Geotechnical Engineering

Environmental Engineering

Hydrogeology

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Preliminary Hydrogeological Assessment for Private Services:

Proposed Residential Development 10 King Street Richmond, Ontario

Prepared For Talos Custom Homes Ltd.

Paterson Group Inc.

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Report: PH1292-REP.01

UPDATED: APRIL 8, 2012

Syllabus of Addi	tional Information In Response to RVCA Preliminary Comments
Item	Location of Response/Additional Information
Detailed ESA Information	A copy of the ESA reports were prepared under separate cover and appended to this report for reference. The sampling methodology employed for the collection of VOC's for TW1 was completed as per ASTM methodologies and in accordance with Provincial requirements.
Site Plan-well locations, borehole logs	An updated Lot Development Plan - PH1292-2 has been provided in Appendix 5. The plan shows the generic lot layout. The Test Hole Location Plan- PH1292-1 had been updated to clearly delineate the various monitoring wells on, and adjacent to the site The 1:100 year return flood plain is not shown on the drawing as the site is outside of the flood plain elevations. Reference should be made, instead, to the Planning Rationale provided by Novatech Engineering Consultants Ltd.
Cross Section Issues	The cross section, PH1292-FIG.2 has been updated to include domestic wells and TW4 and TW5 are better delineated. The Oxford/March Formation Transition is better delineated on this updated plan, also.
Well Record Mapping	Paterson has updated Drawing PH1292-Fig.2 to accurately reflect the existing water well information based on the MOE WWR's. The locations of 6 King Street and 13 Cockburn are included on both the updated Figure and on the Test Hole Location Plan - PH1292-1.
Missing Well Records/ Additional Well informatio required	The available MOE WWR's for the neighbouring lots have been included in Figure 2 and are included in Appendix 2. The Statistical Analysis has been included in Section 5.2.
Missing Pumping Test Data	All pumping test data carried out for TW4 and TW5 are included in Appendix 4. The pumping tests completed for TW1, TW2, TW3 and EW are appended to Appendix 4 for reference purposes only as the analysis and discussion appear in Paterson Report No. PH1292-REP.01
Field Chemistry	All available field chemistry collected during the pumping test is included in Appendix 3.
March Formation Isolation (Pg.5)	Paterson disagrees that this statement is unsubstantiated. Paterson has elaborated on the works completed by Golder Associates Ltd. in our argument in Section 5.1 and Section 6.0
Recommendations - casing length	The recommendation section has been updated to include a recommendation for casing length.
Transmissivity discrepancies	The transmissivities for all wells have been corrected and the updated table is presented in Section 7.1. The analyses for each well pumping test has been updated and provided in appendix 4.



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1.0 INTRODUCTION

1.1 Terms of Reference

Paterson Group (Paterson) was commissioned by Talos Custom Homes Ltd. (Talos) to conduct a hydrogeological assessment related to the use of private wells to provide potable water to 40 semi-detached homes located at 10 Kings Street, Richmond, Ontario.

The property, hereafter referred to as the subject property, is situated on the south side of Perth Street, and bound by King Street, future Hamilton Street extension and Cockburn Street. The subject property is approximately 1.59 hectares in size and has the legal description: Registered Plan D-13 Unit 59 REF Plans; 4R5234, Parts 1 and 2 (Less 4R11108); Parts 2, 4, Ottawa, Ontario. (Refer to Figure 1 - Site Location Plan in Appendix 5).

A preliminary hydrogeological study was completed by Paterson in February 2010 (reference can be made to Paterson Report No. PH1292-REP.01). The findings of the preliminary report confirmed the presence of suitable water supply aquifers beneath the subject property in support of a proposed zoning by-law amendment application (City of Ottawa Reference No. D02-02-10-0010) filed by Novatech Engineering Consultants Ltd.(Novatech).

Review of the preliminary report by both the City of Ottawa and the Rideau Valley Conservation Authority (RVCA) (refer to Appendix 2 for a copy of the original comments) concluded that additional works were required to demonstrate the aquifer system present beneath the subject property could support the proposed density of development, in the long term.

The purpose of this study has been to augment the original works presented in Paterson Report No. PH1292-REP.01 by combining the preliminary study report with the additional works.

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 hydrogeology of the subject property, as it is understood at the time of writing this report.

Paterson has also completed a Phase I- II - Environmental Site Assessment (ESA) for the subject lands, the results of which are recorded under separate cover in Paterson Report No. PE1623-1. A Geotechnical Report has been issued for this site, by Paterson, under separate cover.



1.2 Background

It is understood that the proposed development will consist of a 20 semi-detached residential blocks resulting in a total of 40 residential units. The proposed general site layout is detailed on the Test Hole Location Plan, Drawing No. PH1292-1 located in Appendix 5.

The subject property is located within the boundary of the Village of Richmond, Ontario. As such, it can be serviced using a "split services" which will consist of private water supply, and a municipal wastewater treatment.

Beyond the Jock River, located more than 1000 m to the south of the subject property, lies a residential development commonly referred to as the King's Park Subdivision. This subdivision is served by two (2) municipal water wells which provide approximately 450 people with drinking water. These wells, based on the available published information, have casings which extend into the Oxford Formation Limestone, but are completed into, and draw water from a sandstone aquifer located in the Nepean Formation. As these wells are municipal water wells, they have been extensively studied to create wellhead protection areas for each aquifer in which they intercept. The proposed development, as it pertains to impacts on the underlying water supply aquifers, is discussed, in detail in Section 7.0 of this report.

In preparation of this report, the following additional literary references were consulted:

- "Drinking Water in the Village of Richmond (King's Park Subdivision) Draft Groundwater Findings", prepared by the Mississippi-Rideau Source Protection Region, dated May 2009;
- "Watershed Characterization Report Preliminary Draft Volume 1 & 2", prepared by the Mississippi Rideau Source Protection Region, dated March 2008; and
- "Procedure D-5-5: Technical Guideline for Private Wells: Water Supply Assessment", prepared by the Ontario Ministry of the Environment, dated August 1996.
- "Hydrogeological Study Report: Perth Street at Shea Road, Richmond, Ontario" prepared by Paterson Group Inc., dated February 3, 2011.



2.0 METHOD OF STUDY

2.1 Terrain Analysis

The subsurface conditions were investigated with a series of boreholes put down along the north east portion of the subject site in conjunction with the Phase I-II Environmental Site Assessment investigative works. The fieldwork program for the investigation was carried out on July 3, 2009. At that time, a total of five (5) deep boreholes were advanced to depths ranging between 5 m and 6 m below the surface of the ground. The borehole locations are shown on Drawing No. PH1292-1 - Test Hole Location Plan, included in Appendix 5 and the geotechnical and environmental findings of the investigation are summarized on the Soil Profile and Test Data sheets located in Appendix 1 of this report.

Additional subsurface investigation works were undertaken by Paterson as part of the geotechnical investigation. During the geotechnical investigation, a total of five (5) additional deep boreholes were put down across the site. The borehole locations are shown on Drawing No. PH1292-1 and are denoted by a "G" suffix. The Soil Profile and Test Data sheets are located in Appendix 1 of this report and are denoted by PG2022 -BH1 to BH5, inclusive.

Groundwater

Groundwater levels (GWLs) were measured in the standpipes installed in the boreholes and the results are summarized in Table 1. The groundwater table level can also be estimated based on moisture levels and colour of the recovered soil samples. Based on these observations at the borehole locations, the permanent groundwater table is expected between 2.5 to 5 m depth. It should be noted that groundwater levels are subject to seasonal fluctuations. Therefore, the groundwater levels could vary at the time of construction.



TABLE 1:			ELEVATIONS IN B AL INVESTIGATION	OREHOLES PUTDOWN N AT THE SITE
Test Hole	Ground Surface	Groundy	vater Levels	
Number	Elevation (m)			Recording Date
		Depth (m)	Elevation (m)	Recording Date
BH 1	94.02	2.56	91.46	February 5, 2010
BH 2	93.94	3.20	90.74	February 5, 2010
BH 3	94.07	2.80	91.27	February 5, 2010
BH 4	93.94	2.90	91.04	February 5, 2010
BH 5	93.86	3.60	90.26	February 5, 2010

Note: The ground surface elevation at each test hole location are referenced to a TBM consisting of the top of manhole located along the south property boundary of the subject site

2.2 Test Well Installation

EW

The initial field investigation program identified the presence of an existing drilled water well on the subject property, hereafter referred to as Existing Well (EW). An Ontario Ministry of the Environment (MOE) Water Well Record (WWR) was secured for the well and the well construction methodology, subsurface stratigraphy and well yield were evaluated. A copy of the MOE WWR for EW is provided in Appendix 2.

TW1

Based on the information provided in the background documents and in the WWR for EW a conceptual hydrogeological model was derived. In order to further evaluate the water supply aquifer(s) underlying the site, a new test well, denoted as TW1, was constructed. The test well was constructed by Air Rock Drilling Company Ltd. of Richmond, Ontario on January 11, 2010 at the location shown on the Test Hole Location Plan (Drawing No. PH1292-1). The test well location was selected by Paterson in conjunction with the civil consultant, Novatech.

With respect to the construction of TW1, a 228 mm diameter casing hole for the test well was advanced using a rotary tri-cone bit through the overburden, to the underlying limestone. The casing hole was advanced into the bedrock of the Oxford Formation an additional 2.1 m for TW1 to ensure that the casing was seated on competent bedrock.



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

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

TW2 and TW3

During the interim period between the submission of the preliminary hydrogeological study report and the receipt of the comments from the review agencies, it was decided to construct two (2) additional test wells on the site in order to satisfy the requirements of Procedure D-5-5, with respect to the minimum number of test wells required for the site. These wells, hereafter denoted as TW2 and TW3, were constructed utilizing the same well construction methodology as had been adopted for TW1. Reference can be made to the published MOE Water Well Records for TW2 and TW3, which are located in Appendix 2.

TW4 and TW5

Subsequent to the receipt of the comments from the review agencies, and subsequent to the successful completion of the hydrogeological study carried out on the nearby property located at the corner of Perth Street and Shea Road (refer to Paterson Report No. PH1553-REP.01, dated February 3, 2011), several technical meetings were held with the hydrogeologists from the City and RVCA.

Based on the outcome of those discussions, it was determined that the March Formation could be considered to be hydraulically isolated from the Oxford Formation, as evidenced by the works completed at the Perth Street and Shea Road site. As such, the same well construction methodology was employed as had been done on the nearby lands.

Specifically, TW4 and TW5 were constructed such that the casing hole was advanced through the overburden and through the limestone of the Oxford Formation, terminating approximately 3.0 m into the shallow reaches of the March Formation.



Casing was installed in each casing hole and grouted in place using reverse pressure grouting techniques consistent with Ontario Regulation 903 requirements.

The open borehole was advanced into the March Formation where a strong water supply aquifer was intercepted by both wells.

The wells were surged and pumped for an initial extended period of well development to clear the formation of the majority of the fine rock cuttings.

2.3 Aquifer Analysis

All of the five (5) test wells were subjected to an initial one (1) hour pumping test, carried out by Air Rock Drilling Company Ltd. (Air Rock) immediately following stabilization of the static water level in the well column.

The one (1) hour pumping tests demonstrated that the test wells, overall, had potential II yields of between 68.1 L/min. and 681 L/min.

Constant Rate Pumping of TW1, TW2 and TW3

TW1, TW2, and TW3 were subjected to individual constant rate pumping tests following the initial one hour testing. The pumping equipment was supplied and installed by Air Rock and a member of the hydrogeology department of Paterson was present to record water levels and to carry out a series of well head water quality analyses. Paterson confirmed the installation of a 20 USgpm (75.7 L/min.) flow restrictor on the outlet of the discharge pipe prior to commencement of the pumping test. The discharge line was directed at least 15 m downgradient of the well head and the surficial drainage carried the discharge water away from the well.

The duration of the constant rate pumping test for TW1, TW2 and TW3 was set at period of 360 minutes in accordance with the minimum requirements of Ontario Ministry of the Environment (MOE) Procedure D-5-5 guidance document (Procedure D-5-5).

The results of the aquifer analysis are presented and discussed in Section 7 of this report. Additional data regarding the underlying aquifers was referenced from adjacent hydrogeological study reports and the transmissivity, storativity and specific capacity values were compared against those obtained in this assessment.

Recovery data was collected for each of TW1, TW2 and TW3 following the completion of the constant rate extended pumping test until 95% recovery was achieved.



Constant Rate Pumping of TW4 and TW5

TW4 and TW5, having been constructed such that they have theoretically isolated the March Formation water supply aquifer from the influence of the Oxford Formation, was subjected to a detailed constant rate pumping test analysis. Paterson employed the use of dataloggers manufactured by Schlumberger to, with a high degree of accuracy, monitor the effects of pumping on the neighbouring wells surrounding the subject property. A detailed summary of the set up and analysis of the data is presented in Section 6.0 and Section 7.4, of this report, respectively.

2.4 Field Survey

The ground surface elevations for the wells are referenced to a geodetic datum. The elevations at the wells, which are delineated on Drawing No. PH1292-1 - Test Hole Location Plan in Appendix 5, were surveyed and laid out by Novatech prior to the construction of each of the five (5) test wells.

2.5 Laboratory Testing

Testing of Water Supply Aquifer

Two (2) water samples were collected from each of the five (5) test wells during the course of the constant rate extended pumping tests at 3 and 6 hour testing milestones. For TW4 and TW5, which were each subjected to a nine (9) hour constant rate pumping test, samples were collected at 3 and 9 hour milestones. Chlorine residuals were measured in the field using a Hanna C-114 multimeter to ensure the absence of chlorine when the water samples were collected.

The water samples were submitted to Accutest Laboratories for analysis of a standard "Subdivision Supply Requirement" package which includes a comprehensive suite of health and aesthetic based parameters that are typically used to assess water quality for the purposes of human consumption. The analytical results of each water sample are provided in Appendix 3, and are discussed in detail under Section 7. In addition, the water quantity and quality information was obtained from a total of two (2) neighbouring residences located at 6 King Street and 13 Cockburn, respectively. A complete subdivision package was recovered from the raw water supply at each residence and stored for immediate transportation to Accutest for analysis. The

analytical results are provided in Appendix 3 and are discussed in Section 7.

Hydrogeological Assessment



wa Kingston North Bay Proposed Residential Development
11 King Street, Richmond, Ontario

In addition to the individual raw water samples obtained from the immediate neighbouring residences, the raw water quality obtained from a 12 hour pumping test of the test well put down on the adjacent proposed development lands bordered by Perth Street and Shea Road, have been included in this analysis, as the water quality from this particular well is considered to be indicative of the March Formation water supply aquifer.



3.0 SITE DESCRIPTION

3.1 Surface Conditions

The subject property is relatively flat and predominantly overlain with grass cover. The general surface topography favours an a slight south-southeast direction towards the Jock River, which is located a distance of approximately 500 m beyond the southern limits of the property.

Site drainage appears to be poor to imperfect with drainage being achieved through a combination of surficial runoff and vertical infiltration. The neighbouring roadside ditches, which effectively box the subject property on three (3) sides, are generally shallow and provide passive site drainage only. There was no evidence of active drainage (i.e. subsurface tile drains, grassed swales, etc.) on the subject property at the time of the site investigation.

3.2 Surrounding Land Uses

The subject property is bound by streets along the east, south (future) and west property limits. A right-of-way for a street is located to the south of the subject property, beyond which, is existing residential development. To the north, a series of commercial and residential uses have been established.

An existing fuel station is located immediately beyond the northeastern edge of the site. The Phase I-II ESA which, was completed by Paterson, did not find any evidence of either Volatile Organic Compounds (VOC's) or petroleum hydrocarbons (PHC's) at detectable concentrations in the overburden groundwater at the site. However, in order to address the groundwater, VOC and PHC analysis was carried out on a raw water sample from TW1 recovered during the constant rate pumping test. The laboratory reports of analysis are provided of reference purposes in Appendix 3 and the results are summarized and discussed in Section 7 of this report.



4.0 GEOLOGY

4.1 Surficial Geology

A review of available surficial soils mapping for the area in the vicinity of the subject property indicates that the site is located within the sub-littoral and deep water facies of the Champlain Sea Deposits with isolated areas of glacial till deposits at the surface.

The surficial soils map for the area, entitled, "Soils of The Regional Municipality of Ottawa Carleton (Excluding the Urban Fringe) Sheet 3", provides the overall surficial geology for the surrounding area. The subject property is located within the urban boundaries and, as such, the soil information is not specifically defined. However, based on the mapping beyond the urban boundaries indicate a broad coverage of low permeable silty clays of the Dalhousie and North Grenville Soil Associations.

Generally, the soil profile at this site consists of a deep silty clay deposit. The upper portion of the silty clay has been weathered to a brown crust at all test hole locations. Grey silty clay was encountered below the brown silty clay crust at all test hole locations. In situ shear vane field testing conducted within the grey silty clay layer yielded undrained shear strength values ranging from 30 to 80 kPa. These values are indicative of a firm to stiff consistency.

Reference should be made to the Soil Profile and Test Data sheets presented in Appendix 1 for specific details of the soil profiles encountered at the test hole locations.

4.2 Bedrock Geology

Based on available geological mapping, the surficial soils are directly underlain by dolomite and limestone of the Oxford Formation which is, in turn, underlain by the March Formation, which overlies the Nepean Formation (Golder, 2003). Both the Oxford and March Formations comprise the Beekmantown Group of the Palaeozoic Era. The general area is directly underlain by dolomite and limestone of the Oxford Formation and is expected to be encountered at depths varying between 5 and 15 m.

The overall maximum thickness of the Oxford Formation is of the order of 70 m in the Ottawa area. TW1, which was drilled through the Oxford Formation and completed into the March Formation, passed through approximately 56 m of Oxford Formation. This is slightly less than the average thickness of the Oxford Formation, but it is consistent with Paterson's experience in the surrounding area. The Oxford Formation thins significantly as one moves eastward from the west of Richmond to the other side of the Rideau River at Manotick, Ontario. Based on available MOE Water Well

11 King Street, Richmond, Ontario



Kingston

Records the Oxford formation thins to an overall thickness of approximately 10 to 15m. east of Manotick, Ontario.

The March Formation has an estimated thickness of between 8 and 9 m and is comprised of thick beds of grey sandstone alternating with thick beds of sandy bluegrey dolomite. The contact with the Nepean formation is generally placed at the lowest dolomitic layer, however it is often difficult to differentiate the Nepean and March formations due to similarities in appearance. Paterson's experience has derived that the Nepean Formation can be differentiated from the March Formation by careful evaluation of both the colour of, and integrity of the rock fragments produced during drilling through each of these layers.

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

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

4.3 Groundwater

The groundwater levels, as detailed in Table 1 in Section 2.1 of this report, were measured in BH5 during the environmental assessment and during the constant rate pumping tests. The depth to the groundwater varies across the site, ranging from approximately 2.5m below ground surface (bgs) to 3.6 m bgs.

Based on the borehole information, the overburden at the site consists primarily of a stiff to very still silty clay parent material. The overburden groundwater present beneath the surface of the ground exists in a perched state within the lower extents of the weathered crust portion of the silty clay stratum. The overall direction of groundwater flow, within this interfacial water appears to follow the topography of the site with a modest southeasterly gradient.



5.0 REGIONAL HYDROGEOLOGY

5.1 Published General Hydrogeology

Based on the available published MOE Water Well Record data, the wells immediately surrounding the subject property consist of drilled wells utilizing water supply aquifers located within the Oxford, March and Nepean Formations.

As discussed in Section 1.2 of this report, the regional hydrogeology of the Richmond area has been extensively studied over the past many years. Based on the available data, the upper aquifer, located within the Oxford Formation is the dominant source of drinking water for over 90% of the inhabitants of Richmond, Ontario. This water supply aquifer has been previously categorized as having an immense volumetric well yield and has been demonstrated to have satisfactory water quality.

A lower aquifer exists within the March Formation, located at the bottom of the formation at the March-Nepean Formation interface. This aquifer has also been demonstrated to have significant well yields, and is presently utilized by the private communal wells servicing the newer Hyde Park Subdivision which is located to the northwest of the subject property.

The deepest mapped aquifer present beneath the subject property exists in the Nepean Formation. This aquifer, has been well documented by Paterson, Golder Associates Ltd. (Golder) and others to be a regional aquifer with extensive areal coverage across the Ottawa area extending from Almonte, Kemptville and Merrickville eastward past Greely, Ontario. The Nepean aquifer, like that of the Oxford Formation, possesses aquifer characteristics which make it a highly productive aquifer with very desirable water chemistry. The two (2) municipal water supply wells for the King's Park subdivision primarily exploit the Nepean Formation.

The Source Water Protection Initiative presently underway by the Mississippi-Rideau Source Protection Region has summarized the wellhead protection information for the King's Park Subdivision. Based on the compiled information utilizing the 2003 Golder data, the upper Oxford Formation aquifer has a wellhead protection area extending from beneath the subdivision southward away from the subject property. Conversely, the wellhead protection area for the lower Nepean Formation aquifer, extends in a northwest direction just south of the subject property several kilometers beyond the Village limits. Neither of the wellhead protection areas associated with the underlying water supply aquifers for the communal wells servicing King's Park appear to directly intersect the subject property.



5.2 Water Well Record Review

Based on the available published MOE Water Well Record data, the wells immediately surrounding the subject property consist of drilled wells utilizing water supply aquifers located primarily within the Oxford Formation with only a small grouping of wells intercepting the March Formation aquifer at considerable distance from the proposed development.

