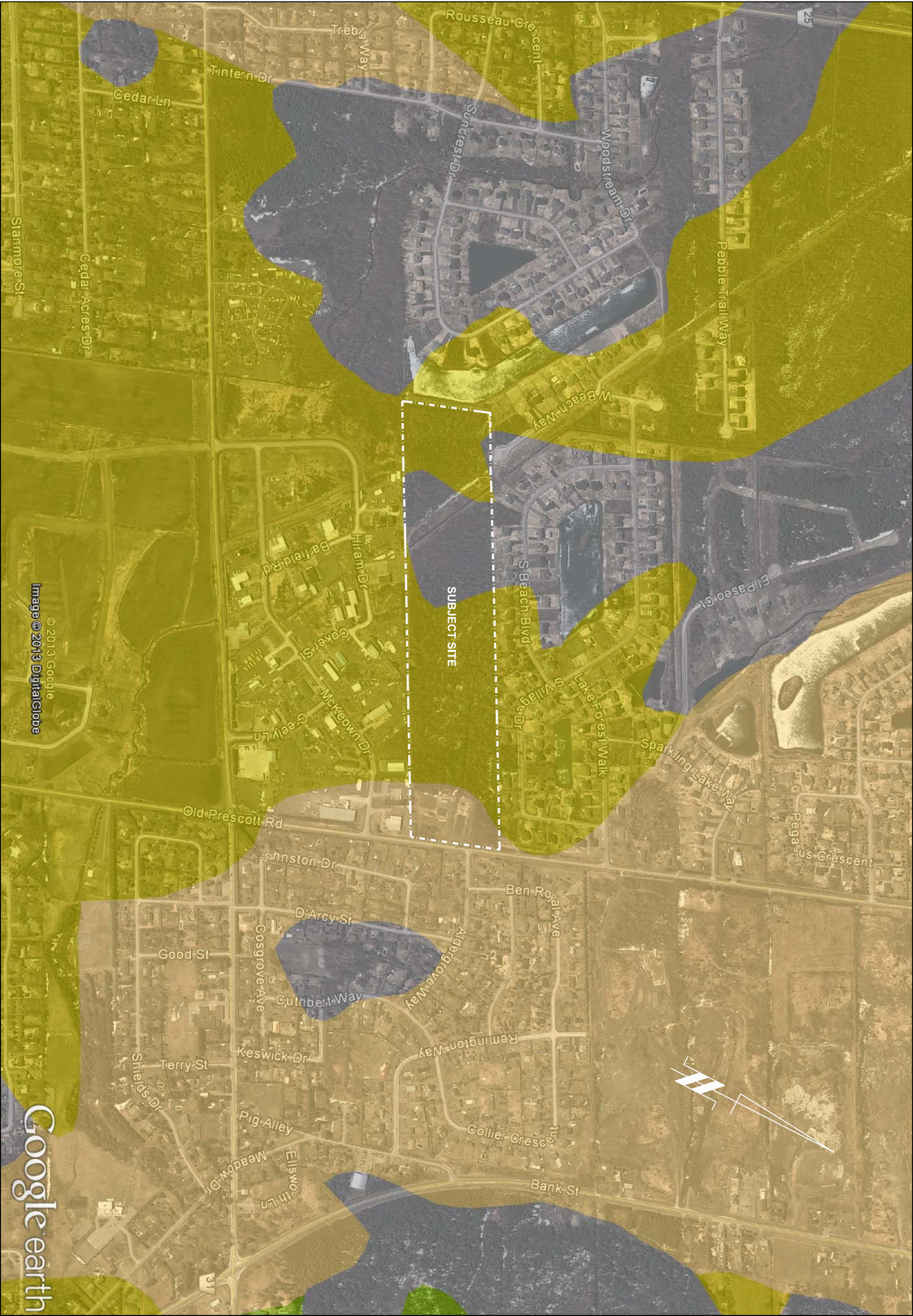
RAP

File:

PH2095

Drawing No.:

PH2095-FIG.1



LEGEND:

- GLACIOFLUVIAL DEPOSITS
- COARSE-TEXTURED GLACIOMARINE DEPOSITS
- ORGANIC DEPOSITS
- TILL

Client:
1384341 ONTARIO LTD.