Figure 2- Regional Hydrogeological Summary, located in Appendix 5, illustrates a representative cross section of the neighbouring wells. Several of these wells were utilized as observation wells as part of the study.

Analysis of Figure 2 reveals that the majority of the wells located in the immediate vicinity of the subject property are completed into the upper Oxford Formation. There is a grouping of wells located further to the north to northwest of the subject property, which appear to have open boreholes through the Oxford Formation and intercept the March Formation. The test well put down on the lands at the corner of Perth Street and Shea Road is isolated to the March Formation in the same manner as is TW4 and TW5.

Based on the statistical analysis performed on the surrounding wells in close proximity to the subject property, two bedrock aquifers exist underlying the site. Both the limestone and sandstone aquifers are reported to have moderate to high well yields and it would appears that the test wells constructed at the site are indicative of those in the surrounding area.

5.3 Surrounding Water Quality

General Chemistry

General water quality, as it relates to the Oxford Formation water supply aquifer, is summarized for the neighbouring wells immediately adjacent to the site, is presented in Table 2, below.

Table 2 also summarizes the raw water quality of the March Formation water supply aquifer, based on the results of a 12 hour pumping test of a test well having the same well construction methodology as that employed for TW4 and TW5. This well is considered to be representative of the water quality within the March Formation and compares well with the raw water quality reported for TW4 and TW5 in Section 7 of this report.



Parameter	Units	Neighbour	ing Water We	Ontario Drinking Water Standards ¹		
		6 King Street (Lab Id:927148)	10 Cockburn (Lab Id:927147)	Perth St. @ Shea Rd (24 HR) (Lab Id: 857774)	Туре	Limit
licrobiological Parameter	'S ²					
Escherichia Coli	ct/100 mL	0	0	0	MAC	0
Faecal Coliforms	ct/100 mL	0	0	0	-	-
Faecal Streptococcus	ct/100 mL	0	0	0	-	+ -
Heterotrophic Plate Count	ct/1 mL	0	0	2	-	-
Total Coliforms	ct/100 mL	0	0	0	MAC	0
Chemical Parameters (Hea	l alth Related)					
Fluoride	mg/L	0.38	0.36	1.03	MAC	2.4
Nitrite	mg/L	<0.10	<0.10	<0.10	MAC	1
Nitrate	mg/L	<0.10	<0.10	<0.10	MAC	10
Chemical Parameters with	Aesthetic Ob	jectives/ Op	<u> </u>	 delines		
Alkalinity	mg/L	260	260	223	OG	500
Chloride	mg/L	46	46	121	AO	250
Colour	TCU	2	<2	<2	AO	5
DOC	mg/L	1.2	1.1	1.2	AO	5
Hydrogen Sulfide	mg/L	<0.01	0.01	<0.01	AO	0.05
рН		7.94	7.90	8.18	AO	6.5-8.5
Sulphate	mg/L	47	47	47	AO	500
Hardness	mg/L	298	303	161	OG	100
Sodium	mg/L	35	34	119	AO	20(200
Iron	mg/L	0.36	0.43	0.22	AO	0.3
Manganese	mg/L	<0.01	0.01	0.01	AO	0.05
Total Dissolved Solids	mg/L	454	451	593	AO	500
Turbidity (Laboratory)	NTU	3.4	6.5	1.1	AO	1
Turbidity (Field)	NTU	0.1	1.1	0.0	AO	1

^{1.} Ontario Drinking Water Standards identifies the following types of parameters: MAC= Maximum Allowable Concentration; AO=Aesthetic Objective; OG=Operational Guideline.



6.0 SITE HYDROGEOLOGY

As previously stated in this report, a single test well was constructed at the subject site (refer to Drawing No. PH1553-1 - Test Hole Location Plan in Appendix 5 for well location). Hydrogeological details of the construction of the test well based on the MOE Water Well Records and and engineering site notes, are summarized below in Drawing No. PH1553-3 - Generalized Hydrogeological Cross Section.

A cursory review of the hydrogeological cross section (Drawing No. PH1292-Fig.2) reveals that the hydrogeology of the test well is very much similar, in terms of bedrock strata, aquifer locations, etc., as to the data presented in Section 5.0 of this report.

TW1 intercepted a water supply aquifer located within the lower limits of the March Formation. This well construction methodology is considered to be unique for the area as most of the adjacent wells are completed at relatively shallow depths within the upper Oxford Formation, while the remaining wells have open boreholes extending through the Oxford Formation and completed in the March Formation.

The static water levels reported in TW1 indicates potentiometric head pressures on the aquifer of upwards of 60 m. This produces an artesian condition, however the static water level remains below the surface of the ground and a suitable distance below the top of casing to not anticipated free flowing artesian conditions in the future.

With respect to the inferred direction of groundwater flow, previous hydrogeological studies carried out by Paterson in the vicinity of the subject property have previously presented evidence to indicate that the direction of groundwater flow within the Oxford Formation is in a west to southwest direction towards the Rideau River.



7.0 AQUIFER ANALYSIS

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

7.1 Aquifer Characteristics

The aquifer characteristics determined from the compilations of the pumping tests for the five (5) test wells are summarized below:

				TICS RESULTING CONSTANT RAT		YSIS OF	
		TEST WELL NUMBER					
PARAMETER	TW1	TW2	TW3	TW4	TW5	EW	
Transmissivity ¹ (m²/d)	4	2	684	56.7	118	118	
Storativity ²	n/a	n/a	n/a	1.0 x 10 ⁻⁴	4.0 x 10 ⁻⁵	4.0 x 10⁻⁵	
Pumping Rate (L/min)	76	76	75.7	75.7	81.8	37.8	
Available Drawdown (m)	71	69	72	66	64	7	
Maximum Drawdown (m)	3.01	1.2	1.9	5.3	3.5	0.25	
% Drawdown	4.2	1.7	2.6	8.0	5.5	3.6	
Specific Capacity (L/min/m dd)	25	63	40	14.3	23	151	
20 Year Safe Yield (m³/day)	479	78	30251	1882	3932	3932	

- 1. Transmissivity values calculated from numerical averages of values derived from the Theis & Jacobs Recovery method of analysis. In the case of TW3, transmissivity was calculated as the numerical average of the three (3) analytical results through the use of observation well data.
- 2. Storativity values calculated based on the numerical averages of all storativity values obtained from both Theis and Cooper & Jacobs Time-Drawdown analytical methods.



7.2 Groundwater Geochemistry Assessment

As two distinct water supply aquifers/aquifer combinations were encountered within the bedrock beneath the subject property, the well combinations have been grouped into the following categories related to the contributions of the individual water supply aquifers on the overall water quality of the wells.

Combined Oxford/March Formation

The well construction program resulted in TW1, TW2 and TW3 having open holes throughout the Oxford Formation and into the March Formation, the water quality data for these well is presented in Table 4 and Table 5, below to summarize the combined contributions of the Oxford and March Formation water supply aquifers.

Isolated March Formation

As TW4 and TW5 were constructed such that the Oxford Formation is completely isolated from the Oxford Formation, Table 6 and Table 7 summarize the raw water quality of the March Formation water supply aquifer.

Oxford Formation

The MOE WWR for the existing drilled well on the site, previously denoted as EW, indicates that the well was completed into the upper Oxford Formation. Table 8 and Table 9 summarize the raw water quality for this water supply aquifer. Additional discussion regarding the upper Oxford Formation, and specifically, the representativeness of EW to reflect only the water quality from the upper Oxford water supply aquifer is discussed in detail in Section 7.3.

Additional Testing for Potential Contaminants

In addition to the reported water quality analysis for these wells, TW1 was sampled for volatile organic compounds and petroleum hydrocarbons, as part of the original preliminary hydrogeological study report and appears in this report in Table 10. The purpose of this testing, as detailed elsewhere in this report, was to confirm the absence of these contaminants in the water supply aquifers beneath the site consistent with the environmental remediation efforts which had previously taken place on an adjacent site of a former fuel station.



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		1	W1	TW	2	Т	W3	10	ows
Parameter	Parameter Units	3 HR (771127)	6 HR (771144)	3 HR (777415)	6 HR (777416)	3 HR (783870)	6 HR (783871)	TYPE	LIMIT
Microbiologic	cal Parameter	's							
E.coli	ct/100 mL	0	0	0	0	0	0	MAC	0
Total Coliforms	ct/100 mL	0	0	0	0	0	0	MAC	0
Chemical Par	ameters (Hea	alth Related)				- 1		1
Fluoride	mg/L	0.31	0.31	0.29	0.29	0.34	0.36	MAC	2.4
Nitrite	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	MAC	1
Nitrate	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	MAC	10
Chemical Par	rameters with	Aesthetic	Dbjectives/	Operational	Guidelines				
Alkalinity	mg/L	258	258	254	255	252	253	OG	500
Chloride	mg/L	50	51	56	55	52	52	AO	250
		<2	2	<2	2	<2	<2	AO	5
Colour	TCU	~~							
Colour	mg/L	N/A	1.3	1.2	1.2	1.2	1.2	AO	5
			1.3	1.2 0.02	1.2	1.2 0.01	1.2 <0.01	AO AO	
DOC	mg/L	N/A							5
DOC H ₂ S	mg/L	N/A <0.01	<0.01	0.02	0.02	0.01	<0.01	AO	5
DOC H ₂ S pH	mg/L	N/A <0.01 7.97	<0.01 7.95	0.02 7.93	0.02 7.94	0.01 7.96	<0.01 7.98	AO AO	5 0.05 6.5-8.5
DOC H ₂ S pH Sulphate	mg/L mg/L	N/A <0.01 7.97 46	<0.01 7.95 46	7.93 47	0.02 7.94 47	0.01 7.96 54	<0.01 7.98 53	AO AO	5 0.05 6.5-8.5 500
DOC H ₂ S pH Sulphate Hardness	mg/L mg/L mg/L mg/L	N/A <0.01 7.97 46 292	<0.01 7.95 46 <u>308</u>	0.02 7.93 47 <u>288</u>	0.02 7.94 47 <u>297</u>	0.01 7.96 54 <u>287</u>	<0.01 7.98 53 <u>287</u>	AO AO AO OG	5 0.05 6.5-8.5 500 100
DOC H ₂ S pH Sulphate Hardness Sodium	mg/L mg/L mg/L mg/L mg/L	N/A <0.01 7.97 46 292 26	<0.01 7.95 46 308 29	0.02 7.93 47 <u>288</u> <u>29</u>	0.02 7.94 47 297 29	0.01 7.96 54 <u>287</u> <u>29</u>	<0.01 7.98 53 287 30	AO AO AO OG AO	5 0.05 6.5-8.5 500 100 20(200
DOC H ₂ S pH Sulphate Hardness Sodium Iron	mg/L mg/L mg/L mg/L mg/L mg/L	N/A <0.01 7.97 46 292 26 0.99	<0.01 7.95 46 308 29 0.81	0.02 7.93 47 288 29 0.58	0.02 7.94 47 297 29 0.59	0.01 7.96 54 287 29 0.58	<0.01 7.98 53 287 30 0.4	AO AO OG AO AO	5 0.05 6.5-8.5 500 100 20(200 0.3

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TABLE 5:	SUMMARY OF GENERAL CHEMISTRY PARAMETERS FOR THE COMBINED OXFORD
	FORMATION AND MARCH FORMATION WATER SUPPLY AQUIFERS AS DEFINED BY TW1,
Í	TW2 & TW3

	1002 & 1003						
		٦	TW1	TW	2	Т	W3
PARAMETER	PARAMETER UNITS		6 HR (771144)	3 HR (777415)	6 HR (777416)	3 HR (783870)	6 HR (783871)
General Chemical	l Parameters						
Conductivity	uS/cm	702	705	722	718	685	683
N-NH₃ (Ammonia)	mg/L	0.07	0.06	0.03	0.03	0.05	0.05
Phenols	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Tannin & Lignin	mg/L	<0.1	0.2	0.1	<0.1	0.2	0.2
Total Kjeldahl Nitrogen	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Ion Balance	Unitless	0.94	0.99	0.92	0.95	0.93	0.93
Calcium	mg/L	74	77	74	76	72	72
Magnesium	mg/L	26	28	25	26	26	26
Potassium	mg/L	5	4	4	4	4	4



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			PLY AQUIFER AS		ERS FOR THE M W4 & TW5	ARCH	
		7	ſW4		TW5	ODV	vs
Parameter	Units	3 HR (906783)	9 HR (906784)	3 HR (777415)	6 HR (777416)	TYPE	LIMIT
Microbiologica	I Parameters						
E.coli	ct/100 mL	0	0	0	0	MAC	0
Total Coliforms	ct/100 mL	0	2	0	0	MAC	0
Chemical Para	meters (Health	Related)					<u>.</u>
Fluoride	mg/L	0.29	0.29	0.28	0.27	MAC	2.4
Nitrite	mg/L	<0.10	<0.10	<0.10	<0.10	MAC	1
Nitrate	mg/L	<0.10	<0.10	<0.10	<0.10	MAC	10
Chemical Para	meters with A	esthetic Objectiv	es/ Operational C	Guidelines		L	.1
Alkalinity	mg/L	268	267	266	268	OG	500
Chloride	mg/L	44	44	45	45	AO	250
Colour	TCU	<2	3	<2	2	AO	5
DOC	mg/L	1.2	1.2	1.0	1.1	AO	5
H ₂ S	mg/L	<0.01	<0.01	<0.01	<0.01	AO	0.05
рН		8.17	8.17	7.97	7.96	AO	6.5-8.5
Sulphate	mg/L	46	46	49	49	AO	500
Hardness	mg/L	<u>304</u>	302	<u>285</u>	306	OG	100
Sodium	mg/L	<u>24</u>	24	<u>26</u>	<u>27</u>	AO	20(200)
Iron	mg/L	<u>0.32</u>	<u>0.32</u>	<u>0.66</u>	<u>0.54</u>	AO	0.3
Manganese	mg/L	<0.10	<0.10	0.01	0.01	AO	0.05
TDS	mg/L	447	446	449	442	AO	500
Turbidity Laboratory	NTU	2.8	1.5	6.5		AO/MAC	5/1



_	_		MISTRY PARAMETER BY TW4 & TW5	S FOR MARCH FORM	MATION WATER
			TW4	Т	W5
PARAMETER	METER UNITS		6 HR (771144)	3 HR (777415)	6 HR (777416)
General Chemical	Parameters				
Conductivity	uS/cm	687	686	691	680
N-NH₃ (Ammonia)	mg/L	0.04	0.05	<0.02	<0.02
Phenols	mg/L	<0.001	<0.001	<0.001	<0.001
「annin & Lignin	mg/L	<0.1	<0.1	<0.1	<0.1
otal Kjeldahl litrogen	mg/L	<0.10	<0.10	<0.10	0.12
on Balance	Unitless	0.95	0.95	0.91	0.96
Calcium	mg/L	79	78	73	78
lagnesium	mg/L	26	26	25	27
Potassium	mg/L	3	3	3	3



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TABLE 8:SUM		LTH AND AESTHETIC/O FORMATION AS DEFINE		ETERS FOR THE		
		EW		ODWS		
Parameter	Units	3 HR (773876)	9 HR (773877)	TYPE	LIMIT	
Microbiologica	al Parameters					
E.coli	ct/100 mL	0	0	MAC	0	
Total Coliforms	ct/100 mL	0	0	MAC	0	
Chemical Para	meters (Health	Related)				
Fluoride	mg/L	0.38	0.38	MAC	2.4	
Nitrite	mg/L	<0.10	<0.10	MAC	1	
Nitrate	mg/L	<0.10	<0.10	MAC	10	
Chemical Para	meters with Ae	sthetic Objectives/ Oper	ational Guidelines			
Alkalinity	mg/L	269	269	OG	500	
Chloride	mg/L	44	43	AO	250	
Colour	TCU	<2	<2	AO	5	
DOC	mg/L	1.3	1.2	AO	5	
H ₂ S	mg/L	<0.01	<0.01	AO	0.05	
рН		8.12	8.16	AO	6.5-8.5	
Sulphate	mg/L	49	49	AO	500	
Hardness	mg/L	<u>290</u>	<u>283</u>	OG	100	
Sodium	mg/L	34	<u>34</u>	AO	20(200)	
Iron	mg/L	0.27	0.23	AO	0.3	
Manganese	mg/L	<0.10	<0.10	AO	0.05	
TDS	mg/L	456	456	AO	500	
Turbidity Laboratory	NTU	1.6	1.1	AO/MAC	5/1	



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		L CHEMISTRY PARAMETER PPLY AQUIFER AS DEFINE				
		EW				
PARAMETER	UNITS	3 HR (773876)	9 HR (773877)			
General Chemical Parame	eters					
Conductivity	uS/cm	702	702			
N-NH₃ (Ammonia)	mg/L	0.09	0.08			
Phenols	mg/L	<0.001	<0.001			
Fannin & Lignin	mg/L	<0.1	<0.1			
Fotal Kjeldahl Nitrogen	mg/L	0.11	<0.10			
on Balance	Unitless	0.97	0.95			
Calcium	mg/L	70	69			
Magnesium	mg/L	28	27			
Potassium	mg/L	5	5			



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TABLE 10: SUMMARY OF VOLATILE ORGANIC COMPOUND AND POLYAROMATIC **HYDROCARBON TESTING CARRIED OUT ON TW1 PARAMETER** UNITS MRL TW 1 TYPE LIMIT UNITS OLATILE ORGANIC COMPOUNDS (VOC'S) 1,1,2-tetrachloroethane ug/L <2 1,1-trichloroethane ug/L 2 <2 1,2,2-tetrachloroethane 2 <2 ug/L 1,2-trichloroethane ug/L 2 <2 1-dichloroethane ug/L 2 <2 4 2-dibromoethane ug/L <4.0 2-dichloropropane ug/L 2 <2 3,5-trimethylbenzene ug/L 1 <1 3-dichlorobenzene ug/L 2 <2 omomethane ug/L 2 <2 1,2-Dichloroethylene ug/L 2 <2 1,3-Dichloropropylene ug/L 0.8 <0.8 hloroethane ug/L 4 <4.0 hloromethane ug/L 4 <4.0 hylbenzene ug/L 2 ΑO 2.4 ug/L ug/L 2 <2 ,2-Dichloroethylene ug/L 2 <2 ,3-Dichloropropylene ug/L 0.8 <0.8 ug/L 2 <2 AO 24 ug/L richlorofluoromethane 2 ug/L <2 1-dichloroethylene ug/L 2 MAC 14 ug/L <2 2-dichlorobenzene ug/L 2 <2 MAC 200 ug/L 2-dichloroethane ug/L 2 <2 **IMAC** 5 ug/L MAC 4-dichlorobenzene ug/L 2 <2 5 ug/L 2 MAC 5 enzene ug/L <2 ug/L MAC arbon Tetrachloride ug/L 2 <2 5 ug/L ichloromethane ug/L 16 <16 MAC 50 ug/L onochlorobenzene ug/L 0.8 <0.8 MAC 80 ug/L MAC 30 1 etrachloroethylene ug/L <1 ug/L MAC richloroethylene ug/L <1 ug/L inyl Chloride ug/L <0.8 MAC ug/L omodichloromethane ug/L 2 <2 romoform ug/L hloroform ug/L <2 Dibromochloromethane 1 <1 ua/L n/p-xylene ug/L 4 <4.0 ug/L 2 <2 OC SURROGATES oluene-d8 92 bromofluorobenzene % 120

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2-dichloroethane-d4



7.3 Aquifer Analysis Summary

Water Quantity Assessment

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

Analysis of Table 6 in Section 7.1, reveals that the pumping rates chosen for each of the pumping wells are above this minimum pumping rate. Furthermore, all of the test wells were reported to have utilized less than 75% of the available drawdown during the pumping tests. This information, combined with the calculated 20 year long term safe yield values, suggests that the specified well yields are representative of the yields which residents of the development are likely to obtain from future wells put down on the site. Long term offsite impacts on wells intercepting the March Formation are not anticipated, considering the drawdown experienced in TW4 and TW5 from the extended constant rate pumping tests, the spacing of the wells on the site, and the intermittent nature of the water use.

Water Quality

Oxford Formation

A review of the water quality analysis data from Table 8 and Table 9, 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 minor concentration of sodium. These aesthetic parameters are explained below:

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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. EW had a post pumping reported hardness concentration of 283 mg/L which is well 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 EW were noted to be present above a concentration of 20 mg/L (34 mg/L reported in post pumping sampling). 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 diets

Combined Oxford and March Formations

Analysis of Table 4 and Table5, which reflect the general groundwater geochemistry associated with the combined Oxford Formation and March Formation water supply aguifers, reveals that the raw water meets all of the critical health related parameters of the Ontario Drinking Water Quality Standards (ODWS).

With respect to aesthetic water quality parameters, the raw water originating from this combined aguifer system shows similarly elevated concentrations of sodium, hardness and iron as was noted in the water quality summary for the Oxford Formation water supply aquifer, above. In addition, residual turbidity in the post pumping water samples suggests additional well development is necessary to further reduce the fine particulate matter dispersed into the formation as a result of drilling operations. Moreover, it is likely, given Paterson's experience with these formations, that the chosen pumping rate is too high for the formation which is resulting in the creation of turbidity. A lower pumping rate, similar to that of typical residential uses (i.e. 25 L/min.) will likely maintain laminar flow within the March Formation aguifer (the most likely significant contributor to the overall water quality of the combined waters.

A brief synopsis of the aesthetic impacts of elevated iron is provided below.

Iron (Fe), an aesthetic water quality parameter, has an aesthetic objective set at 0.30 mg/L. This objective is set by appearance effects. Excessive iron concentrations in drinking water may impart a brownish colour to laundered goods and plumbing fixtures. The colour of the water may also be affected by excessive iron concentrations and the raw water can produce a bitter, astringent taste which may affect beverages. The post pumping iron concentrations reported in TW1, TW2 and TW3 (0.58 mg/L to 0.81 mg/L). while higher than the aesthetic objective of 0.3 mg/L, are well below the maximum treatable limit of 10 mg/L set forth in Table 3 of Procedure D-5-5.



March Formation

The summarized raw water quality for TW4 and TW5, the wells which were confirmed to penetrate into the March Formation water supply aquifer while being isolated from the Oxford Formation, appears in Table 6 and Table 7. Analysis of the tabulated data, which reflect the general groundwater geochemistry associated with March Formation water supply aquifer, reveals that the raw water meets all of the critical health related parameters of the Ontario Drinking Water Quality Standards (ODWS).

With respect to aesthetic water quality parameters, the raw water originating from this aquifer system shows similarly elevated concentrations of sodium, hardness and, to a much lesser extent, iron, as was noted in the water quality summary for the Oxford Formation and Combined Oxford and March Formation aquifer systems, above. The raw water from the March Formation can be considered to be hard with sodium concentrations barely above the minimum reporting threshold of 20 mg/L (24 mg/L to 27 mg/L reported in post pumping sampling). Iron concentrations are considered to be only minimally elevated and are readily treatable.

The March Formation water supply aquifer, based on both the nature of the hydrogeological isolation and the raw groundwater geochemistry, is considered to be the preferred water supply aquifer for the proposed development.

7.4 Water Conditioning Considerations

Based on the water quality analysis presented in previous sections of this report, it may be desirable, from aesthetic and operational perspectives, to address the hardness level and iron concentration in the water. Given the reported concentrations of these two parameters, a water softener will provide for sufficient removal of both the hardness and the iron concentrations noted in the water quality analysis. The softener would need to be properly sized by a qualified professional and the installation should see a separate drinking water tap being installed and fed from the raw water supply.

7.5 Potential Well Interference Onsite

Interference Between Wells

As it is proposed to service each individual unit with its own water well, a total of 40 wells are proposed. Using the established peak volumes of 2,000 L/day per unit (Procedure D-5-5), a continuous pumping model can be derived. The model, which is compiled in Appendix 4, presents a projected drawdown and static water level of wells located at the centre of the proposed development with <u>all</u> 40 wells pumping continuously for a period of 20 years. Given the model configuration, the total number of water wells modeled was 61 (53% more than proposed).



Based on the data presented in the predictive well interference model, a 4.56 m decline in the potentiometric head of the water supply aquifer is anticipated. Given that it represents a reduction of only approximately 6.5% of the available drawdown of TW1, which is indicative of future wells, the development will not be adversely impacted by the drawdown anticipated in this ultra conservative model.

Offsite Well Impacts

Paterson, as detailed earlier in this report, employed a series of dataloggers installed in select well locations on and off the subject property during the extended pumping tests of TW4 and TW5. A datalogger was installed in the water supply well for 6 King Street and at 13 Cockburn Street, which represent offsite wells which are completed into the upper Oxford Formation. The MOE WWR for 6 King Street (1516749) is provided in Appendix 2 for reference purposes. With respect to 13 Cockburn street, although a WWR could not be located for this property, the well was physically measured in the field and the depth of the well was recorded to be approximate 18 m below top of casing.

With respect to the onsite wells, dataloggers were installed in TW4, TW5 and in TW3 for the purpose of establishing aquifer parameters (TW4 and TW5) while also assessing the impacts on TW3 (open through the Oxford and March Formations) to the pumping of TW4. The monitoring of TW3 could then be compared to the offsite shallow Oxford Formation wells in order to quantify/explain any offsite well interference.

The measured offsite well impact analysis is provided for reference purposes in Appendix 4. Analysis of this data reveals no measurable changes to the groundwater regime within the Oxford Formation water supply wells during the 9 hour pumping of TW4 and TW5. The drawdown measured in TW5 while pumping TW4, and vice versa, was such that, in accordance with radius of influence calculations by Bear (1979) (ie. R=1.5(TtS⁻¹)^{0.5}) the anticipated radius of influence using the transmissivity and storativity values from Table 3, combined with a pumping duration of 0.375 days, suggests the radius of influence should have theoretically extended approximately 750m beyond the site. As such, since TW3 had measured interference and it likely intercepts water from the lower Oxford and the March Formation, and since the offsite wells showed no measurable impacts while the radius of influence extended sufficiently beyond the offsite wells where pressure changes would have been anticipated if there was a hydraulic interconnection, it is reasonable to conclude that no direct hydraulic connection exists between the March Formation and the Upper Oxford Formation. As a result, the primary concern with respect to impacts of pumping of a total of 40 wells on the subject property becomes not one of offsite impacts to the neighbours, but reasonable long term drawdown within the March Formation itself. Given the relatively minor theoretical drawdown calculated in the continuous pumping model, the onsite wells will have suitable available drawdown in the long term.

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8.0 CONCLUSIONS

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

- 1. The subject property presently exists as a vacant, grassed parcel which is generally flat to slightly sloping towards the Jock River. The surficial drainage of the site is considered to be imperfect to poor with a perched overburden groundwater table within the close proximity to the surface.
- 2. Adjacent land uses are a mixture of residential, commercial and vacant land uses. There are no obvious offsite impacts that would adversely impact the proposed development, based on the completed testing.
- 3. An available water supply aquifer exists within the bottom of the March Formation of the underlying bedrock at a depth of the order of 66 to 70 m below the surface of the ground at the subject property. The March Formation waters supply aquifer is the preferred waters supply aquifer for the proposed development.
- 4. The advancement of the casing hole to a minimum depth of approximate 3.0 m into the March Formation sandstone/limestone interbedding and grouting in accordance with Ontario Regulation 903, is considered to be the ideal method of well construction for this development. This methodology will effectively isolate the March Formation from the Oxford Formation and, based on the completed aquifer testing, will have no measurable impact on the adjacent properties with wells completed in the Oxford Formation.
- 5. The pumping test program, and subsequent analyses, have indicated that ample water for residential requirements is available from the underlying water supply aquifer. The preferred pumping rate for residential purposes from the March Formation water supply aquifer is set at between 25 L/min and 30 L/min.
- 6. Water quality in the water supply aquifer satisfies all health related parameters of the Ontario Drinking Water Quality Standards. The water is considered to be aesthetically pleasing and is considered to be reasonably treatable according to Table 3 of Procedure D-5-5, where aesthetic parameters are present at concentrations above the ODWS for hardness and iron. Standard residential grade water softeners will provide for sufficient removal of the hardness and iron.
- 7. The subject property is suitable for development as a residential subdivision at the proposed density. Impacts to the neighbouring high density residential development area where the wells intercept only the Oxford Formation have been demonstrated to be negligible. Offsite wells intercepting the March Formation aquifer will experience well interference of less than 5% of the available drawdown in the wells.





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9.0 RECOMMENDATIONS

Considering the information presented within this report, and given the nature of the proposed development, the following recommendations are provided:

- 1. Future wells should be constructed in a similar manner as has been presented for TW4 and TW5. These wells should be advanced through the Oxford Formation and be completed immediately below the interception of the water supply aquifer located at the base of the March Formation. The target depth for casing completion is between 55 m and 60 m below ground surface.
- 2. The Medical Officer of Health should be notified regarding the minor sodium exceedances noted in the March Formation water supply aquifer for TW4, TW5 and all future wells, as required by the Ontario Drinking Water Standards.
- Care should be taken to protect the existing well heads for TW4 and TW5 during construction. It is recommended that a temporary concrete barrier curb, or other suitable barrier, be placed along the north and west sides of the well head during earthworks and building construction.
- 4. The excavation work for the pitless adaptor, water supply line and electrical conduit should be completed by a qualified well contractor. The work should be supervised by a qualified and licensed Professional Engineer of Ontario.
- Once the distribution system is complete inside the building and the pump is wired and operational, the well and distribution system should be shock chlorinated in order to disinfect the entire water system.
- 6. It is recommended that if water treatment equipment is to be utilized for this site, that the sizing and selection of the equipment be made by a qualified person. Water quality testing should be done on the raw water only after a period of extended well development.
- 7. TW1, TW2, TW3 should either be decommissioned in accordance with Ontario Regulation 903 or, should there locations be ultimately suitable for reuse, these wells should be sleeved and grouted such that the inner casing extends to the 55 m to 60 m below ground surface to make them complaint with the proposed well construction methodology. Decommissioning/sleeving operations should be carried out under the full time supervision of a qualified Professional Engineer of Ontario.
- 8. EW should be decommissioned in strict accordance with Ontario Regulation 903. Decommissioning operations should be carried out under the full time supervision of a qualified Professional Engineer of Ontario.



10.0 STATEMENT OF LIMITATIONS

The hydrogeological testing of the underlying water supply aquifers at the subject site is ongoing and a supplemental report will be issued in subsequent weeks which will summarize our findings and analyses into a single, comprehensive report.

The present report applies only to the project described in this document. Use of this report for purposes other than those described herein or by person(s) other than Talos Custom Homes Inc., or their agents, is not authorized without review by Paterson for the applicability of our recommendations to the alternative use of the report.

PATERSON GROUP INC.

Robert A. Passmore, P.Eng.

Senior Environmental Engineer



SOIL PROFILE AND TEST DATA patersongroup Consulting Engineers Phase I-II Environmental Site Assessment 10 King Street 28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7 Ottawa (Richmond), Ontario TBM - Top of grate located on south side of subject site. Geodetic elevation = FILE NO. DATUM PE1623 REMARKS HOLE NO. BH 1 DATE 3 Jul 09 BORINGS BY CME 45 Power Auger Pen. Resist. Blows/0.3m SAMPLE PLOT DEPTH ELEV. • 50 mm Dia. Cone SOIL DESCRIPTION (m) (m) RECOVERY N VALUE of ROD STRATA NUMBER O Lower Explosive Limit % **GROUND SURFACE** 0 + 93.80**TOPSOIL** 1 1 + 92.807 2 25 3 58 3 SS 2 + 91.80Brown SILTY CLAY 75 5 SS 4 3+90.80 SS 5 100 2 - grey by 3.7m depth 4+89.80 SS 6 100 1 SS 7 100 1 5+88.80 _ <u>5.18</u> End of Borehole (Open hole GWL @ 3.7m depth) 300 Gastech 1314 Rdg. (ppm) ▲ Full Gas Resp. △ Methane Elim.

SOIL PROFILE AND TEST DATA patersongroup Consulting Engineers Phase I-II Environmental Site Assessment 10 King Street 28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7 Ottawa (Richmond), Ontario TBM - Top of grate located on south side of subject site. Geodetic elevation = FILE NO. DATUM PE1623 REMARKS HOLE NO. BH 2 DATE 3 Jul 09 BORINGS BY CME 45 Power Auger Pen. Resist. Blows/0,3m SAMPLE PLOT ELEV. DEPTH • 50 mm Dia. Cone SOIL DESCRIPTION (m) (m) VALUE or RQD RECOVERY STRATA NUMBER Lower Explosive Limit % N Q. 60 80 **GROUND SURFACE** 0+93.900.13 TOPSOIL 1 1 + 92.903 75 SS 2 100 4 SS 3 2+91.90 Brown SILTY CLAY 100 3 SS 4 3+90.90 100 2 SS 5 - grey by 3.7m depth 4+89.90 SS 6 100 1 SS 7 100 1 5+88.90 5.18 End of Borehole (Open hole GWL @ 3.7m depth) 200 300 Gastech 1314 Rdg. (ppm) ▲ Full Gas Resp. △ Methane Elim.

SOIL PROFILE AND TEST DATA patersongroup Consulting Engineers Phase I-II Environmental Site Assessment 10 King Street 28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7 Ottawa (Richmond), Ontario TBM - Top of grate located on south side of subject site. Geodetic elevation = FILE NO. DATUM PE1623 REMARKS HOLE NO. **BH 3** DATE 3 Jul 09 BORINGS BY CME 45 Power Auger Pen. Resist. Blows/0.3m SAMPLE PLOT ELEV. DEPTH 50 mm Dia, Cone SOIL DESCRIPTION (m) (m) VALUE RECOVERY STRATA TYPE Lower Explosive Limit % N O H **GROUND SURFACE** 94.00 TOPSOIL 0.19 1 1 + 93.002 2 50 4 3 SS 83 2 + 92.003 100 **Brown SILTY CLAY** SS 4 3 + 91.002 100 SS 5 - grey by 3.5m depth 4 + 90.00SS 100 1 6 SS 7 100 1 5+89.00 6+88.00 End of Borehole (Open hole GVVL @ 3.7m depth) 200 300 400 Gastech 1314 Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

SOIL PROFILE AND TEST DATA patersongroup Consulting Engineers Phase I-II Environmental Site Assessment 10 King Street 28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7 Ottawa (Richmond), Ontario TBM - Top of grate located on south side of subject site. Geodetic elevation = FILE NO. DATUM PE1623 REMARKS HOLE NO. **BH 4** DATE 3 Jul 09 BORINGS BY CME 45 Power Auger Pen. Resist. Blows/0.3m SAMPLE PLOI DEPTH ELEV. 50 mm Dia. Cone **SOIL DESCRIPTION** (m) (m) VALUE RECOVERY STRATA NUMBER Lower Explosive Limit % N V **GROUND SURFACE** 0 + 93.80TOPSOIL 0.10 1 1 + 92.805 2 33 SS 4 SS 3 67 2+91.80 Brown SILTY CLAY 100 2 SS 4 3+90.80SS 5 100 1 - grey by 3.5m deth $\underline{\nabla}$ 4 + 89.80SS 6 100 1 SS 100 5+88.80 5.18 End of Borehole (Open hole GVVL @ 3.7m depth) 300 200 Gastech 1314 Rdg. (ppm) ▲ Full Gas Resp. △ Methane Elim.

patersongroup Consulting Engineers

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

SOIL PROFILE AND TEST DATA

Phase I-II Environmental Site Assessment 10 King Street Ottawa (Richmond), Ontario

DATUM

TBM - Top of grate located on south side of subject site. Geodetic elevation =

FILE NO.

PE1623 REMARKS HOLE NO. BH 5 DATE 3 Jul 09 BORINGS BY CME 45 Power Auger Pen. Resist. Blows/0.3m SAMPLE PLOT DEPTH ELEV. 50 mm Dia. Cone SOIL DESCRIPTION (m) (m) N VALUE or RQD RECOVERY NUMBER Lower Explosive Limit % **GROUND SURFACE** 0 + 93.80TOPSOIL 1 + 92.802+91.80 3 + 90.80Inferred SILTY CLAY 4+89.80 5 + 88.806+87.80 End of Borehole (GVVL @ 1.90m-July 7/09) 200 300 Gastech 1314 Rdg. (ppm) ▲ Full Gas Resp. △ Methane Elim.

patersongroupConsulting

SOIL PROFILE AND TEST DATA

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

Geotechnical Investigation Proposed Residential Developement-King Street Ottawa, Ontario

DATUM

TBM - Top of grate located on south side of subject site. Geodetic elevation =

FILE NO.

PG2022

REMARKS

HOLE NO. BH 1

BORINGS BY CME 55 Power Auger				D	ATE :	29 Jan 10)	HOLE NO. BH 1
SOIL DESCRIPTION	PLOT		SAN	/IPLE	I	DEPTH		Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone
	STRATA	TYPE	NUMBER	8 RECOVERY	N VALUE or RQD	(m)	(m)	Pen. Resist. Blows/0.3m • 50 mm Dia. Cone O Water Content %
GROUND SURFACE		&		14,		0-	-94.02	20 40 60 80
		AU	1					
		ss	2	38	8	1-	-93.02	
		ss	3	0	9	2-	-92.02	
Very stiff to stiff, brown SILTY CLAY		ss	4	100	5	3-	-91.02	138
- stiff to firm and grey by 4.3m depth						4-	-90.02	
						5-	-89.02	
6.5	5					6-	-88.02	
End of Borehole								
(GWL @ 2.56m-Feb. 5/10)	1							20 40 60 80 100 Shear Strength (kPa) ▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

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

SOIL PROFILE AND TEST DATA

Geotechnical Investigation Proposed Residential Developement-King Street

DATUM

TBM - Top of grate located on south side of subject site. Geodetic elevation =

FILE NO.

PG2022 REMARKS HOLE NO. BH 2

BORINGS BY CME 55 Power Auger				Đ	ATE 2	29 Jan 10		BH 2
SOIL DESCRIPTION	PLOT		SAN	/IPLE	1		LEV.	Pen. Resist. Blows/0.3m ■ 50 mm Dia. Cone
GROUND SURFACE	STRATA E	TYPE	NUMBER	8 RECOVERY	N VALUE or RQD		(m)	Pen. Resist. Blows/0.3m
GROUND SURFACE		AU	1			0+93	3.94	
		SS	2	4	4	1+92	2.94	
Very stiff to stiff, brown SILTY CLAY		ss	3	83	3	2-91	1.94	
- stiff to firm and grey-brown by 2.9m depth		ss	4	100	5	3-90).94	A =
- grey by 4.3m depth						4-89	9.94	
						5+88	3.94	
6.5 End of Borehole	55					6-87	7.94	
(GWL @ 3.20m-Feb. 5/10)								20 40 60 80 100 Shear Strength (kPa) ▲ Undisturbed △ Remoulded

patersongroupEngineers

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

SOIL PROFILE AND TEST DATA

FILE NO.

Geotechnical Investigation Proposed Residential Developement-King Street Ottawa, Ontario

TBM - Top of grate located on south side of subject site. Geodetic elevation =

BORINGS BY CME 55 Power Auger	1 1			ם	ATE 2	29 Jan 10		HOLE NO.	BH 3	
SOIL DESCRIPTION	PLOT	ı	SAN	1PLE		DEPTH ELEV.	ł.	esist. Blov 0 mm Dia. (vs/0.3m Cone	eter
	STRATA	TYPE	NUMBER	3 RECOVERY	N VALUE or RQD	(m) (m)	O W	/ater Conte	ent %	Piezomețer
GROUND SURFACE		AU	1			0-94.07		70 30		
		ss	2	21	3	1-93.07				
>		ss	3	100	3	2-92.07				
ery stiff to stiff, brown		ss	4	88	5	3-91.07			-40	1
stiff to firm and grey-brown y 3.5m depth						4-90.07	Δ			
grey by 5.0m depth						5-89.07	Δ			
6.5	5					6-88.07				
End of Borehole (GWL @ 2.80m-Feb. 5/10)							20	40 60	80 10	00

patersongroup Consulting Engineers

SOIL PROFILE AND TEST DATA

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

Geotechnical Investigation Proposed Residential Developement-King Street Ottawa, Ontario

TBM - Top of grate located on south side of subject site. Geodetic elevation = 93.71m

FILE NO.

PG2022

93.71m.	u on se	Julii 3	ide oi	Subje	or sire	, occur	o cicratic	,	FILL NO.	PG202	2
REMARKS BORINGS BY CME 55 Power Auger				D	ATE 2	29 Jan 10)		HOLE NO	D. BH 4	
	PLOT		SAN	/IPLE		DEPTH	ELEV.		esist. Bl 0 mm Dia	lows/0.3m	fer
SOIL DESCRIPTION	STRATA PI	TYPE	NUMBER	% RECOVERY	N VALUE or RQD	(m)	(m)		Vater Co		Piezometer Construction
GROUND SURFACE	61			EZ	z ⁰	0-	-93.94	20	40 6	0 80	- इंडर्ग एव
		SS	2	58	5		-92.94				
Very stiff to stiff, brown SILTY CLAY		ss	3	75	3	2-	-91.94				
- stiff to firm and grey-brown by 2.9m depth		ss	4	100	4	3-	-90.94				<u>*</u>
- grey by 4.4m depth						4-	-89.94		1		
						5-	88.94				
End of Borehole (GWL @ 2.90m-Feb. 5/10)	55					6	-87.94				
								20 Shea ▲ Undist	ar Streng	so 80 yth (kPa) . Remoulded	100

patersongroupEngineers

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

SOIL PROFILE AND TEST DATA

Geotechnical Investigation Proposed Residential Developement-King Street Ottawa, Ontario

DATUM TBM -

TBM - Top of grate located on south side of subject site. Geodetic elevation = 93.71m.

FILE NO.

PG2022

REMARKS								HOLE NO.	
BORINGS BY CME 55 Power Auger				D	ATE 2	29 Jan 10		BH 5	
SOIL DESCRIPTION	PLOT		SAN	IPLE	T	DEPTH		Pen. Resist. Blows/0.3m ■ 50 mm Dia. Cone	ction
25.12 p.2561.11 1161.1	STRATA I	TYPE	NUMBER	% RECOVERY	N VALUE	(m)	(m)	O Water Content %	Construction
GROUND SURFACE	60		Z	뙶	z °	0-	-93.86	20 40 60 80	T1993
		XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	1				33.00		
		ss	2	58	11	1-	-92.86		
Very stiff to stiff, brown		ss	3	71	5	2-	91.86		
Very stiff to stiff, brown SILTY CLAY -stiff to firm and grey by 2.9m		ss	4	100	4				
depth						3-	90.86		X 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0
						4-	89.86		
						5-	88.86	1	
6.5 End of Borehole	5					6-	87.86		
(GWL @ 3.60m-Feb. 5/10)								20 40 60 80 100 Shear Strength (kPa) ▲ Undisturbed △ Remoulded	

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	6 5-85
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.