Consultant:
patersongroup
consulting engineers

Project:
OLD PRESCOTT ROAD SUBDIVISION
1240 OLD PRESCOTT ROAD
OTTAWA (GREELY), ONTARIO

Drawing:
SURFICIAL SOIL DELINEATION MAPPING

Scale:	N.T.S	Seal:
Date:	09/2013	
Drawn by:	BA	
Checked by:	RAP	
File:	PH2095	

Drawing No.:
PH2095-FIG.2

NOTE: INFORMATION REPRODUCED FROM ONTARIO GEOLOGICAL SURVEY G.I.S. OVERLAY FOR GOOGLE EARTH
REFERENCE SHOULD BE MADE TO SITE SPECIFIC GEOTECHNICAL INVESTIGATION FINDINGS BY PATERSON GROUP INC.

- LEGEND:
- OXFORD
 - MARCH
 - NEPEAN
 - CARLSBAD
 - QUEENSTON
 - BOBCAYGEON
 - GULL RIVER
 - ROCKCLIFFE
 - BILLINGS

Client:

1384341 ONTARIO LTD.

Consultant:

patersongroup
consulting engineers

Project:

OLD PRESCOTT ROAD
SUBDIVISION
1240 OLD PRESCOTT ROAD
OTTAWA (GREELY), ONTARIO

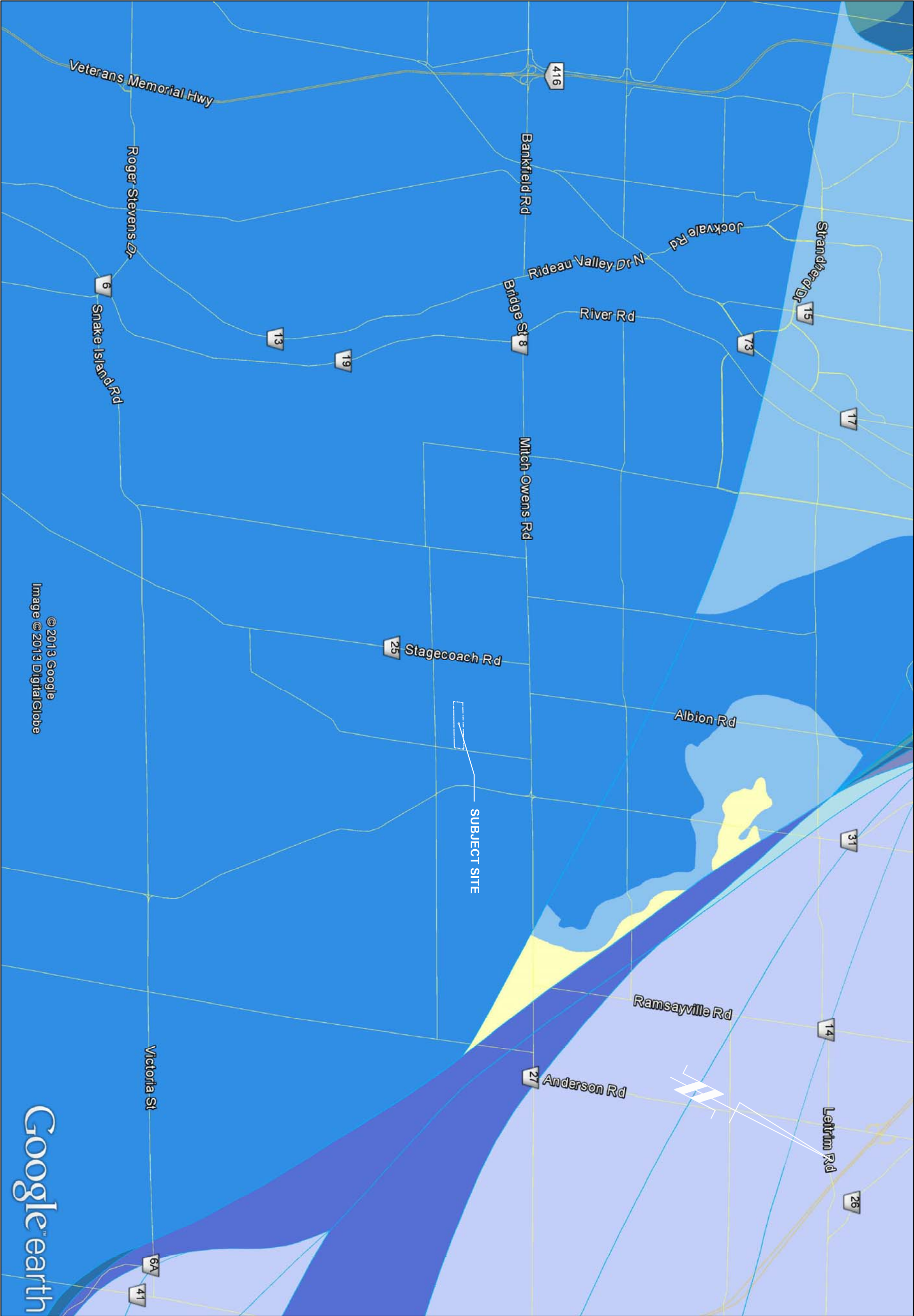
Drawing:

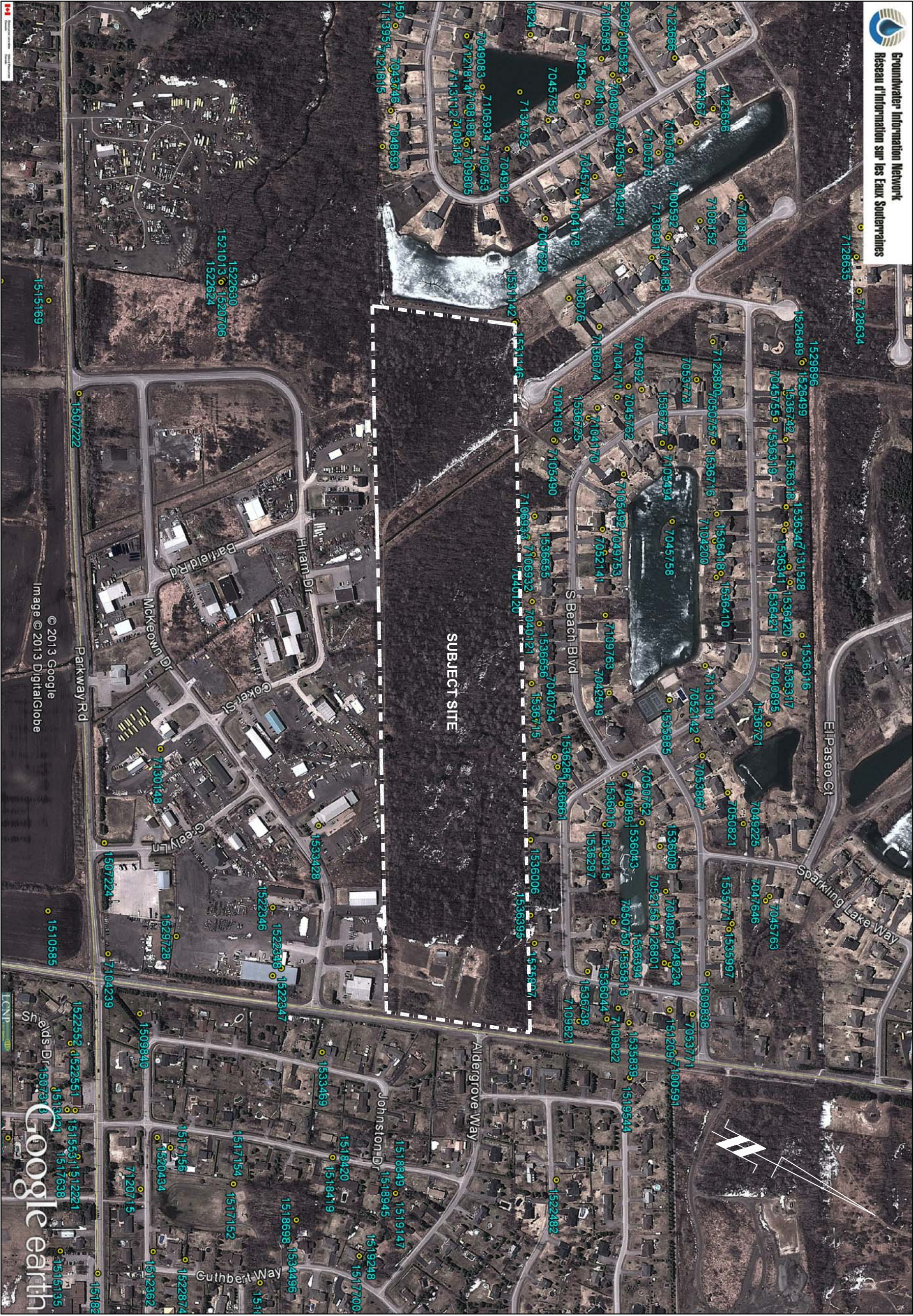
REGIONAL BEDROCK
MAPPING

Scale:	N.T.S	Seal:
Date:	09/2013	
Drawn by:	BA	
Checked by:	RAP	
File:	PH2095	

Drawing No.: PH2095-FIG.3

NOTE: BEDROCK INFORMATION REPRODUCED FROM ONTARIO GEOLOGICAL SURVEY G.I.S. OVERLAY FOR GOOGLE EARTH





LEGEND:

1536297 WATER WELL RECORD
(PUBLISHED MOE RECORDS)

Client:

1384341 ONTARIO LTD.

Consultant:

patersongroup
consulting engineers

Project:

OLD PRESCOTT ROAD
SUBDIVISION
1240 OLD PRESCOTT ROAD
OTTAWA (GRELTY), ONTARIO

Drawing:

REGIONAL WELLS PLAN

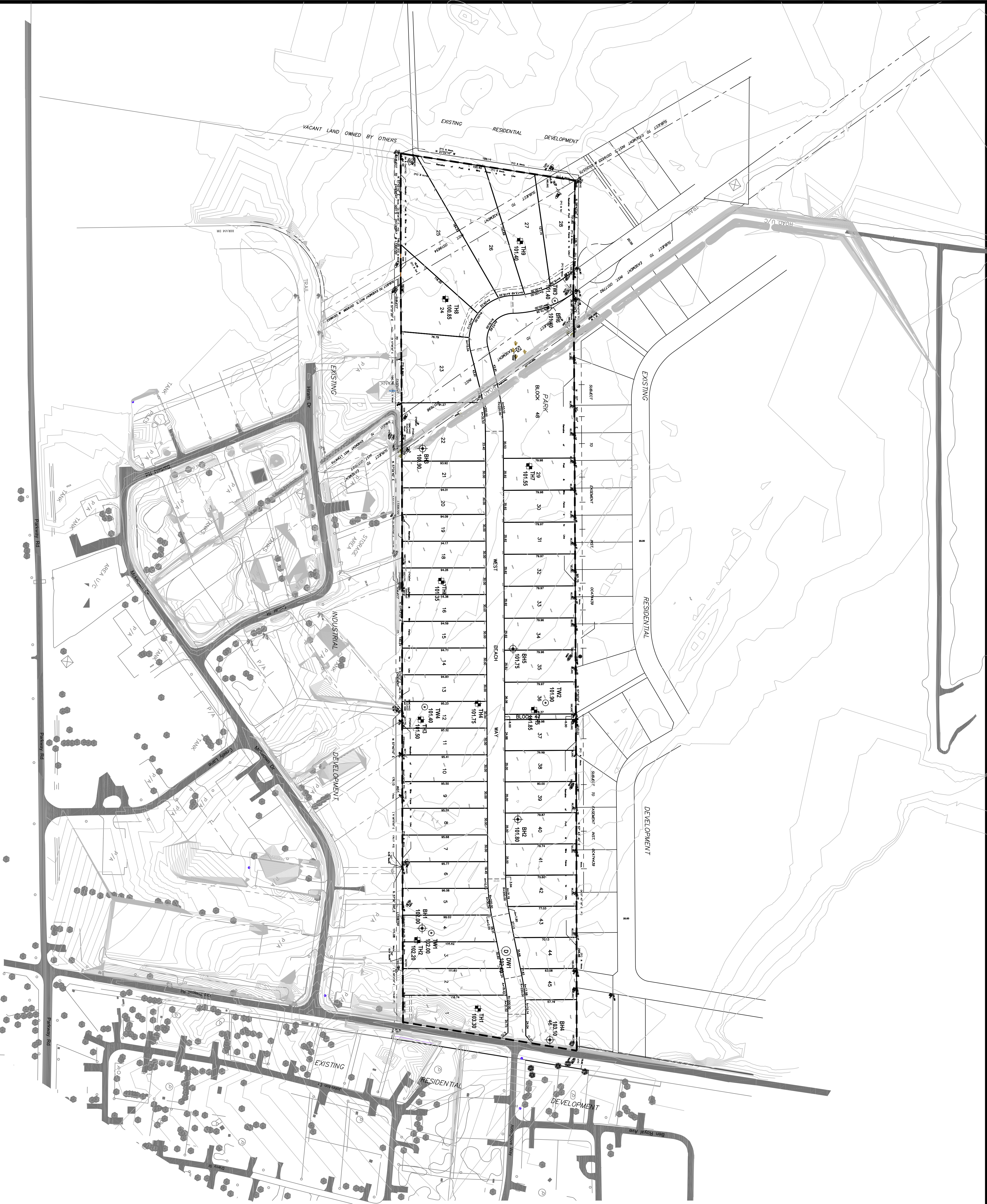
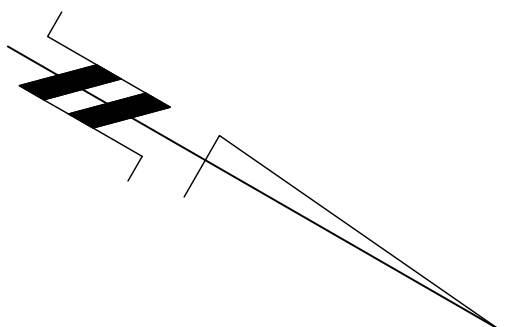
Scale:	N.T.S	Seal:
Date:	09/2013	
Drawn by:	BA	
Checked by:	RAP	
File:	PH2095	