Undrained Shear Strength (kPa)	'N' Value
<12	<2
12-25	2-4
25-50	4-8
50-100	8-15
100-200	15-30
>200	>30
	<12 12-25 25-50 50-100 100-200

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

Cohesive soils can also 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
ΑU	-	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)

Dxx - 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

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

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

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

Cu - Uniformity coefficient = D60 / D10

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

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

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

Sand and gravels not meeting the above requirements are poorly-graded or uniformly-graded. Cc and Cu are not applicable for the description of soils with more than 10% silt and clay (more than 10% finer than 0.075 mm or the #200 sieve)

CONSOLIDATION TEST

p'o - Present effective overburden pressure at sample depth

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

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

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

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

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

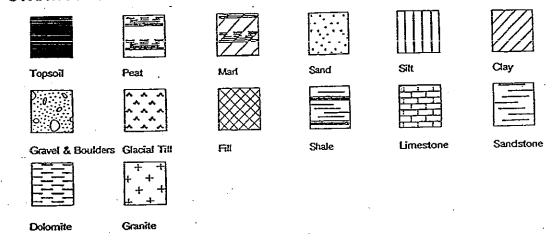
Wo - Initial water content (at start of consolidation test)

PERMEABILITY TEST

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

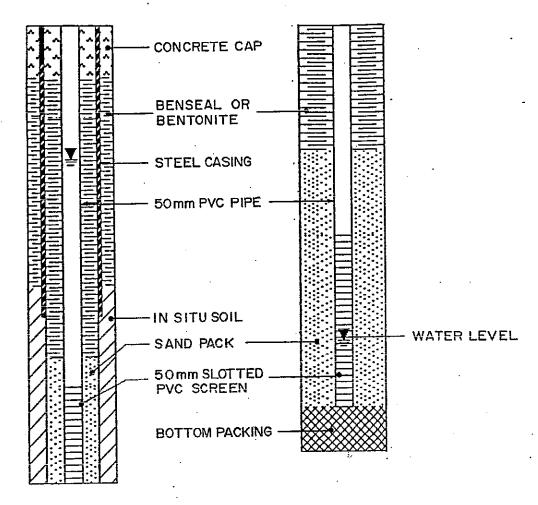
SYMBOLS AND TERMS (continued)

STRATA PLOT



MONITORING WELL AND PIEZOMETER CONSTRUCTION

Monitoring Well Construction Piezometer Construction





File Number: D02-02-10-0010

April 23, 2010

Novatech Engineering Consultants Ltd. Adam Thompson 240 Michael Cowpland Dr., Suite 200 Ottawa K2M 1P6

Dear Mr. Thompson:

RE: Zoning By-law Amendment Application

11 King Street

The above-noted Zoning Amendment application, which was received by the Client Service Centre on February 24, 2010, has completed the circulation and we offer the following:

- 1) A number of residents have expressed concerns with, in particular water quality and quantity but also with; potential traffic increases, parking, that the development is too dense and not in keeping with the community, drainage and sewer capacity.
- 2) Hydrogeology: The RVCA has already forwarded their comments. We have also reviewed the report and the RVCA's comments and note that we do have concerns with the rezoning proceeding at this time. The rezoning would have the effect of increasing the unit yield and as such we need to be assured that the development can be serviced with water. The Hydrogeological Report indicates that the well water does not meet the Ontario Drinking Water Guideline. Please amend your report as follows:
 - a. The reporting must include testing and reporting on the minimum number of wells specified in MOE Procedure D-5-5 (in this case three is the minimum number but we would suggest more);
 - b. Our experience in Richmond is that the potentiometric surface for the deeper aquifer(s) (March and Nepean) is often above the ground surface. This means that the wells located within the primary fracture network in the March/Nepean could be flowing artesian wells. Flowing artesian conditions may present a challenge for future homeowners. For a municipal well, flowing artesian conditions can be dealt with, but for private homeowners it would be more difficult. Flowing artesian conditions were not encountered in TW1, but the static level was close to the ground surface. Other wells completed at this same level, or lower, could exhibit flowing artesian conditions. Therefore, a number of wells would be required in order for the City to gain a comfort level.
 - c. TW1 is an open hole through the Oxford and March formations (the casing is only slightly into the top of the Oxford). Having 40 wells with open holes could significantly change the local groundwater regime, and this could be important, especially due to the presence of potential sources of contamination in the area (i.e.- it could cause existing contamination to spread). For this reason, and also to better protect the March/Nepean, it would be advisable to case and grout the wells through the Oxford and into the March/Nepean. This would add a few thousand dollars to the construction of each well, but it is warranted in this case.

Shaping our future together Ensemble, formons notre avenir City of Ottawa Infrastructure Services and Community Sustainability 110 Laurier Avenue West Ottawa ON KIP 1JI Tel: 613-580-2400 Fax: 613-580-2576

www.ottawa.ca

Ville d'Ottawa
Services d'infrastructure et Viabilité des collectivités
110, avenue Laurier Ouest
Ottawa ON KIP IJ1
Tél: 613-580-2400
Fac: 613-580-2576
www.ottawa.ca

- d. The length of the pumping test and the pumping rate should be increased, considering the scope of this development. (Please note that there is a typo in the report, as the site is 1.59 ha, not 15.93 ha as indicated on page 1 -- which makes the well density very
- e. Observation wells in the same formation being tested are to be monitored during
- The lab turbidity is very high and this has not been adequately addressed. Casing the wells into the March/Nepean may help turbidity by sealing off the contribution form the upper bedrock. The report (page 19) says that turbidity may clear up with more pumping. This should be demonstrated through the additional pumping recommended above.
- Contact Michel Kearney to discuss these comments
- 3) Hydro Ottawa: Has standard comments that are to be faxed separately.
- 4) Sanitary Sewer: Please note that the pump station has reached its Official Plan designated capacity of 1800 units approved and built. Upgrades to the station are mandated prior to any additional units. Your servicing report will need to address this issue. Please contact Kevin Hall to discuss this.
- 5) Planning Rationale: Please ensure that it is updated as needed pursuant to any changes on the studies as noted above. As well it would be helpful to have a more detailed discussion relating to compatibility of use, building form, lot fabric, layout proposed etc.
- 6) If the soils are clay then we may have issues with the lot sizes and minimum setbacks in order to achieve appropriate separation of the trees from foundations, services and so on. Please provide information with respect to soils types and opinions with respect to the lot sizes and appropriateness of the setbacks that will allow for trees to be planted on each lot.

Please provide the additional information so that the zoning by-law amendment can proceed forward. If you wish to wait for the subdivision process to 'catch up' with the zoning, as previously discussed, let me know. Should you require any clarification or have any questions on the status of this application, please contact me, the assigned planner, at 613-580-2424, extension 30234, or at Cheryl.mcwilliams@ottawa.ca

Sincerely,

signed

Cheryl McWilliams Planning and Growth Management Department

Attach:

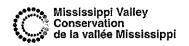
Kevin Hall C.C. Michel Kearney Jocelyn Chandler RVCA

Shaping our future together Ensemble, formons notre avenir City of Ottawa Infrastructure Services and Community Sustainability 110 Laurier Avenue West Ottawa ON K1P IJ1 Tel: 613-580-2400 Fax: 613-580-2576

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Conservation Partners Partenaires de conservation







March 30, 2010 File: 09-GLO-ZBA

City of Ottawa, Planning & Growth Mngt. Department 110 Laurier Avenue West, 4th floor Ottawa, Ontario K1P 1J1

Attention:

Cheryl McWilliams

Subject:

Talos Custom Homes Ltd.

Zoning By-law Amendment D02-02-10-0010

10 King St. in the Village of Richmond

Dear Ms. McWilliams:

The Conservation Partners Planning and Development Review Team has completed a review of the above noted Zoning By-law Amendment to allow the rezoning of the subject site, removing the floodplain overlay and permitting the development of 40 semi-detached dwelling units on individual private water wells and municipal wastewater. We have undertaken our review within the context of Sections 2.3 Natural Heritage, 2.4 Water Quality and Quantity and 3.1 Natural Hazards of the Provincial Policy Statement under Section 3 of the Planning Act and from the perspective of our responsibilities under O.Reg 174/06 of the Conservation Authorities Act. The following comments are offered for your consideration.

Natural Heritage

There are no natural heritage features precluding the approval of this application.

Natural Hazards

This site has been subject to the floodplain overlay based on the floodplain mapping of the Jock River prepared by the Rideau Valley Conservation Authority, dated March11, 2010. Subsequent to that mapping, an application was submitted to the RVCA for approval to re-grade the property with existing stockpiled fill material on the site. This application (RV5-04/09) was approved April 6, 2009 and the work was undertaken. An as-built elevation survey dated Sept.14/09 prepared by M. Savic of Novatech Engineering Consultants Ltd. was submitted following the work and the new grades have shown the property to be above the 1:100 year floodplain of the Jock River. The RVCA has since revised the mapping of the subject property to remove it from the floodplain designation. These new mapping files will be submitted to the City of Ottawa to make amendments to their floodplain overlay zoning in the very near future. The data files will be provided directly to Francoise Jessop, the Program Manager of Zoning Studies, as we have been instructed.

Private Servicing (water wells only)

A preliminary hydrogeological report 'Preliminary Hydrogeological Assessment for Private Services, Proposed Residential Development' dated February 4, 2010 reoprt # PH1292-REP.01 prepared by Paterson Group Inc. was submitted to the RVCA in support of this application. The report was reviewed for water quality, quantity and impacts of the proposed development on the hydrogeological and watershed environments as per the policies of the City of Ottawa (if any), applicable provincial regulations and guidelines including the document MOEE Hydrogeological Technical Information Requirements for Land Development Applications (April 1995, includes procedures D-5-4 & D-5-5). Our comments on the groundwater quality have also accounted for the Ontario Drinking Water Standards, Objectives and Guidelines (ODWSOG) prescribed in the provincial document titled "Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines (MOE Revised June 2006)".

The technical review has evaluated whether the results of the preliminary investigations support the potential of the proposed groundwater supply to service the proposed development. The review has determined that the preliminary hydrogeological testing undertaken on the site supports the conclusions of the consultants that the underlying March formation bedrock aquifer has the potential to supply the groundwater for domestic use and for drinking water purposes as per requirements of the provincial guidelines (MOE 1995, Procedure D-5-5). Aesthetic related exceedances or elevations related to hardness, iron, sodium and turbidity are expected in the future wells. Further, as per opinions presented in the study, the development is not anticipated to be adversely impacted by the mutual well interference. Please see the technical memo prepared by Asher Rizvi dated March 26, 210 for detailed comments.

Stormwater management

The conceptual stormwater management proposed for this property indicates that the stormwater will be conveyed to the Hamilton drain and subsequently to an outlet at the Jock River by way of municipal infrastructure. The Hamilton drain and the Jock River are fish habitat and as such an enhanced level of quality treatment is required (80% TSS removal).

Conclusion

The Conservation Partners have no objections to the proposed zoning to allow for the development of 40 residential units on this property. Please keep us informed regarding the status of this application. Please contact me at ext. 1137 if you have any questions.

Yours truly, Chancle _

Jocelyn Chandler M.Pl., MCIP RPP

Planner, Planning and Regulations (RVCA)

Attachment: Technical memo-Asher Rizvi dated Mar.26, 2010.

cc: Adam Thompson, agent: Novatech Engineering Consultants Ltd.



Watershed Science and Engineering Services Technical Memo

Date: Mar. 26, 2010 File: D02-02-10-0010

To: Jocelyn Chandler, Planner (M.Pl., MCIP, RPP), RVCA

From: Asher Rizvi, Hydrogeologist (P.Geo.), Conservation Partners

Subject:

Preliminary Hydrogeological Assessment for Private Services, Proposed Residential Subdivision (Talos Custom Homes/ 10 King St), Part lot 24, Con. III, Village of Richmond, Ottawa (formerly Twp. of

Goulbourn)

We are in receipt of a report titled "Preliminary Hydrogeological Assessment for Private Services, Proposed Residential Development" dated Feb. 04, 2010 from Paterson Group (PGI) Inc. The report was received on Mar. 12, 2010 in our office. The study pertains to a proposed forty (40) semi-detached dwelling subdivision to be developed on private wells (in total, 40 wells will be constructed). Private septic systems are not proposed for the development as the Village of Richmond is serviced by municipal sanitary sewers. We have reviewed the submission and offer the following comments.

The report was reviewed for water quality, quantity and impacts of the proposed development on the hydrogeological and watershed environments as per policies of the City of Ottawa (if any), applicable provincial regulations and guidelines including the document MOEE Hydrogeological Technical Information Requirements for Land Development Applications (April 1995, includes procedures D-5-4 & D-5-5). Our comments on the groundwater quality have also accounted for the Ontario Drinking Water Standards, Objectives and Guidelines (ODWSOG) prescribed in the provincial document titled "Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines (MOE Revised June 2006)".

The PGI study states that this report is preliminary in nature and provides a summary of the findings to-date as they relate to the quantity and quality of the water supply aquifer(s) present beneath the subject property. The report further indicates that the investigation works on this site are on-going and a final comprehensive report will be issued upon completion of these works. Since a complete hydrogeology study is forthcoming, our review has only identified the matters that need to be addressed in the future submission accounting for the currently available information. We have also evaluated whether the results of the preliminary investigations support that the proposed groundwater supply has the potential to service the subject development.

Our review shows that the preliminary hydrogeological testing undertaken on the site supports that the underlying March formation bedrock aquifer has the potential to supply the groundwater for domestic use and for drinking water purposes as per requirements of

the provincial guidelines (MOE 1995, Procedure D-5-5). Aesthetic related exceedances or elevations related to hardness, iron, sodium and turbidity are expected in the future wells. Further, as per opinions presented in the study, the development is not anticipated to be adversely impacted by the mutual well interference. The following information will need to be provided at the time the final hydrogeological assessment report is submitted for our review:

- 1 With respect to the site investigations, the following should be provided:
 - a The report has discussed the surficial and bedrock geology. However, the geological mapping has not been attached with the report nor has a cross-section been provided. The report discussion on surficial geology (section 4.1) is incomplete. These will need to be addressed.

The hydrogeological study (PGI dated Feb. 04, 2010) identified only the presence of Kings Park wells as the high yield operations in proximity to the site. If any other high yield water taking operations (such as quarry extraction, municipal or communal wells etc.) are present in the surrounding area (especially in the up-gradient side of the site), then those need to be identified and discussed for their impacts on the long term well yields.

Similarly, only a gas station has been recognized as the high risk land use. A confirmation needs to be provided whether any other high risk land uses (landfills, junk yards, salt storage facilities etc.) exist in the surroundings or within recharge areas of the on-site wells that may impact the long term water quality of the target aquifer.

- A water sample was analyzed for petroleum hydrocarbon fractions to assess whether the fuel station located at the northeast edge of the site has impacted the water supplies. The lab results of the analysis are provided in Table 4 of the report. However, the results have not been discussed nor has an opinion been provided whether any impacts were evident from the analysis. The analysis results should be discussed and confirmation provided whether any impacts on the groundwater were noted.
- d The report has indicated that the Jock River flows in the south some 1000 metres from the subject property. A confirmation is required whether any impacts are anticipated on the water supplies from the hydraulic interconnectivity (if any) between the surface water and the target aquifer. The report must document the recharge/discharge characteristics of the site and its relationship to the hydrological features. If any other hydrogeologically sensitive land uses (wetlands, streams etc.) are present on the site or in close proximity, then those should be identified and an impact evaluation undertaken.

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- The groundwater quality was tested by analyzing the water samples obtained during the pump tests from an on-site well (TW1). The following needs to be addressed regarding the raw groundwater quality exceedances from an existing test well (or any future test wells):
 - a The effects of iron and hardness exceedances (laundry staining, encrustation etc.) have not been discussed nor identified in the final recommendations. Also, the recommendation to deal with them in future wells should be documented in the final set of recommendations.
 - b The report has not provided any opinion whether the sodium and chloride levels noted in the water samples are seen as naturally occurring or a result of surficial impacts (road salt, leaching from salt storage facilities if present in the area etc.).
 - The steps that are to be undertaken to address the turbidity in groundwater as discussed in the report (extended well development etc.) should be documented in the final set of recommendations.
- The water quantity was assessed by carrying out a pump test in TW1 test well. The following water quantity related aspects need to be addressed:
 - a The pump test data and the aquifer properties analysis has been appended in the report. However, the report does not confirm whether the drawdown and the aquifer properties are exhibiting the presence of a confined aquifer. This needs to be confirmed.
 - Accounting for the presence of the Jock River, the response needs to confirm whether any boundaries (recharge boundary etc.) were encountered during the pump tests. If any measures need to be adopted by the future well owners to protect the water supplies (accounting for the potential of surface water impacts from the river etc.), then those need to be identified.
 - c Potential of mutual well interference has been discussed in the report (section 7.5) in a cursory manner and it has been concluded that the development is not anticipated to be adversely impacted by the mutual well interference. This opinion needs to be presented in detail with discussions on the interference between forty (40) on-site wells, and impacts beyond the property on neighboring wells. The report has stated that 90% of the wells in Richmond area are utilizing Oxford formation bedrock aquifer which is a shallower water supply aquifer compared to the March formation bedrock aquifer (a deeper aquifer) being proposed for the subject development. The likelihood of impacts on the shallow aquifers from pumping in the deeper aquifers and interference between target

aquifer and communal/municipal wells in the area should also be accounted for during the mutual interference evaluation.

In consideration of the high density of wells on the site (40 wells within 1.59 ha), it may useful to undertake a long term pumping test (longer than 6 hours) so that a more representative set of aquifer properties is available to undertaken well interference analysis.

d The final well construction recommendation should clearly identify the casing length that needs to be set well into the bedrock consistent with the test well drilling. If sufficient information is available from the on-going investigations regarding the occurrence depth of the target aquifer (March formation bedrock aquifer), then that should be specified in the final recommendations.

Accounting for the high density of wells on the site (40 wells within 1.59 ha), appropriate distances between the adjacent wells should be identified (to minimize the water quantity conflicts) and documented in the final set of recommendations.

Two neighboring wells (HW1 well utilizing shallow Oxford formation aquifer, and a well on 20 King Street utilizing same deep aquifer as being tested for the site) were analyzed for their water quality. The report documents that the water sample obtained from the neighboring well utilizing Oxford formation was a softened water sample. Therefore, in our opinion, this sample does not represent the raw groundwater quality from the Oxford formation. In order to establish the baseline groundwater quality for this formation, we suggest that raw water samples be obtained from additional neighboring wells (utilizing Oxford formation) and analyzed. Additional neighboring wells utilizing the target aquifer should also be analyzed for their geo-chemistry and results analyzed for long term water quality impacts.

A table (Table 3) in the report has been provided showing the comparison of water quality results from the sampled wells. It is noted that all the analyzed parameters are not shown in this table. The table should be updated to include all the analyzed parameters.

It is noted that the neighboring lot owners were not interviewed regarding water quality, quantity or issues with water supplies, nor were any well inspections conducted. The noted investigation need to be undertaken to confirm whether any issues with water supplies exist in the area. All lots included in the survey should have a well record (or information on the type of aquifer, well depth etc. obtained through appropriate investigations) and long term water quantity assessed for conflicts etc.

A complete summary of recommendations will need to be provided with the final submission. If new recommendations are made in response to our comments, or as a result of on-going investigations, then the recommendations provided in the current report (Section 9) will need to be updated accordingly. It is also noted that some of the recommendations discussed within the report have not been documented in the recommendations section. This section should include all the recommendations regarding water treatment, effects of iron and turbidity on water quality and how the future well owners should deal with them, the recommendation about the target aquifer (identify), lot development plan showing well locations (identify the figure no. PH1292-1) etc. Some of the recommendations have been identified in the above paragraphs and those should be included in this section as well.

We trust this meets your satisfaction and is sufficient for your present requirements, but please don't hesitate to call if you have any questions.

APPENDIX 2

- □ PUBLISHED MOE WELL DATA
- □ WELL RECORD FOR TEST WELLS

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A U93b41 Print Below) Well Record Ministry of Regulation 903 Ontario Water Resources Act A093641 the Environment Page Metric Measurements recorded in: Well Owner's Information : 1 E-mail Address ☐ Well Constructed Last Name / Organization by Well Owner Talos Custom Homes Ltd Telephone No. (inc. area code) Postal Code Province Municipality Mailing Address (Street Number/Name) | K1J 9B8 ON Ottawa Unit 1-5509 Canotek Road Well Location
Address of Well Location (Street Number/Name) Goulboum 10 King Street Province City/Town/Village County/District/Municipality 1111 Ontario Richmond icipal Plan and Sublot Number Ottawa-Carleton Other Northing Part 1&2 4R5234 5004993 NAD | 8 3 18 434437 Depth (m/ft General Description Other Materials Most Common Material General Colour o′ 29 Gravel 4 Clay 29 175 Limestone Grey 223 175 Sandstone Grey & White 223 225 Grega White Sandstone 159- Plan 485234 P SERVICE RESIDENCE WEIGHT GOVERNMENT stogs Annua Space Draw Down Recovery After test of well yield, water was: Volume Placed Type of Sealant Used Water Level Depth Set at (mc) Water Level Clear and sand free (m³/ft³) (Material and Type) (m/fi) (min) (m/l)Other, specify Not tester 7.8 Neat cement Swary Static 175 9 185 7.1 If pumping discontinued, give reason: Level 50.4 Bentonite slurry 175 0 Ø 7.1 1 8.2 Pump intake set at (n@) 7.1 2 8.2 2 200-3 7.1 3 8.3 Pumping rate (Vmin (GPM) Method of Construction () Well Well Use France () 7.1 20 8.4 4 Not used Public Domestic Commercial ☐ Diamond
☐ Jetting Duration of pumping Dewatering 5 5 7.1 8.4 Municipal 1 hrs + 0 min. Rotary (Conventional) ■ Monitoring Test Hole ☐ Livestock Driving Rotary (Reverse) Final water level and of pumping (m/ft) 10 Cooling & Air Conditioning 7.1 10 8.5 [] Imgation Digging ☐ Boring Industrial Air percussion 7.1 15 8.6 If flowing give rate (Vmin / GPM) Other, specify Other, specify Construction'Record Casting to The State of 8.7 20 7.1 20 Recommended pump depth (1022) Depth (mat) Water Supply Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel) Wadi Thickness (cness) 25 7.1 Inside 25 8.8 100/ mended pump rate Replacement Well To From (cm/fil Test Hole 30 30 7.1 8.8 Recharge Well (Imin / 6259) ÷Ð 185 .188 6 Steel Dewatering Well 40 7.1 40 8.9 225 Observation and/or Monitoring Hole Well production (Imin. / SEM) 185 5#8" Open Hole 50 7.1 50 8.9 Alteration 7.14 (Construction) Yes No ☐ Ahandoned. Insufficient Supply Construction Record Screen Abandoned, Poor Please provide a map below following instructions on the back. 中海流 Water Quality Depth (m/ft) Outside Abandoned, other, Slot No. From W#4 (cm/n) Other, specify Water Dot alls The Manager And Annual Property of the District Control of the Con Water found at Depth Kind of Water: Fresh Intested (cm/n) 363 (mp Gas □ Other, specify Water found at Depth Kind of Water: Fresh Untested 185 57B" (m/ft) Gas Other, specify 225 185 Water found at Depth Kind of Water: Fresh Untested (m/ft) Gas Other, specify A SEAL CONTRACTOR and Well Hochrician Information and the seal of Well Contractor's Licence No Business Name of Well Contractor 1119. Air Rock Drilling Co. Ltd. Comments: Municipality Richmond Business Address (Street Number/Name) 6659 Frankfown Road, RR#1e 24 Business E-mail Address Postal Codeair-rock@sympatico.ca Well owner's KQA 220 ON information Bus. Telephone No. (Inc. area code) Name of Well Technician (Last Name, First Name) package delivered Y Y2011 NOMED 23 Purcell, Shannon 6138382170 | | | XIYes Date Schippited 08 31 Signature of Technicis Nel Technician T2122 ☐ No

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Ontario	Ministry of the Environment	Well T	0959 <i>1</i>	y Below)	Regulation	Well 903 Ontario Water Re	Record esources Act
Measurements recorded	in: Metric Mimperial	170	<u>909</u>	19		Page	of
Well Owner's Informa	ation					<u> </u>	
Elect Name Address (Street No. 4 1 - 550 9) Well Location	Last Name / Organization	on ES Municipal	tous	Province	Postal Code	Telephone No. (Il Constructed Mell Owner Ic. area code)
Address of Well Location (Street Number/Name)	Township	16		Lat	Concession	neil.
County/District/Municipality UTM Coordinates Zone E	Colleton		Tyillage V	Number		Province Pos Ontario	stal Code
NAD 8 3 Overburden and Bedro	ck Materials/Abandonment S	ealing Record (see	instructions on the b	ack of this form)	a in g		Landle (all 78)
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W ATTER S	Annular Space	100/5			Results of W	ell Yield Testing	
Depth Set at (A)	Type of Sealant Used	j Vo	olume Placed	After test of well yie		Draw Down	Recovery ne Water Level
From To	(Material and Type)	7 `	(m(ft²))	Charant San	The tree	(min) (m/ft) (m	
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Method of Cons	truction	Well Use		Pumping rate (Vin	in (GPM)	1 3 S	
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☐ Boring	☐ Digging ☐ Irrigation ☐ Industrial	Cooling & Air C	onditioning	Final water level e	nd of pumping (m/ft)	10 6'3"	0
Air percussion Other, specify	Other, speci	<i>ه</i> ر		If flowing give rate	e (Vmin / GPM)	15/2/5"	15
Cons	truction Record - Casing		atus of Well		S		20
Inside Open Hole C Diameter (Galvanized,	Fibreglass, Thickness		ater Supply eplacement Well	Recommended p	oump depth (no/ft)	25 6'8" 2	25
(anvin) Concrete, Pla	asic, steel) (Croin)	─ □ ٣:	est Hole	Recommended p	oump rate	30 😼	30
6" Sec	-B8" +2"	· // ~ ` □ ^	echarge Well ewatering Well	(Vmin (PM))	7 0	1.00	10
418" AR	indo 40		bservation and/or lonitoring Hole	Well production (Vmin (GEM)		
			Iteration	Disinfected?	5 ~	50	50
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Con	struction Record - Screen	Comment of the form of the control of	sufficient Supply bandoned, Poor			Vell Location	
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			Other, specify		-10	SAVE	e
4				16	21 Th		
	Water Details		lameter		1		
~ _	(ind of Water: ☐Fresh ☐Untes	ted Depth (m/ft From	Γο (cm/in)		2401	l l	
Water found at Depth K	Other, specify ind of Water: Fresh Xuntes	ted o' Ac	S' 6"		740 J		
216 (m@) Gas [Other, specify	-10° 54	D' L'k"		¥	1 # (C	>
Water found at Depth K	(ind of Water: Fresh Duntes	ted L. C.		1 XX		> Kin	9
	I Contractor and Well Techni	cian Information			90'	م اسم	·
Business Name of Well C			ractor's Licence No.		10	124	eey
Business Address (Stree	t Number/Name	Municipa	t (/ /	Comments:	-		
Desigess Address (Stree	(Humberhadine)		Ghon		-CL 1	1600 #F	2
Province Pos	stal Code Business E-mail			1	<u>>7 1</u>		
ONI It	mea code) Name of Well Technicis	an (I set Namo Bilet N	Jamel	information •	late Package Delive	Audit No.	Use Only
Sus, Telephone No. (inc. a)	7 L -	tAM K	IAN	package delivered	>O (O O O E	<u>[Z a d </u>	08297
Well Technician's Licerica N				Yes No	Devot B	1	
0506E (12/2007)	- Kong		Y M M. D D linistry's Copy		الماليات المحر		inter for Ontario, 2007
(·====·/		18				•	

314/4/. 79' GROUND WATER BRANCH UTM 1/8 2 413141410 P. 15 N^{0} 5 R 5004960 N Ontario Water Resources Commission A MAY 22 1962 ONTARIO WATER Lot Date completed Owners.... Casing and Screen Record **Pumping Test** Inside diameter of casing 614. Static levei / 0 ' Total length of casing 3.4' Pumping level 70 -Type of screen Length of screen Water clear or cloudy at end of test Depth to top of screen..... Diameter of finished hole 614" with pump setting of ______feet below ground surface Water Record Well Log Depth(s) at which water(s) found Kind of water From Overburden and Bedrock Record (fresh, salty, sulphur) 122 .) Location of Well For what purpose(s) is the water to be used?..... In diagram below show distances of well from road and lot line. Indicate north by arrow. Is well on upland, in valley, or on hillside?. Drilling or Boring Firm... (Signature of Licensed Drilling or Boring Contractor) Form 7 15M Sets 60-5930

OWRC COPY

hillen Resoundes DIVISION UIM 1/8 Z A 3 A 14 8 C P 5 R 5004980 Ontario Water Resources Commission Act ONTARIO WATE WELL Elev. 4 R 0 3 10 15 W Township, Village Town or City. Con. Date completed Owner. Casing and Screen Record **Pumping Test** Static levei / O Total length of casing 3.7 Test-pumping rate / O G.P.M. Pumping level 24 Type of screen Duration of test pumping / hr Length of screen Depth to top of screen...... Water clear or cloudy at end of test..... Diameter of finished hole with pump setting of 50 feet below ground surface Well Log Water Record Depth(s) at Kind of water From To ft. Overburden and Bedrock Record which water(s) (fresh, salty, sulphur) found <u>२०</u> 70 Location of Well For what purpose(s) is the water to be used?... In diagram below show distances of well from road and lot line. Indicate north by arrow. Is well on upland, in valley or on hillside?. Drilling or Boring Firm.

Form 7 15M-60-4138

Address

OWRC COPY

Licence Number 2158

(Signature of Licensed Drilling or Boring Gontractor)

Name of Driller or Borer......



The Ontario Water Resources Commission Act WATER WELL RECORD

Water management In Onto	I. PRINT ONLY IN SP	ACES PROVIDED	[]	151033	39 MUNICIP	CON.	22 23 24
COUNTY OR DISTRICT		TOWNSHIP, BOROUGH, CITY, TOWN, VILLA	GE		CON., BLOCK, YRACT, SURVEY,		OT 25-27
		DORESS		D	8	DAY 15 NO. 08	7 79
210) ;	128 434	STAD STOCK 8180	RC. ELEVI	ATION 131013	RC BASIN CODE		<u>v</u>
*	10	G OF OVERBURDEN AND BEI			30 31		47
GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS			GENERAL DESCRIPTION	DEPTH FROM	- FEET
brown	clay	boulder	۵		hard	0	27
1 na	9				0 5		
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61001	Pine.				solt	43	56
9	A74114.7				T		
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31 <u>baark</u>	<u>45/13 004</u>	alanst i i laasraanst i l	عنا لنا	<u>, , , , , , , , , ,</u>	<u> </u>]	
12 10 14	RECORD	51 CASING & OPEN HO	LE REC	CORD	Z SIZE(S) OF OPENING 31-	65 33 DIAMETER 34-38 (75 60 ENGTH 39-40
- X7 - YEET	ND OF WATER	INSIDE WALL DIAM, MATERIAL THICKNESS INCHES INCHES	DEPTH -	TO	MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN	FEET 41-44 80
055 1 26 SAL	TY 4 I MINERAL	05"-11 1 XSTEEL 12 /88	0	23'0' L	<u>v</u>		FEFT
2 SAL	TY 4 MINERAL	1749 1 STEEL 19	30	-56	DEPTH SET AT - FEET MATE	(CE)	CORD
2 5AL	TY 4 D MINERAL	Z [] GALYANIZED 3 [] CONCRETE 4 2 OPEN HOLE	1.	0052	FROM TO 10-13 14-32		PACKER, E.C.)
1	TY 4 [] MINERAL	24-25 STEEL 25		27-30	18-21 22-25 26-29 30-33 80		
2 SAL	TY 4 MINERAL	4 OPEN HOLE			26-29 50-33 80		
PUMP 2	NBAILER OO	1 1 15-15 00 17	ins.	DV 0/4/	LOCATION OF		
STATIC W/	ATER LEVEL 25 END OF WATER PUMPING 22-24 15 MINUTES	R LEVELS DURING 2 RECOVERY 1 30 MINUTES 45 MINUTES 60 MINUTES		LOT LI	NE, INDICATE NORTH BY ARROW.	WEEL (NOW HOTE PAIN	×Z'
 - , .	7/3	28 29-31 32-34 35	5-37 FEET	_	Postl	1+	
Z IF FLOWING, GIVE RATE RECONMENDED PUMP TY	38-41 PUMP INTAXE :	FEET 1 CLEAR 20X CLOUD	42 DY				
RECOMMENDED PUMP TY	PE RECOMMENDED	43-45 RECOMMENDED 46	5-49 ;pu.		4		
50-51 005	O GPM JFT. SPECI				₹		-
FINAL STATUS	1 DAWATER SUPPLY 2 OBSERVATION WEI 3 TEST HOLE	5 ABANDONED, INSUFFICIENT SUPPI LL 6 ABANDONED, POOR QUALITY 7 UNFINISHED	LY		67 0		8
OF WELL	4 RECHARGE WELL	5 ☐ COMMERCIAL	\dashv		3 0	ر منا	\mathcal{Z}
WATER 0/	2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL	6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING			₩	100	g
R7:	D OTHER	9 I NOT USED	4		47	•	
METHOD OF	1 C CABLE TOOL 2 ROTARY (CONVENT 3 ROTARY (REVERSE	6 ☐ BORING FIONAL) 7 ☐ DIAMOND E) 8 ☐ JETTING					
DRILLING	4 ROTARY (AIR) 5 AIR PERCUSSION	9 □ ORIVING	DAILL	ERS REMARKS:			
NUME OF WELL CONT	l date	V. Supplied 321	6 z	DATA SOURCE	1503	28116	41-68 80
O COLO	sh Lord	Dr. Ottown	ᄼᆝᄬ	DATE OF INSPECTS	ON INSPECTOR	Cher PIP	0
NAME OF DRILLER OF	R BORER	LICENCE NUMBER		REMARKS:			
SIGNATURE OF CONTI	RACTOR AND	SAMISSION DATE					
	, ~~ .	7				** ** * * * * * * * * * * * * * * * *	

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The Ontario Water Resources Commission Act 3164 8. WATER WELL RECORD 1. PRINT ONLY IN SPACES PROVIDED 2. CHECK CORRECT BOX WHERE APPLICABLE 1511082 4 500499 # 1/10 1/31/41/41/81/21 LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS) DEPTH - FEET GENERAL DESCRIPTION OTHER MATERIALS FROM 10 GENERAL COLOUR COMMON NATERIAL 28 clay enestore <u>0038305.1.1 00582/67.1.1 [...] [...</u> 31 أرابا الماليان المالي 32 Z SIZE(S) OF OPENING U W MATERIAL AND TYP O 34-38 LENGTH TET CASING & OPEN HOLE RECORD WATER RECORD KIND OF WATER MATERIAL MATERIAL AND TYPE FROM 1 FRESH 3 SULPHUR 2 SALTY 4 MINERAL 203 3+ STEEL GALVANIZED 188 PLUGGING & SEALING RECORD 0 3 CONCRETE 61 1 | FRESH 2 | SALTY 3 SULPHUR 4 MINERAL DEPTH SET AY - FEET (CEMENT GROUT, LEAD PACKER, ETC.) MATERIAL AND TYPE □ STEEL 2 GALYANIZED 3 GONCRETE 4 OPEN HOLE 3 () SULPHUR 4 () MINERAL 1 🗆 FRESH 0058 2 🗆 SALTY 1 TRESH 3 SULPHUR 4 MINERAL 22-2 I STEEL 2 GALVANIZED 2 SALTY FRESH 3 SULPHUR 4 SINERAL 3 CONCRETE 4 OPEN HOLE LOCATION OF WELL 15-18 00 17-18 HOURS 00 MINS 71 IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE, INDICATE NORTH BY ARROW. 2 BAILER 1 □ PUMP PUMPING 2 RECOVERY WATER LEVEL END OF PUMPING 22-2 WATER LEYELS DURING TEST 45 MINUTES 00 4 32-34 I CLEAR 2 TLOUDY PUMP 020 SHALLOW DEEP FÉET OCO, 9 GPM./FT. SPECIFIC CAPACITY WATER SUPPLY 5 ABANDONED, INSUFFICIENT SUPPLY 6 ABANDONED, POOR QUALITY FINAL OBSERVATION WELL STATUS OF WELL 7 UNFINISHED 4 D RECHARGE WELL 5 COMMERCIAL 1 DOMESTIC 2 - STOCK WATER 7 PUBLIC SUPPLY 3 | IRRIGATION USE O 4 INDUSTRIAL 8 COOLING OR AIR CONDITIONING 9 NOT USED OTHER 1 CABLE TOOL 2 ROTARY (CONVENTIONAL) 3 ROTARY (REVERSE) 5 D BORING 7 DIAMOND METHOD 9KITT3L 🗆 8 OF DRILLING 4 ROTARY (AIR) 5 AIR PERCUSSION 9 DRIVING DRILLERS REMARKS: SARE DATE RECEIVED 0,10371 ONLY

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REMARKS:

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MINISTRY OF THE ENVIRONMENT The Ontario Water Resources Act.

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		MC3COICES ACI.	
WATER	WEL	L RECORD)

Ontario I. PAINT ONLY IN SPAC		_L REC 1515154- 8	ORD	co4,	3164
COUNTY OF DISTRICT	TOWNSHIP, BOROLLEM, CITATOWN, VILLAGE		Prochamer sabor ru	()X_	LOT 25-27
- Contract	ADDRESS D-1	101		TE CONSTITUTE OF	"" 2d
	NORTHING N	C. ELEVATION ACT		08 09	
T 1515154 18 434527	7 5005024 OF OVERBURDEN AND BEDK	4 306 4	Z6 JUN	28, 1977	300
GENERAL COLOUR COMMON MATERIAL	OTHER MATERIALS		L DESCRIPTION	DEPTH	- FEET
grey Clay	,				30
oney limestine			· · · · · · · · · · · · · · · · · · ·	30	75
		<u> </u>			
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31 0030005 11 00592	الاللالالالالالالالالالالالالالالالالا				
41 WATER RECORD		البياليانا إ	لللللللي	لبسلل	
WEST FOUND KIND OF WATER	IAM MATERIAL THICKNESS	GEPTH - FEET	OF OPENING 31-33 O)	THEHES	ENGTX 39-40 FECT
STS I FRESH 3 SULPHUR "	10-11 1 STEEL 12	HOM TO SO MATERI	AL AND TYPE	OF SCREEN	41-44 10 = 1. FEET
15-18 1 FRESH 3 SULPHUR 17	. 1 L/XVII/	20-33 DEPTH SE	PLUGGING &	SEALING RECO	
20-23 1 FRESH 3 SULPHUR 24 2 SALTY 4 MINERAL	2 GALVANIZEO 3 GONCRETE	FROM (0-1)	TO MATERI	AL AND TYPE LEAD PA	NE GROUT CHER ETC 1
Z SALTY. 2 MINERAL	4 □ OPEN HOLE 26-29 I □ STEEL 26 2 □ GALVANIZED	27-30	32-25		
2 SALTY 4 MINERAL	3 CONCRETE 4 CO OPEN MOLE	21-20	30-23 89		
71 PUPPING TEST METHOD TO PURPING RATE.	B-M DURATION OF PUMPING 15-18 GPM 12-18 MINS	LO	CATION OF W	VELL 340	5
STATIC WATER LEVEL 25 LEVEL END OF WATER LEVELS PUMPING WATER LEVELS 19-21 22-24 15 MINUTES 10	2 G RECOVERY	IN DIAGRAM BELOW LOT LINE, INDIC	SHOW DISTANCES OF V ATE NORTH BY ARROW.	WELL FROM ROAD AN	"\
18hn9 030 120 mba	0 28-31 030 31-31 30 31-37 FEET 030 FEET			//	1
GPE RATE	WATER AT END OF TEST 42				1
2 SHALLOW DEEP SETTING	FEET RECOMMENDED 5 GPM		1/2 St		
FINAL SE I WATER SUPPLY	S () ABANDONEO, INSUFFICIENT SUPPLY	1 10	\rightarrow	ว ว /	,
STATUS 2 OBSERVATION WELL 1 TEST HOLE 1 RECHARGE WELL 2 RECHARGE WELL	ABANDONED, POOR QUALITY TO UNFINISHED		Į.	, r	
\$5-56 : TO DOMESTIC S C	GOMMERCIAL HUNICIPAL	2			İ
	PUBLIC SUPPLY COOLING OR AIR CONDITIONING P D NOT USED	4			}
METHOD 10 CABLE TOOL	s □ BORING				
OF 1 ROTARY (REVERSE) ORILLING ROTARY (AIR)) 7 □ GIAMOND 6 □ JETTING 9 □ DAIVING	l I		•	
MATERIAL CONTRACTOR	/ LICENCE NUMBER	DRILLERS REMARKS:	RACYOR 19-62 DATE RE	CENTO	\$3-68 BO
E Burry Mains Will A	Irilling 3644	SOURCE SOURCE	3644 /	5017	
HAME OF STREET CONTRACTION WITH A STREET CONTRACTION OF STREET CON	mond Out	S Jene 16, 17	76 (LE/Z	Trey	iciolit
SIGNATURATION SIGNATURATION	Z BURNISSION SATE	J. Gunnin	a - owner	P W	ULT
	DAY 3 NO. 7 YNS	0		W	1