Drawing No.:

PH2095-FIG.4

NOTE: WATER WELL INFORMATION REPRODUCED FROM THE ONTARIO GROUND WATER INFORMATION NETWORK (GIN)

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LEGEND:

- TW1 TEST WELL LOCATION
- BH2 BOREHOLE LOCATION WITH MONITORING WELL INSTALLED
- TH3 TEST HOLE LOCATION

NOTE: BASEPLAN AND TOPOGRAPHIC INFORMATION PROVIDED BY ANNIS O'SULLIVAN VOLLEBERG.

NO.	DESCRIPTION	DATE
DESIGNED BY:	RAP	
DRAWN BY:	BA	
CHECKED BY:	RAP	
DATE:	1/20/00	
CLIENT:	01/20/13	

1384341 ONTARIO LTD.

OLD PRESCOTT
ROAD SUBDIVISION
1240 OLD PRESCOTT ROAD
OTTAWA (GRIELEY), ONTARIO

TEST WELL
LOCATION PLAN

PH2095-1

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

Scale: H 1:2500
V 1:1000

Des.: RAP

Dwn: RAP

Chkd: RAP

1384341 ONTARIO LTD.

OLD PRESCOTT ROAD SUBDIVISION

1240 OLD PRESCOTT ROAD

OTTAWA (GREELY),

ONTARIO

Dwg. No. PH2095-??

Report No.: PH2095-REP???

Date: 10/2014

patersongroup

consulting engineers

154 Colonnade Road, Ottawa, Ontario K2E 7J5

The diagram is a cross-section of a site, showing various geological features and infrastructure. The horizontal axis represents distance in meters, ranging from 0 to 1000.00. The vertical axis represents elevation in meters, ranging from -150 to 150. Key features include:

- Property Lines:** Indicated by dashed lines at the top and bottom of the diagram.
- CL OF HYDRO EASEMENT:** A horizontal line at approximately 125m elevation.
- CL OF DRAINAGE DITCH:** A horizontal line at approximately 100m elevation.
- TW 1, TW 2, TW 3, TW 4, TW 5:** Trench locations marked with vertical lines and labels.
- Soil Types:** Various soil types are labeled along the cross-section, including SAND, SANDY SILT, SAND GRAV BOULD, GREY LIMESTONE, GREY BROWN LIMESTONE, WHITE SANDSTONE, GREY WHITE SANDSTONE/LIMESTONE MIX, GREY SANDSTONE, LIMESTONE, LIMESTONE WITH GREY SANDSTONE, and GREY GRAVEL SAND.