The Ontario Water Resources Act WATER WELL RECORD

Ontario	I IN SPACES PROVIDED	15,16	749 1570	ا الاستان	
COUNTY OF DISTRICT	TOWNSHIP, BOROUGH OTY, TOWN, VILLAG	it /	COH., BLOUX, TRACT, SU	RVEVERO	LOT 25-27
	race (Mo)	ne 1		DATE COMPLETED	<u>- 3-2</u>
	(9) //C	AC ELEVATION 3	ON!	DAY 22 NO.	_ ,.2
: 10 43	4400 5004460	<u>ૡ</u> ૢ૿૽ <i>૿</i> ૽ૢ૽૱૽૽ૼ	30 31	<u> </u>	<u> </u>
GENERAL COLOUR MOST	LOG OF OVERBURDEN AND BED	ROCK MATERIA	LS (SEE INSTRUCTIONS)		
COMMON MATERIAL	OTHER MATERIALS		GENERAL DESCRIPTION	FROM	H - FEET
Caron Class					
The say	··				10
Poly Claw			soft		20
	;	7	in the second	//	27
grey limedon				94	44
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V					
la de la la la la la la la la la la la la la	10				
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WATER RECORD	(51) CASING & OPEN HOLE	المللينيا لـ	SILE IS OF OPENING	21-23 DIAMETER 34-38	75 JO
WATER FOUND KIND OF WATER	THAIDI WALL	DEPTH - FLET	SILETS OF OPENING USUAL AND TYPE OF	INCHES	FEET PERSON
39 10-13 PRESH 3 SULPHUR S	OIAN MATERIAL INICANTES INCHES	10 MINA	MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN	41-44 30
15-18 1 FRESH 3 SULPHUR 1	LO GALVANIZEU 188	0 (232	61 PLUGGIN	IC & CEALING DECC	· (()
20-23 SALTY 4 MINERAL 20-23 D FRESH 3 SULPHUR 24	17-16 I GALVANIZED	20-23	DEPTH SET AT FEET		L41 690JT
2 SALTY 4 MINERAL 25-20 1 FRESH 3 SULPHUR 2	CONCRETE COPEN HOLE		10-13 14-17	LEAD .	ACKER, ETG 1
Z SALTY 4 MINERAL	24-25 1 □ STEEL 26 2 □ GALVANIZED	27-30	18-21 22-25		
1 FRESH 1 SULPHUR 14 SULPHUR 14 SALTY 4 MINERAL	3 CONCRETE		26-29 30-33 80		
TI TOMPING TEST METHOD TO PUMPING B	11-16 CURATION OF PUMPING		LOCATION (OF WELL	
STATIC WATER LEVEL 25	ANS PUMPING	J	GRAM BELOW SHOW DISTANCE	ES OF WELL FROM ROAD A	NO
(O / 10-21) 22-24 15 MEMOT	S 30 MINUTES 49 MINUTES 60 MINUTES	┪╿	NE INDICATE NORTH BY A	HROW.	1
	TELL PREST FEET	<u>.</u> j	D H	01	N
S GPM	TEET 1 D CLEAR 2 CLOUDY] [- Fulh	31.	
D. SHALLOW DEEP SETTING		1 1		,	· 1.
SD-53 GPM./FT S	PECIFIC CAPACITY	ן [\ \	_^\$ ∕	
FINAL 1 D WATER SUPPLY STATUS 2 D OBSERVATION W]		>	
OF WELL 4 RECHARGE WELL	7 D UNFINISHED		-12	501	7,
WATER O STOCK	S COMMERCIAL]	KING		
USE 4 D INDUSTRIAL	FOR COOLING OR AIR CONDITIONING		(P)		
27 1 D CAME TOO:	* 🗆 NOT USED		<i>\$1</i>		-
METHOD S CABLE TOOL CABLE TOOL CONTENT CONTENT CONTENT CREVERS	BORING TIONALI 7 DIAMONO EI 4 DIETTING				
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HENE OF WELL CONTACTOR - ///	M () . II LICENAS HOMOER	DATA	60 CONTRACTOR \$9-62	DATE RECEIPED 1 1 8	67-11 10
a Hony Mans We	V Willing 3644	OATE OF INSPECT		2,711	
HAME OF DRILLER OF SOUTH	Kichmond Out.	14/s	/79	Kny J.	?. P.
thery /	Michigan LICENCE HUMBER	D REMARKS:		Р	
SIGNATURE OF CONTRACTOR	SUBMISSION DATE DAY 22 MO. 5 YR.	<u> </u>	ii e		<u>'</u>
MINISTRY OF THE ENVIRON		I I		FORM 7	MOE 07-091

APPENDIX 3

- ☐ WATER LABORATORY TEST RESULTS
 - **□** WATER SAMPLES FOR TEST WELLS
 - **□** WATER SAMPLES FOR NEIGHBOURING OFFSITE RESIDENCES
 - **□** WATER SAMPLES FROM TEST WELL USED IN CONJUNCTION WITH PH1553-REP.01

I



1000779 2010-01-18 2010-01-14 PH1292 Report Number: Date: Date Submitted: Project: 28 Concourse Gate, Unit 1 Attention: Mr. Robert Passmore Client: Paterson Group Nepean, ON K2E 7T7

P.O. Number: Matrix: Chain of Custody Number: 105597

INVOICE: Paterson Group Inc.

Water 8794

CFU/100mL CFU/100mL UNITS GUIDELINE ODWSOG LIMIT 00 MAC 2010-01-13 TW1-WS1 771127 00-00 LAB ID: Sample Date: Sample ID: MRL CFU/100mL CFU/1mL CFU/100mL CFU/100mL UNITS CFU/100mL PARAMETER Heterotrophic Plate Count Faecal Streptococcus Faecal Coliforms Escherichia Coli Total Coliforms

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

Dragana Dzeletovic Microbiology Analyst Results relate only to the parameters tested on the samples submittle

1 of 1



UNITS ™g/L TCU mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L NTU mg/L Water GUIDELINE 1000787 2010-01-22 2010-01-14 ODWSOG 6.5-8.5 PH 1292 1.0 LIMIT 1.5 200 200 0.3 0.05 550 550 5 500 5. 5 8794 A A MAC MAC 06 8 8 8 ð 888 9 Date Submitted: Report Number: Date: P.O. Number: Project: Matrix: 2010-01-13 TW1-WS1 771142 Sample ID: LAB ID: Sample Date: MRL 1 2 5 0.1 0.02 0.1 UNITS mg/L TCU US/cm mg/L mg/L mg/L mg/L mg/L mg/L ng/L ng/L mg/L mg/L mg/L mg/L PARAMETER Total Dissolved Solids (COND - CALC) Chain of Custody Number: 105597 28 Concourse Gate, Unit 1 Attention: Mr. Robert Passmore INVOICE: Paterson Group Inc. Paterson Group Nepean, ON K2E 7T7 Total Kjeldahl Nitrogen Hardness as CaCO3 Alkalinity as CaCO3 Hydrogen Sulphide N-NH3 (Ammonia) N-NO3 (Nitrate) Fannin & Lignin N-NO2 (Nitrite) Conductivity Fluoride lon Balance Manganese Magnesium Potassium Turbidity Chloride Sulphate Phenols Sodium Calcium Client: Colour

Denation Reporting Limit INC = Incomplete AD = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

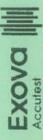
H2S MRL elevated due to sample turbidity.

APPROVAĽ:
Ewan McBabbie
Inorgánic Lab Supervisor

Results relate only to the parameters tested on the samples submitted.

PH1292

Project:



1000780 2010-01-18 2010-01-14 Report Number: Date Submitted:

REPORT OF ANALYSIS

28 Concourse Gate, Unit 1 Attention: Mr. Robert Passmore INVOICE: Paterson Group Inc. Client: Paterson Group Nepean, ON K2E 7T7

8794 Water P.O. Number: Matrix: Chain of Custody Number: 105597

		UNITS	CFU/100mL	CFU/100mL				
	ODWSOG			0				
		TYPE	MAC	MAC				
F								
2010-01-13	TW1-WS2		0	0	80	0	0	
-	-							
Samp	es.	UNITS	CFU/100mL	CFU/100mL	CFU/1mL	CFU/100mL	CFU/100mL	
					ate Count			
	=	Sample Date: 2010-01-13 ODWS0G	sie Date: 2010-01-13 ODWSOG mple ID: TW1-WS2 ODWSOG MRL TYPE LIMIT	Sample Date: 2010-01-13 CDW/SOG	Sample IDs 2010-01-13 ODWSOG PARAMETER UNITS MRL 0 DOWSOG DOWSOG CFU/100mL 0 0 MAC 0 CFU/100mL 0 0 MAC 0	Sample Date: 2010-01-13 ODWSOG PARAMETER UNITS MRL 0 CFU/100mL 0 DWSC 0 CFU/100mL 0 </th <th> Sample Date: Sample Date: Sample Date: Sample ID: TW1-WS2 Sample ID: TW1-WS2</th> <th>Sample IDs. Sample ID: Sample ID: Sample ID: TW1-WS2 TW1-WS2 OPWSOG PARAMETER UNITS MRL 0 DPWSOG ale Count CFU/100mL C</th>	Sample Date: Sample Date: Sample Date: Sample ID: TW1-WS2 Sample IDs. Sample ID: Sample ID: Sample ID: TW1-WS2 TW1-WS2 OPWSOG PARAMETER UNITS MRL 0 DPWSOG ale Count CFU/100mL C	

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

Dragana Dzeletovic Microbiology Analyst APPROVAL

Results relate only to the parameters tested on the samples the

1 of 1

2010-01-26 2010-01-14

1000789

PH 1292



Report Number: Date: Date Submitted: Project: Attention: Mr. Robert Passmore 28 Concourse Gate, Unit 1 Client: Paterson Group Nepean, ON

P.O. Number:

8794 Water Matrix:

Chain of Custody Number: 105597

INVOICE: Paterson Group Inc.

K2E 7T7

		I AB ID.	774144		Mannx.		water	
			441111				GUIDELINE	
	San	Sample Date:	2010-01-13					
	S	Sample ID:	TW1-WS2				ODWSOG	
					,			
PARAMETER	UNITS	MRL				TYPE	LIMIT	UNITS
Alkalinity as CaCO3	Тош	2	258			90	200	maA
Chloride	mg/L	-	51			AO	250	mark
Colour	TCU	2	2			AO	5	TCU
Conductivity	uS/cm	5	705					
Dissolved Organic Carbon	mg/L	0.5	1,3			AO	10	mal
Fluoride	mg/L	0.1	0.31			MAC	1.5	mad
Hydrogen Sulphide	mg/L	0.1	40.1			AO	0.05	mod
N-NH3 (Ammonia)	mg/L	0.02	90.0					i i
N-NO2 (Nitrite)	mg/L	0.1	<0.10			MAC	1.0	mod
N-NO3 (Nitrate)	mg/L	0.1	<0.10			MAC	10.01	100
Ha			7.95				REAR	b
Phenois	mg/L	0.001	<0.001				0.000	
Sulphate	mg/L		46			AO	200	Pom
Tannin & Lignin	mg/L	0.1	0.2			2	3	T.R.
Total Dissolved Solids (COND - CALC)	mg/L	w	458			AO	200	mon
Total Kjeldahi Nitrogen	mg/L	0.1	<0.10					i i
Turbidity	DEN	0.1	27.6			MAG	10	NTE
Hardness as CaCO3	mg/L		308			90	100	Mod
for Balance		10.0	0.99					i b
Calcium	mg/L	-	77					
Magnesium	mg/L	-	28					
Potassium	mg/L	-	¥					
Sodium	mg/L	2	29			AO	200	man
Iron	mg/L	0.03	0.81			AO	0.3	Mod
Manganese	mg/L	0.01	0.02			AO	0.05	may

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

771144: H2S MRL elevated due to sample turbidity

APPROVA

Results relate only to the para

2010-01-26

1000789

PH 1292

REPORT OF ANALYSIS



28 Concourse Gate, Unit 1 Client: Paterson Group Nepean, ON

Attention: Mr. Robert Passmore

KZE 7T7

Report Number: Date Submitted: Project:

8794 Water P.O. Number: Matrix: Chain of Custody Number: 105597 INVOICE: Paterson Group Inc.

		LAB ID:	771144				GUIDELINE	
	Sam	Sample Date:	2010-01-13					
	S	Sample ID:	TW1-WS2				ODWSOG	
PARAMETER	UNITS	MRL				TYPE	LIMIT	UNITS
VOLATILE ORGANIC COMPOUNDS - VOCs								
1,1,1,2-tetrachloroethane	Ug/L	2	7					
1,1,1-trichloroethane	ug/L	2	8					
1,1,2,2-tetrachloroethane	ug/L	2	4					
1,1,2-trichloroethane	ug/L	2	4					
1,1-dichloroethane	ug/L	2	0					
1,2-dibromoethane	Ug/L	4	<4.0					
1,2-dichloropropane	ug/L	2	<2					
1,3,5-trimethy/benzene	Ug/L	-	V					
1,3-dichlorobenzene	ug/L	2	<2					
Bromomethane	ng/L	2	<2					
c-1,2-Dichloroethylene	ug/L	2	25					
c-1,3-Dichloropropylene	ng/L	0.8	<0.8			7/11		
Chloroethane	ng/L	4	<4.0					
Chloromethane	ng/L	4	C4.0					
Ethylbenzene	ng/L	2	2			AO	2.4	nav
Styrene	Ug/L	2	<25 C2					
t-1,2-Dichloroethylene	ng/L	2	<2					
t-1,3-Dichloropropylene	ng/L	8.0	8.0>					
Totuene	J/6n	2	<2			AO	24	ng/L
Trichlorofluoromethane	ng/L	2	\$ °					
1,1-dichloroethylene	Ug/L	2	<2			MAC	14	UDA
1,2-dichlorobenzene	ug/L	2	<2 <2			MAC	200	UB/L
1,2-dichloroethane	ug/L	2	2			IMAC	ro.	ng/L
1,4-dichlorobenzene	ng/L	2	25			MAC	20	ng/L
Benzene	Ug/L	2	42			MAC	uo	ug/L
Carbon Tetrachloride	Ug/L	2	4			MAC	ις.	ng/L
Dichloromethane	ng/L	16	<16			MAC	20	ng/L
Monochlorobenzene	Ug/L	9.0	<0.8			MAC	80	Ug/L
Tetrachloroethylene	ng/L	-				MAC	30	UQ/L

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

771144: VOC MRL elevated due to matrix interference.

Organic Lab Supervisor APPROVAL:

28 Concourse Gate, Unil 1

Nepean, ON

K2E 7T7

Client: Paterson Group

REPORT OF ANALYSIS

Report Number:

Matrix:

LAB ID: Sample Date: Sample ID:

Chain of Custody Number: 105597

INVOICE: Paterson Group Inc.

Attention: Mr. Robert Passmore

Water 2010-01-26 2010-01-14 PH 1292 1000789 8794 Date Submitted: P.O. Number: Project:

2010-01-13 TW1-WS2 771144

PARAMETER

Bromodichloromethane

Bromoform

Chloroform

Trichloroethylene Vinyl Chloride

UNITS Ug/L

LIMIT

TYPE MAC

10 01

ODWSOG

z % z a a z 4 a MRL 9.0

* * *

Dibromochloromethane

m/p-xylene

VOC SURROGATES Toluene-d8 o-xylene

CCME Total Petroleum Hydrocarbons 4-bromofluorobenzene 1,2-dichloroethane-d4

F1-8TEX (C6-C10) F2 (C10-C16) F1 (C6-C10)

9 9 9 9 9

02 0 2 2 0 0 2

mg/L mg/L mg/L

92 120 92

F3 (C16-C34)

F4 (C34-C50)

MRL = Method Reporting Limit INC = Incomplete AO = Aesthelic Objective CG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Inferim Maximum Allowable Concentration

Organic Lab Supervisor

Results relate only to the parameter



CCME METHOD VERIFICATION REPORT

EXOVA ACCUTEST

Report Number: 1000789 Date: 2010-01-26 Date Submitted; 2010-01-14	Project: PH 1292	P.O. Number: 8794 Matrix: Water		If No then Reasons													Naphthalene (PAH) not requested/analysed	THE RESIDENCE OF THE PARTY OF T		PAH not requested/analysed					
			Soil, CCME/TPH* e in the laboratory.	HOLD TIME ANALYSIS TIME YES NO YES NO			36			YES NO										5		YES NO	<u> </u>		
Client: Paterson Group 28 Concourse Gate, Unit 1 Nepean, ON K2E 777	Attention: Mr. Robert Passmore	INVOICE: Paterson Group Inc.	Samples were analysed by Accutest Method AMCCME2, "Petroleum Hydrocarbons in Water and Soil, CCME/TPHT This method complies with the reference method for the CCME CWS PHC and is validated for use in the laboratory. Accutest is accredited by CAEAL (ISO 17025) for all CCME F1-F4 fractions as listed in this report. Data for QC samples (blank, duplicate, spike) are available on request.	Fractions Analysed Within Acceptable Holding/Analysis Times	F1 (C6-C10)	F2 (C10-C16)	F4 (C34.C50)	F4 (C34-C50) gravimetric (when applicable)	Fraction Specific Information	-	nC6 and nC10 response factors within 30% of Toluene	BTEX subtracted from F1 fraction	If YES was F1-BTEX (C6-C10) reported	F2	nC10, nC16 and nC34 response factors within 10% of their average (F2-F4)	Linearity within 15 % (F2-F4)	Naphthalene subtracted from F2 fraction	If YES was F2-Napthalene reported	23	PAH (selected compounds) subtracted from F3 fraction	If YES was F3-PAH reported	T.	C50 response factor within 70% of nC10 + nC16 + nC34 average	Chromatogram descended to baseline by retention time of C50	If NO was F4 (C34-C50) gravimetric reported

APPROVAL:



1003171 2010-02-22 2010-02-17 PH1292 8808 Water Report Number: Date: Date Submitted: P.O. Number: Matrix: Project: INVOICE: Paterson Group Inc. Chain of Custody Number: 105022 Cllent: Paterson Group 28 Concourse Gate, Unit 1 Nepean, ON K2E 7T7 Attention: Mr. Robert Passmore

Chain of Custody Number: 105022					MATELIX:		weier		
	LAB ID:	777417	777418				GUIDELINE	LINE	
	Sample Date:	2010-02-17	2010-02-17						
	Sample ID:	TW2-WS1	TW2-WS2				ODWSOG	908	
PARAMETER	UNITS MRL					TYPE	: LIMIT		UNITS
Total Coliforms	CFU/100mL	0	0			MAC	0	Ö	CFU/100mL
Escherichia Coli	CFU/100mL	0	0			MAC	0		-U/100mL
Heterotrophic Plate Count	CFU/1mL	0	0						
Faecal Coliforms	CFU/100mL	0	0						
Faecal Streptococcus	CFU/100mL	0	0						
							•		

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

APPROVAL: / V

Dragana Dzeletovic

Microbiology Analyst

Results relate only to the parameters tested on the samples submitted



1003170 2010-02-25 2010-02-17	PH1292	8808 Water	GUIDELINE		ODWSOG	LIMIT UNITS	500 mg/L		5 TCU		2	1.5 mg/L	0.05	_	_	10.0 mg/L	6.5-8.5		500 mg/L		500 mg/L		1.0 NTU	100 mg/L					200 mg/L	0.3 mg/L	712
Report Number: Date: Date Submitted:	Project:	P.O. Number: Matrix:				TYPE	90	AO	AO		AO	MAC	AO	28,000	MAC	MAC			AO		AO		MAC	90					AO	AO	AO
			777416	2010-02-17	TW2-WS2		255	55	2	718	1.2	0.29	0.02	0.03	<0.10	<0.10	7.94	<0.001	47	<0.1	467	<0.10	17.2	297	0.95	76	26	4	29	0.59	0.01
			777415	2010-02-17	TW2-WS1		254	56	<2 2	722	4.	0.29	0.03	0.03	<0.10	<0.10	7.93	<0.001	47	0.1	469	<0.10	16.7	288	0.92	74	25	4	28	0.58	0.01
			LAB ID:	Sample Date:	Sample ID:	MRL	ıo	-	2	ß	0.5	0.1	0.01	0.02	0.1	0.1		0.001	-	0.1	40	0.1	0.1	-	0.01	-	-	-	2	0.03	0.01
				San	co.	UNITS	mg/L	mg/L	TCU	ms/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	0.000	mg/L	mg/L	mg/L	mg/L	mg/L	DTN	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	l/om
Client: Paterson Group 28 Concourse Gate, Unit 1 Nepean, ON	Attention: Mr. Robert Passmore	INVOICE: Paterson Group Inc. Chain of Custody Number: 105022				PARAMETER	Alkalinity as CaCO3	Chloride	Colour	Conductivity	Dissolved Organic Carbon	Fluoride	Hydrogen Sulphide	N-NH3 (Ammonia)	N-NO2 (Nitrite)	N-NO3 (Nitrate)	PH Hd	Phenols	Sulphate	Tannin & Lignin	Total Dissolved Solids (COND - CALC)	Total Kjeldahl Nitrogen	Turbidity	Hardness as CaCO3	Ion Balance	Calcium	Magnesium	Potassium	Sodium	Iron	Manganese

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

APPROVAL:
Ewagr McRóbbie
Ingrganic Lab Supervisor

Results relate only to the parametery tested on the samples submitted.

1 of 1



CFU/100mL CFU/100mL UNITS 1005516 2010-03-22 2010-03-18 GUIDELINE ODWSOG LIMIT PH1292 00 Water 8811 MAC MAC Report Number: Date: Date Submitted: P.O. Number: Project: Matrix: 783873 2010-03-18 TW3-WS2 00000 2010-03-18 TW3-WS1 783872 00000 Sample Date: Sample ID: LAB ID: MRL CFU/100mL CFU/100mL CFU/100mL CFU/100mL UNITS PARAMETER INVOICE: Paterson Group Inc. Chain of Custody Number: 105024 28 Concourse Gate, Unit 1 Attention: Mr. Robert Passmore Client: Paterson Group Heterotrophic Plate Count Nepean, ON Faecal Streptococcus K2E 7T7 Faecal Coliforms Escherichia Coli Total Coliforms

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

Drinking Water Coordinator APPROVAL:

Results relate only to the parameters tested on the samples submitted.

REPORT OF ANALYSIS



Attention: Mr. Robert Passmore 28 Concourse Gate, Unit 1 Client: Paterson Group Nepean, ON K2E 7T7

Chain of Custody Number: 105024 INVOICE: Paterson Group Inc.

1005515 2010-03-29 2010-03-18 Report Number: Date: Date Submitted:

PH1292

P.O. Number: Matrix:

Project:

8811 Water

		LAB ID:	783870	783871		GUI	GUIDELINE	
	San	Sample Date:	2010-03-18	2010-03-18				
	us.	Sample ID:	TW3-WS1	TW3-WS2		8	ODWSOG	
PARAMETER	UNITS	MRL			TYPE		LIMIT	UNITS
Alkalinity as CaCO3	mg/L	2	252	253	00	H	500	mg/L
Chloride	mg/L	-	52	52	AO	_	250	mg/L
Colour	TCU	2	2	2	AC	_	2	TCU
Conductivity	nS/cm	ιΩ	685	683				
Dissolved Organic Carbon	mg/L	0.5	1.2	1.2	AC		2	mg/L
Fluoride	mg/L	0.1	0.34	0.36	MA		1,5	mg/L
Hydrogen Sulphide	mg/L	0.01	0.01	<0.01	AC		0.05	mg/L
N-NH3 (Ammonia)	mg/L	0.02	0.05	0.05				
N-NO2 (Nitrite)	mg/L	0.1	<0.10	<0.10	MA	_	1.0	mg/L
N-NO3 (Nitrate)	mg/L	0.1	<0.10	<0.10	MA	_	10.0	mg/L
Н			7.96	7.98			5-8.5	
Phenois	mg/L	0.001	<0.001	<0.001				
Sulphate	mg/L	-	54	53	AO	0	200	mg/L
Tannin & Lignin	mg/L	0.1	0.2	0.2			Ī	
Total Dissolved Solids (COND - CALC)	mg/L	2	445	444	AC	_	200	mg/L
Total Kjeldahi Nitrogen	mg/L	0.1	<0.10	<0.10		8 8		
Turbidity	UTN	0.1	13.2	5.1	MA	0	1.0	DTN
Hardness as CaCO3	mg/L	-	287	287	8	m	100	mg/L
Ion Balance		0.01	0.93	0.93				
Calcium	mg/L	-	72	72				
Magnesium	mg/L	-	26	26				
Potassium	mg/L	-	4	4				
Sodium	mg/L	2	29	30	AC	0	200	mg/L
Iron	mg/L	0.03	0.58	0.40	AO	0	0.3	mg/L
Manganese	mg/L	0.01	0.01	<0.01	AO	0	0.05	mg/L
						_		

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

Ewap McRobbie Ingrganic Lab Supervisor APPROVA

Results relate only to the oarameters/fested on the samples submitted

REPORT OF ANALYSIS

Text-Back 3-9h

Exova

Client: Paterson Group

28 Concourse Gate, Unit 1

EXOVA ACCUTEST

Nepean, ON K2E 7T7

Attention: Mr. Robert Passmore

1119873 2011-08-29 2011-08-27 Report Number: Date: Date Submitted:

PH1292

Project:

P.O. Number:	Matrix: Water	GUIDELINE	
		906782	
		906781	
		LAB ID:	
INVOICE: Paterson Group Inc.	Chain of Custody Number: 146205		

	LAB ID:	D: 906781	906782			GUIDELINE	
	Sample Date:	e: 2011-08-26	2011-08-26				
	Sample II	1-	TW4-WS 9hr 26/08/11			ODWSOG	
PARAMETER	UNITS MRL				TYPE	LIMIT	UNITS
Total Coliforms	CFU/100mL	9	2		MAC	0	CFU/100mL
Escherichia Coli	CFU/100mL	0	0		MAC	0	CFU/100mL
Heterotrophic Plate Count	CFUV1ML	234	490				
Faecal Coliforms	CFU/100mL	0	0				
Facel Strantocociie	CFLI/100ml	46	182				
I decal orieptococcus	0	2					

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

Krista Quantrill

Results relate only to the parameters tested on the samples submitted

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

NTU

0.0

MAC

mg/L

1.0 10.0 6.5-8.5

MAC

mg/L mg/L

900

BO BO

500

mg/L mg/L

200

999

EXOVA ACCUTEST

REPORT OF ANALYSIS

Exova Accutest

2011-10-12 PH1292 1122788 Report Number: Date Submitted: Project: Attention: Mr. Robert Passmore Client: Paterson Group 28 Concourse Gate, Unit 1 Nepean, ON K2E 7T7

11627

P.O. Number:

INVOICE: Paterson Group Inc.

Chain of Custody Number: 141371				mdUIA.		Malai	
		LAB ID:	914267			GUIDELINE	
	Sam	ple Date:	2011-09-30				
	ίδ.	Sample ID:	TW5- WS09/2930/1			ODWSOG	
PARAMETER	UNITS	MRL			TYPE	LIMIT	UNITS
Alkalinity as CaCO3	mg/L	5	266		90	900	mg/L
Chloride	may		45		AO	250	mg/L
Colour	TCU	2	<2		AO	N)	TCU
Conductivity	nS/cm	20	691				
Dissolved Organic Carbon	mg/L	0.5	1.0		AO	ın	mg/L
Fluoride	mg/L	0.1	0.28		MAC	1.5	mg/L
Hydrogen Sulphide	mg/L	0.01	×0.01		AO	90.0	mg/L

																									III	
	266	45	42	691	1.0	0.28	×0.04	<0.02	<0.10	<0.10	7.97	<0.001	49	40.1	449	<0.10	6.5	285	0.91	73	25	es	26	99'0	0.01	
MRL	5		2	2	0.5	0.1	0.01	0.02	0.1	0.1		0.001	-	0.1	-	0.1	0.1	-	0.01	-	-	-	2	0.03	0.01	
UNITS	mg/L	mg/L	TCU	uS/cm	Mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		mgv	mg/L	mg/L	mg/L	mg/L	UTN	mg/L		mg/L	mort	mg/L	mg/L	mg/L	mg/L	

Total Dissolved Solids (COND - CALC)

Tannin & Lignin

Sulphate

Phenois

Hydrogen Sulphide N-NH3 (Ammonia)

N-NO2 (Nitrite) N-NO3 (Nitrate)

Total Kjeldahi Nitrogen

Hardness as CaCO3

Turbidity

Ion Balance

Magnesium

Calcium

Potassium

Sodium

Manganese

MRL = Method Reporting Linid INC = Incomplete AO = Aesthetic Objective OG = Operational Guiddrine MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

Sample was subcontracted for DOC analysis.

Inorganic Lab Supervisor APPROVAL:

Methods references and/or additional OAVOC information available on request.

Twy- 3h- Ghr ExOVA

1119874 2011-09-08 2011-08-27

Report Number: Date Submitted:

Date:

PH1292

Project

28 Concourse Gate, Unit 1 Client: Paterson Group

Nepean, ON

Attention: Mr. Robert Passmore K2E 7T7

INVOICE: Paterson Group Inc.

Chain of Custody Number: 146205

P.O. Number: Matrix:

UNITS mg/L mg/L mg/L mg/L mg/L mg/L mg/L TCU mg/L NTU mg/L mg/L Water ODWSOG 6.5-8.5 1.0 500 250 5 1.5 500 500 5.6 0.3 AO AO AO AO MAC MAC 999 AO BO 80 2011-08-26 TW4-WS 9hr 26/08/11 906784 8.17 <0.1 446 <0.10 1.2 0.29 <0.01 <0.10 <0.10 1.5 302 0.95 78 26 46 686 2011-08-26 TW4-WS 26/08/11 906783 0.04 0.04 0.10 0.10 8.17 <0.10 0.1 2.8 304 0.95 79 26 3 24 0.32 0.29 447 687 48 LAB ID: Sample Date: Sample ID: 0.01 0.001 0.01 MRL 0.1 - 0.0 UNITS uS/cm mg/L TCU mg/L mg/L mg/L mg/L mg/L ng/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L PARAMETER Total Dissolved Solids (COND - CALC) Dissolved Organic Carbon Total Kjeldahl Nitrogen Hardness as CaCO3 Alkalinity as CaCO3 Hydrogen Sulphide N-NH3 (Ammonia) Tannin & Lignin N-NO3 (Nitrate) N-NO2 (Nitrite) Conductivity Ion Balance Magnesium Manganese Potassium Sulphate Turbidity Chloride Fluoride Phenois Calcium Sodium Colour

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

Samples were subcontracted for DOC analysis

APPROVAL:

Inorganic Lab Supervisor Lorna Wilson

8-146 Colonnade Road, Ottawa, ON, KZE 7Y1

REPORT OF ANALYSIS

Two Bud eth Exova |

Client: Paterson Group 28 Concourse Gate, Unit 1

EXOVA ACCUTEST

Nepean, ON K2E 7T7

Attention: Mr. Robert Passmore

INVOICE: Paterson Group Inc.

1122782 2011-10-03 2011-09-30 Report Number: Date: Date Submitted:

PH292

Project:

P.O. Number:

Chain of Custody Number: 141371				Matrix:		Water	
	LAB ID:	914257				GUIDELINE	ш
	Sample Date: Sample ID:	2 F				ODWSOG	
PARAMETER	UNITS MRL				TYPE	LIMIT	UNITS
Total Coliforms Escherichia Coli Heterotrophic Plate Count Faecal Coliforms Faecal Streptococcus	CFU/100mL CFU/100mL CFU/100mL CFU/100mL	00 00			N WAG		CFU/100mL

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

APPROVAL:

Microbiology Lab Supervisor Krista Quantrill

Results relate only to the parameters tested on the samples submitted

8-146 Colonnade Road, Ottawa, ON, K2E 7Y1



1122788 2011-10-12 2011-09-30 PH1292 Report Number: Date: Date Submitted: Project: Client: Paterson Group 28 Concourse Gate, Unit 1 Attention: Mr. Robert Passmore Nepean, ON K2E 7T7

11627 Water P.O. Number: Matrix:

INVOICE: Paterson Group Inc. Chain of Custody Number: 141371

Chain of Custody Number: 1413/1		}							
		LAB ID:	914267					GUIDELINE	
	Sam	Sample Date:	2011-09-30						
	SS.		TW5- WS09/2930/1					ODWSOG	
PARAMETER	UNITS	MRL					TYPE	LIMIT	UNITS
Alkalinity as CaCO3	ma/L	2	266				90	200	mg/L
Chloride	ma/L	-	4 ت				AO	250	mg/L
Colour	15	7	. 7				AO	ß	UOT
Conductivity	uS/cm	5	691				. =		
Dissolved Organic Carbon	mg/L	0.5	1.0				AO	Ð	mg/L
Fluoride	mg/L	0.1	0.28				MAC	3.5	mg/L
Hydrogen Sulphide	mg/L	0.01	<0.01				ΑO	0.05	mg/L
N-NH3 (Ammonia)	mg/L	0.02	<0.02					,	•
N-NO2 (Nitrite)	mg/L	0.1	<0.10				MAC	1.0	mg/L
N-NO3 (Nitrate)	mg/L	0.7	<0.10				MAC	10.0	mg/L
Ha			7.97					6.5-8.5	
Phenols	mg/L	0.001	<0.001					1	
Sulphate	mg/L	-	49				Q Q	200	mg/L
Tannin & Lignin	mg/L	0.1	.0.1						;
Total Dissolved Solids (COND - CALC)	mg/L	-	449				AO	200	mg/L
Total Kjeldahl Nitrogen	mg/L	1.0	<0.10					,	į
Turbidity	DTN	0.1	6.5				MAC	1.0	OTN.
Hardness as CaCO3	mg/L	-	285		-		ဗ	100	mg/L
Ion Balance		0.01	0.91						
Calcium	mg/L	Ψ-	73						
Magnesium	mg/L	-	25						
Potassium	mg/L	-	က					·	;
Sodium	mg/L	2	56	-			Yo.	200	mg/L
lion	mg/L	0.03	99.0				δ	0.3	mg/L
Manganese	mg/L	0.01	0.01				9 9	0.05	mg/L

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

Sample was subcontracted for DOC analysis.

Inorganic Lab Supervisor APPROVAL:

Lorna Wilson

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Results relate only to the parameters tested on the samples submitted.



1122839 2011-10-14 2011-10-03 PH1292 Date Submitted: Report Number: **Project:** Client: Paterson Group 28 Concourse Gate, Unit 1 Attention: Mr. Robert Passmore Nepean, ON K2E 7T7

P.O. Number: INVOICE: Paterson Group Inc.

INVOICE: Paterson Group Inc. Chain of Custody Number: 141372		!	ļ			P.O. Number: Matrix:		11627 Water	
		LAB ID:	914459					GUIDELINE	
	Sam	Sample Date:	2011-09-30					;	•
	Sa	Sample ID:	TW5- WS				Provincial W	Provincial Water Quality Objectives - MOE 1999	bjectives -
PARAMETER	UNITS	MRL					TYPE	LIMIT	UNITS
Alkalinity as CaCO3	mg/L	S	268						
Chloride	mg/L	-	45						,
Colour	TCU	7	7		 				
Conductivity	m2/cm	ഗ	680						
Dissolved Organic Carbon	mg/L	0.5	;						
Fluoride	mg/L	0.1	0.27						
Hydrogen Sulphide	mg/L	0.0	<0.01				PWQO	0.002	mg/L
N-NH3 (Ammonia)	mg/L	0.02	<0.02						
N-NO2 (Nitrite)	mg/L	0.1	<0.10						
N-NO3 (Nitrate)	mg/L	0.1	<0.10						
Ha			7.86					6.5-8.5	
Phenols	mg/L	0.001	<0.001		•		PWQO	0.001	mg/L
Sulphate	mg/L	-	49		 • •••				
Tannin & Lignin	mg/L	0.1	٥. 1.						
Total Dissolved Solids (COND - CALC)	mg/L	-	442	•••					
Total Kjeldahl Nitrogen	mg/L	0.1	0.12	•					
Turbidity	NTO	0.1	5.7						
Hardness as CaCO3	mg/L		306						
Ion Balance		0.01	96.0		•				•
Calcium	mg/L	-	78						
Magnesium	mg/L		27						
Potassium	mg/L	-	က						
Sodium	mg/L	7	27						;
uòil	mg/L	0.03	0.54				PWGO	0.30	mg/L
Manganese	mg/L	0.01	0.01						

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

Comment: Holding time for turbidity analysis was exceeded.

Results relate only to the parameters tested on the samples submitted.

REPORT OF ANALYSIS

EXOVQ

Report Number: 28 Concourse Gate, Unit 1 Client: Paterson Group Nepean, ON

Attention: Mr. Robert Passmore

2010-02-01 2010-01-28 PH1292 Date Submitted: Project:

P.O. Number: Matrix: INVOICE: Paterson Group Inc. Chain of Custody Number: 105018

Claim of Consocial Familian - Consocial Consoc		1 AR ID	773874	773875			GUIDELINE		
	Sam	Sample Date:	2010-01-28	100			COLOCALIA		
	S	Sample ID:	EW-WS1	U.S.			ODWSOG		
PARAMETER	UNITS	MRL	The state of the s			TYPE	LIMIT	UNITS	
	CFU/100mL		0	0		MAC	0	CFU/100mL	
Escherichia Coli	CFU/100mL		0	0		MAC	0	CFU/100mL	
ate Count	CFU/1mL		0	0					
	CFU/100mL		0	0					
ocus	CFU/100mL		0	0					
		100							
								4	

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

Comment: This is an amendment and supercedes all other copies of this report. The sample ID's have been amended as per client request.

Microbiology Ana APPROVAL:

Results relate only to the parameters tested on the samples submitted

mg/L mg/L

0.05

999

mg/L

500

AO

mg/L

NTU mg/L

0.0

MAC

49 456 456 456 456 11.1 11.1 11.1 27 27 5 5 34 60.01 60.02 60.01

49 456 60.11 11.6 11.6 70 70 28 5 83 5 60.01

0.03 0.03 0.03

mg/L mg/L mg/L mg/L

Tannin & Lignin Total Dissolved Solids (COND - CALC) Total Kjeldahl Nitrogen

Sulphate

Hardness as CaCO3

Turbidity

Ion Baiance

Calcium

Magnesium Potassium

Sodium

Manganese

REPORT OF ANALYSIS

EXOVQ Acculest

Report Number: Date:

Attention: Mr. Robert Passmore

28 Concourse Gate, Unit 1

Nepean, ON

K2E 777

Client: Paterson Group

Project:

1001798 2010-02-04 2010-01-28 PH1292 Date Submitted:

P.O. Number:

INVOICE: Paterson Group Inc.					P.O. Number:			
Chain of Custody Number: 105018					Matrix:	1	Water	
		LAB ID:	773876	773877			GUIDELINE	
	Samp	Sample Date:	2010-01-28	2010-01-28				
	Sa	Sample ID:	EW-WS1	EW-WS2			ODWSOG	
PARAMETER	UNITS	MRL				TYPE	LIMIT	UNITS
Alkalinity as CaCO3	mg/L	2	269	269		90	200	mg/L
Chloride	mg/L		44	43		AO	250	mg/L
Colour	TCE	2	25	Ø		AO	10	TCU
Conductivity	ms/cm	20	702	702				
Dissolved Organic Carbon	mg/L	0.5	1.3	1.2		AO	2	mg/L
Fluoride	mg/L	0.1	0.38	0.38		MAC	1,5	mg/L
Hydrogen Sulphide	mg/L	0.01	<0.01	<0.01		AO	90.0	mg/L
N-NH3 (Ammonia)	mg/L	0.02	60.0	0.08				
N-NO2 (Nitrite)	mg/L	0.1	<0.10	<0.10		MAC	1.0	mg/L
N-NO3 (Nitrate)	mg/L	0.1	<0.10	<0.10		MAC	10.0	mg/L
H			8.12	8.16			6.5-8.5	
Phends	T/6m	0.001	<0.001	<0.001		100		

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

Results relate only to the parameters ter

PH1292

Project:

Client:



1000782 2010-01-18 2010-01-14 Report Number: Date Submitted: REPORT OF ANALYSIS

Paterson Group 28 Concourse Gate, Unit 1 Attention: Mr. Robert Passmore INVOICE: Paterson Group Inc. Nepean, ON K2E 7T7

8794 P.O. Number:

Chain of Custody Number: 105597				Matrix:	Water
	LAB ID:	771137			GUIDELINE
	Sample Date:	2010-01-13	THE SHAPE OF THE PARTY OF THE P		
	Comple ID.	- 20 King-WS3			

			UNITS	CFU/100mL	CFU/100mL										y y						
GUIDELINE		ODWSOG	LIMIT	0	0																
			TYPE	MAC	MAC						1										
	Salar Salar					k															
		Hoper																			
7711137	2010-01-13	20 King-WS1		0	0	2	0	0													
LAB ID:	Sample Date:	Sample ID:	MRL																		
	Samp	S	UNITS	CFU/100mL	CFU/100mL	CFU/1mL	CFU/100mL	CFU/100mL													
			PARAMETER			ate Count		ocus													

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

Microbiology Analyst APPROVAL:

EXOVA ACCUTEST



2010-01-27 1000794 PH 1292 8794 Report Number: Date Submitted: P.O. Number: Project: Date: Attention: Mr. Robert Passmore 28 Concourse Gate, Unit 1 INVOICE: Paterson Group Inc. Client: Paterson Group Nepean, ON K2E 717

Matrix:

Water Chain of Custody Number: 105597

		-	1		-		-	
		TAB ID:	//1149				GUIDELINE	
	Sam	Sample Date:	2010-01-13					
	S	Sample ID:	20 King-WS1				ODWSOG	
PARAMETER	UNITS	MRL				TYPE	LIMIT	UNITS
Alkalinity as CaCO3	mo/l	LC.	328			100	800	The state of
Chlorida	100		43			3 \$	3 6	mg/L
2000000	100	- (2 (2	707	mg/L
Coor	TCU	2	8			AO	10	TCU
Conductivity	uS/cm	22	654					
Dissolved Organic Carbon	mg/L	0.5	1.5	No.		AO	5	mark
Fluoride	mg/L	0.1	0.36			MAC	1.5	mo/L
Hydrogen Sulphide	mg/L	0.01	<0.01			AO	0.05	may
N-NH3 (Ammonia)	mg/L	0.02	<0.02					
N-NO2 (Nitrite)	mg/L	0.1	<0.10			MAC	1.0	mgA
N-NO3 (Nitrate)	mg/L	0.1	0.13			MAC	10.0	maA
H			7.83				6.5-8.5	
Phenois	mg/L	0.001	<0.001					
Sulphate	mg/L	-	19			AO	200	ma/L
Tannin & Lignin	mg/L	0.1	0.1					
Total Dissolved Solids (COND - CALC)	mg/L	2	425			AO	200	mo/L
Total Kjeldahi Nitrogen	mg/L	0.1	<0.10					
Turbidity	NTO	0.1	0.2			MAC	1.0	NTO
Hardness as CaCO3	mg/L	-	296			90	100	mg/L
lon Balance		0.01	0.92					
Calcium	mg/L	-	7.4					
Magnesium	mg/L	-	27					
Potassium	mg/L	***	2					
Sodium	mg/L	2	19			AO	200	ma/L
Iron	mg/L	0.03	<0.03			AO	0.3	mg/L
Mangariese	mg/L	0.01	<0.01			AO	0.05	mg/L

MRL = Method Reporting Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration Comment VAL.
Ewan MidBabotha
Inopfanic Lab Supervisor APPROVAL;

Results relate only to the parameter's tested on the samples submitted

REPORT OF ANALYSIS



1127252 2011-11-25 2011-11-23 PH1292 Report Number: Date: Date Submitted: 28 Concourse Gate, Unit 1 **EXOVA** ACCUTEST Client: Paterson Group Nepean, ON K2E 7T7

P.O. Number:

Water GUIDELINE

ODWSOG

Project: INVOICE: Paterson Group Inc. Chain of Custody Number: 141378 Attention: Mr. Robert Passmore

927122

Sample Date: Sample ID: LAB ID:

Matrix: 2011-11-22 6 King-WS 22/11/11 927123

MRL

PARAMETER

Heterotrophic Plate Count

Faecal Streptococcus Faecal Coliforms Escherichia Coli Fotal Coliforms

UNITS CFU/100mL CFU/100mL

CFU/1mL CFU/100mL CFU/100mL

UNITS CFU/100mL CFU/100mL

0

TYPE MAC

2011-11-22 10 Cockburn -WS 22/11/11

00000

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

Microbiology Lab Supervisor APPROVAL: KINTA LAN.

Results relate only to the parameters tested on the samples submitted.

J. 1981

REPORT OF ANALYSIS



EXOVQ Acculest

Report Number:

28 Concourse Gate, Unit 1 Client: Paterson Group

1127271 2011-11-25 2011-11-23 PH1292 Water Date Submitted: P.O. Number: Matrix: Project: INVOICE: Paterson Group Inc. Chain of Custody Number: 141378 Attention: Mr. Robert Passmore Nepean, ON K2E 7T7

Chain of Custody Number: 141378									CHINE INE	
		LAB ID:	927147	927148					JOICELINE	T
	Sam		2011-11-22	2011-11-22						
	ΐ		10 Cockburn- WS 22/11/11	6 King-WS 22/11/11	_				ODWSOG	
	OTIMIT	ide			,			TYPE	LIMIT	UNITS
PARAMETER	CNIS	J. I					Ť	٤	200	Jour
Alkalinity as CaCO3	mg/L	ည	260	260				3 9	8 6) = D)
Chloride	ma/L	-	46	46				Q Q	007	J/GE
) [2	2	8	2		•		Q Q	ഹ	고 2
COLOGI	Work.	LC.	694	869						
Conductivity			7	1.2			-	AO	တ	mg/L
Dissolved Organic Carbon	mg/L	0.0	- 6	4.00				MAC	1.5	mg/L
Fluoride	mg/L	٥.٦	95.0	0.30			-) (30.0	- J. Da.
Hydrogen Sulphide	mg/L	0.01	0.01	-0:0)				5	3	1
N-NH3 (Ammonia)	mg/L	0.02	90:0	0.09					,	
N-NO2 (Nitrite)	mg/L	0.1	0,10	<0.10				MAC	1.0	mg/L
N-NO3 (Nitrate)	ma/L	0.1	<0.10	<0.10				MAC	10.0	mg/L
	ì		7.90	7.94					6.5-8.5	
alcoadd	mg/L	0.001	<0.001	<0.001						
Silphote	ma/L	τ-	47	47				AO AO	200	mg/L
Tannin & Linnin	mg/L	0.1	<0.1	-0.1						
Total Dissolved Solids (COND - CALC)	mg/L	-	451	454				AO	200	mg/L
Total Kieldahl Nitrogen	mg/L	0.1	<0.10	0.28				-		ļ
Turbidity	NTC	0.1	6.5	3.4				MAC	0.1	o :
Hardness as CaCO3	mg/L	-	303	298				90	100	mg/L
lon Balance		0.01	1.02	1.01			•			
Calcium	mg/L	-	75	73	•	•				
Magnesium	mg/L	-	28	78						
Potassium	mg/L	Ψ-	4	4				,	4	•
Sodium	mg/L	7	34	32				Q ·	200	mg/L
lon	mg/L	0.03	0.43	0.36				Q !	0.3	mg/L
4 de constant de c	mg/L	0.01	0.01	<0.01				Q V	0.05	mg/L
	•									
			_							

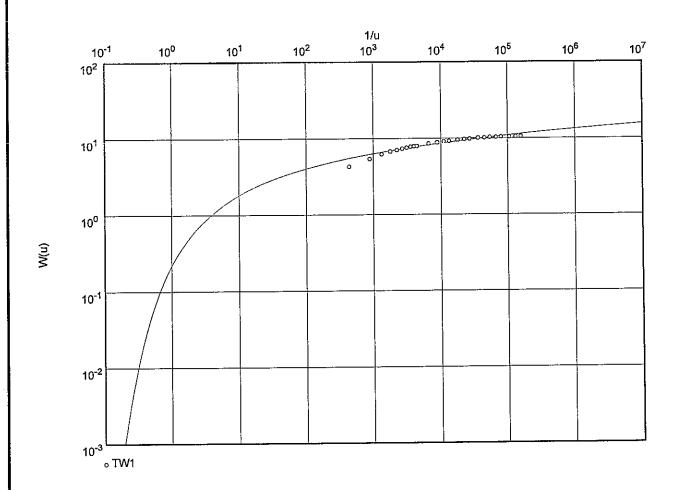
MRL = Method Reporting Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration Comment: Inorganic Lab Supervisor

Results relate only to the parameters tested on the samples submitted.

APPENDIX 4

- **Q** AQUIFER ANALYSIS DATA FOR TEST WELLS
- POTENTIAL WELL INTERFERENCE CALCULATIONS FOR ONSITE WELL INTERFERENCE WITHIN MARCH FORMATION
- MEASURED WELL IMPACT MONITORING SUMMARY FROM TW4 AND TW5 PUMPING OPERATIONS

Pumping test analysis Theis analysis method Confined aquifer	Date: 04.02.2010 none, Page 1 Project: PH1292
	Evaluated by: RAP
Test condu	octed on: Jan. 13/2010
	Theis analysis method Confined aquifer

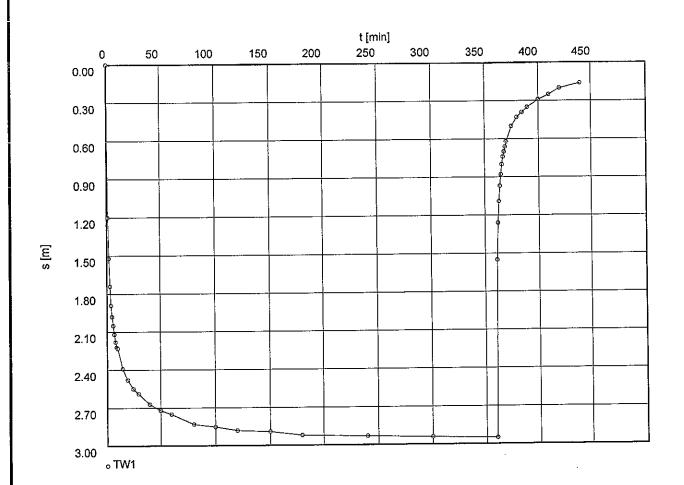


Transmissivity [m²/min]: 2.21 x 10⁻²

Storativity: 2.21 x 10⁻³

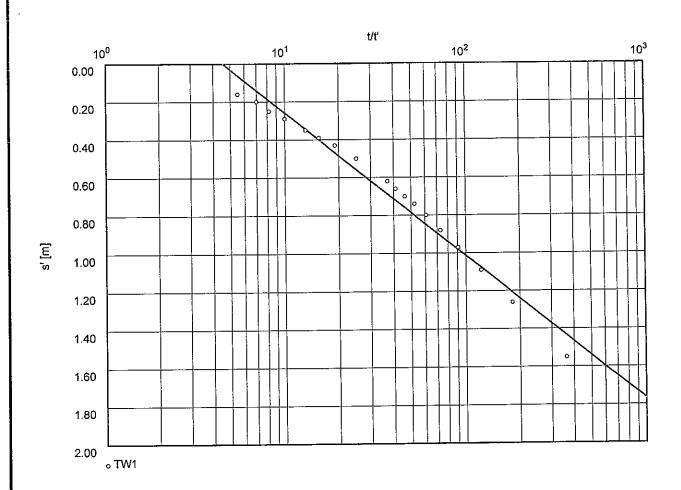
Water	loo Hydrogeologic	Pumping test analysi		Date: 04.02.2010	none, Page 2
180 Co	olumbia St. W. o,Ontario,Canada	Theis analysis metho Confined aquifer	od	Project: PH1292	
ph.(519)7		Commed aquiler		Evaluated by: R/	√ P
Pumpir	ng Test No. 1		Test conducted on: .	lan. 13/2010	
TW1			TW1		
	rge 1.30 l/s		Distance from the pu	mping well 0 300	m
			Distance from the po	imping wen 0.500	
Static v	vater level: 2.090 m below datum				
	Pumping test duration	Water level	Drawdov	vn	
	[min]	[m]	[m]		
				4.000	
3	1.00	3.290 3.610		1.200 1.520	
4	3.00	3.830		1.740	
5	4.00	3.980		1.890	
6	5.00	4.070		1.980	
7	6.00	4.140		2.050	
8	7.00	4.210		2.120	
9	8.00 9.00	4.270 4.310		2.180 2.220	
11	10,00	4.320		2.230	
12	15.00	4.480		2.390	-
13	20.00	4.570		2.480	
14	25.00	4.640	i	2,550	
15	30.00	4.680		2,590	
16	40.00	4.760		2.670	
17	50.00	4.810		2.720	
18 19	60.00 80.00	4.840 4.920		2.750 2.830	
20	100.00	4.940		2.850	 -
21	120.00	4.970		2.880	
22	150.00	4.980		2.890	
23	180.00	5.010		2.920	
24	240.00	5.020		2.930	
25	300.00	5.030 5.040		2.940 2.950	
26	360.00	5,040	· · · · · · · · · · · · · · · · · · ·	2.950	
					, .,
					· · · · · · · · · · · · · · · · · · ·
-					
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$\overline{}$					

Waterioo Hydrogeologic 180 Columbia St. W. Waterloo,Ontario,Canada ph.(519)746-1798	Pumping test analysis Time-Drawdown plot	Date: 04.02.2010 none, Page 1 Project: PH1292 Evaluated by: RAP
Pumping Test No. 1	Test conducted	on: Jan. 13/2010
TW1		
Discharge 1.30 l/s		



Waterloo Hydrogeologic Pumping test analys 180 Columbia St. W. Time-Drawdown plo		ļ	Date: 04.02.2010	none, Page 2	
180 Columbia St. W. I Ime-Drawdown plo Waterloo,Ontario,Canada		Time-Drawdown plot	Project: PH1292		
vvateлоо,Опт ph.(519)746-1	·			Evaluated by: RAF	
Pumping T	est No. 1		Test conducted on: J	an. 13/2010	
TW1			TW1		
Discharge	1.30 l/s		Distance from the pu	mping well 0.300 m	·
	er level: 2.090 m below datum				
	Pumping test duration	Water level	Drawdov	vn	
	[min]	[m]	[m]		
1	0.00	2.090		0.000	
2	1.00	3.290		1.200	
3	2.00	3.610		1.520 1.740	
4	3.00	3.830		1.740	
5	4.00 5.00	3.980 4.070		1.980	· · · · · · · · · · · · · · · · · · ·
6	6.00	4.140		2.050	
8	7.00	4.210		2.120	
9	8.00	4.270		2.180	
10	9.00	4.310		2.220	
11	10.00	4.320		2,230	
12	15.00	4.480		2.390	
13	20.00	4.570		2.480	
14	25.00	4.640		2.550 2.590	
15	30.00	4.680		2.670	
16	40.00	4.760 4.810		2.720	
17	50.00 60.00	4.840		2.750	
18 19	80.00	4.920		2.830	
20	100.00	4.940		2.850	
21	120.00	4.970		2.880	
22	150.00	4.980		2.890	
23	180.00	5.010		2.920	
24	240.00	5.020		2.930	
25	300.00	5.030		2.940 2.950	
26	360.00	5.040		1.550	
27	361.00	3.640 3.350		1.260	
28	362.00 363.00	3.180		1.090	
29 30	364.00	3.060		0.970	
31	365.00	2.970		0.880	
32	366.00	2.890		0.800	
33	367.00	2.830		0.740	
34	368.00	2.790		0.700	
35	369.00	2.750		0.660 0.620	
36	370.00	2.710		0.500	
37	375.00	2.590 2.520		0.430	
38	380.00 385.00	2.520	1	0.390	
39 40	390.00	2.440		0.350	
41	400.00	2,380		0.290	
42	410.00	2.340		0.250	
43	420.00	2.290		0.200	
44	440.00	2.250)	0.160	
					
			1	1	

Waterloo Hydrogeologic 180 Columbia St. W.	Pumping test analysis Recovery method after THEIS & JACOB		Date: 04.02.2010 none, Page 1 Project: PH1292	
Waterloo,Ontario,Canada ph.(519)746-1798	Confined aquifer		Evaluated by: RAP	
Pumping Test No. 1		Test conducted	d on: Jan. 13/2010	
TW1				
Discharge 1.30 l/s				
		Pumping test of	duration: 360.00 min	



Transmissivity [m 2 /min]: 1.89×10^{-2}

Waterloo Hydrogeologic 180 Columbia St. W. Waterloo,Ontario,Canada		Pumping test analysis Recovery method after THEIS & JACOB		Project: PH1292		
Pumping T	Fest No. 1		Test conducted on:	Jan. 13/2010		
TW1			TW1			
Discharge	1.30 l/s		Distance from the pu	imping well 0.300 m		
Static water	er level: 2.090 m below datum		Pumping test duration			
	Time from	Water level	Residu			
	end of pumping		drawdov	vn		
	[min]	[m]	[m]	1.550		
1	1.00 2.00	3.640 3.350		1.260		
3	3.00	3,180		1.090		
4	4.00	3.060	<u> </u>	0.970		
5	5.00	2.970		0.880		
6	6.00	2.890		0.800		
7	7.00	2.830		0.740		
8	8.00	2.790		0.700		
9	9.00	2.750		0.660		
10	10.00	2.710		0.620		
11	15.00	2.590		0.500		
12	20.00	2.520		0.430		
13	25.00	2.480		0.390 0.350		
14	30.00	2.440 2.380		0.290		
15	40.00 50.00	2.340		0.250		
16 17	60.00	2.290		0.200	-	
18	80.00	2.250		0.160		
10	80.00					
					<u></u>	
		<u> </u>				
		·				
	•					
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			WII			10000	
			Drawdown	1.93 2.18 2.50 2.74 2.99	3.44 3.82 4.25 4.56	0006	
	·		4th Well Grouping u W(u)	5.17 5.86 6.78 7.47 8.16			
			4th Well (u	3.2E-03 1.6E-03 6.4E-04 3.2E-04 1.6E-04	4.4E-05 1.5E-05 4.4E-06 1.8E-06	0008	į
ference			ouping W(u)	5.50 6.24 7.11 7.80 8.54	9.80 10.94 12.11 12.98	own vs. Time	
/ell Interi			3rd Well Grouping u W(u)	2.3E-03 1.1E-03 4.6E-04 2.3E-04 1.1E-04	3.1E-05 1.0E-05 3.1E-06 1.3E-06	wn vs. Time	
otential W			uping W(u)	6.00 6.70 7.64 8.30 9.00	10.29 11.41 12.60 13.53	rawdown vs.	
ation of Potential Well Interference		of 61 Wells	2nd Well Grouping u W(u)	1.4E-03 6.9E-04 2.7E-04 1.4E-04 6.9E-05	1.9E-05 6.2E-06 1.9E-06 7.5E-07	ph of D	
Determinat			ng W(u)	7.11 7.80 8.73 9.41 10.10	11.40 12.50 13.70 14.62	3000	
Δ	2 27.2 15 0.00221	Analysis Assumes Continuous Pumping	1st Well Grouping u	4.6E-04 2.3E-04 9.1E-05 4.6E-05 2.3E-05	6.3E-06 2.1E-06 6.3E-07 2.5E-07	1000 2000	
·		Analysis,				1000 2000	
	Pumping Rate (Q) m3/day Transmissivity (T) m2/day Average Well Spacing (m) r Coefficient of Storage S	Notes:	Time (days)	5 10 25 50 50	365 1100 3650 9125	Cumulative Drawdown (metres) 3.50 Cumulative Drawdown (metres) 0.00 0.00	

8/29/2011 8/29/2011 8/28/2011 8/28/2011 SWS_K4679 - K4679 - [8/26/2011 8:30:00 AM - 8/29/2011 11:34:01 AM] 8/28/2011 8/28/2011 8/27/2011 上百 8/27/2011 8/27/2011 Sprilland So ale 8/27/2011 8/26/2011 8/26/2011 (OSHm) DoT of pagest daw leveling Pressure (mH2O) 13.5 14.5 14.5 14.5 14.5 14.5 11.5 10.5 Temperature (Celsius)

13 COUCAVEN

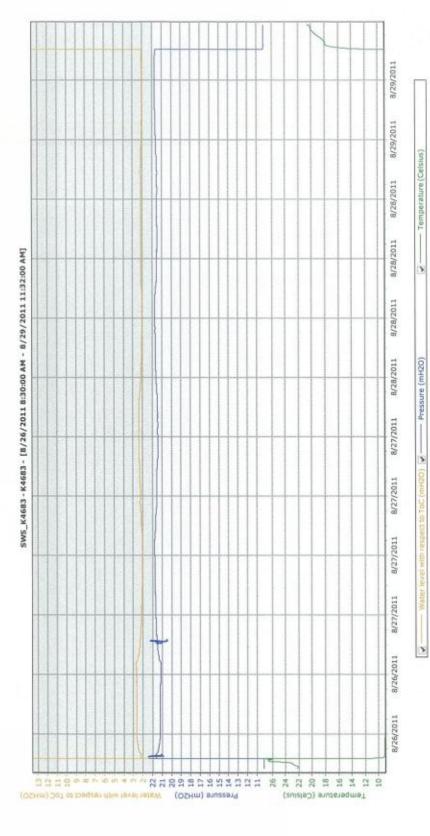
Temperature (Celsius)

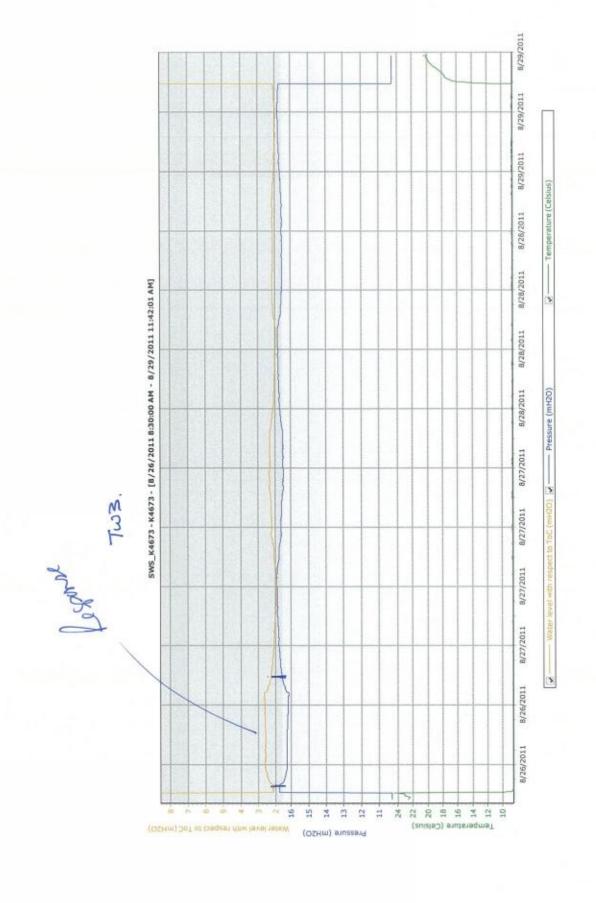
- Pressure (mH2O)

>

Desponse.







8/29/2011 8/29/2011 8/29/2011 8/28/2011 8/28/2011 SWS_K4684-K4684-[8/26/20118:30:00 AM - 8/29/201111:43:00 AM] 8/28/2011 8/28/2011 8/27/2011 8/27/2011 8/27/2011 8/27/2011 010 # 9 Ť. 7.7 E E = Temperature (Celsius) (OSHm) DoT of rangest film lavel rateW Pressure (mH2O)

#6/4104,55

8/29/2011 8/29/2011 8/29/2011 8/28/2011 POWPNY HEL (TWY)
SWS_D6676-D6676-[8/26/2011 8:30:00 AM - 8/29/2011 11:40:01 AM] 8/28/2011 8/28/2011 8/28/2011 8/27/2011 8/27/2011 8/27/2011 8/27/2011 8/26/2011 8/26/2011 Pressure (mH2O) Water level with respect to ToC (mH Temperature (Celsius) (OSHm) DoT of pagesh filliw laval rateW

- Pressure (mH2O)

APPENDIX 5

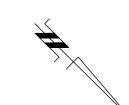
- ☐ FIGURE 1 SITE LOCATION PLAN
- FIGURE 2 REGIONAL HYDROGEOLOGIC WELL SUMMARY
- ☐ TEST HOLE LOCATION PLAN Drawing No. PH1292-1
- □ CONCEPTUAL HYDROGEOLOGIC MODEL Drawing No. PH1292-2



FIGURE 1 KEY PLAN

patersongroup





Client:

Consultant:

TALOS CUSTOM HOMES INC.

consulting engineers

paterson group

Project:

PROPOSED RESIDENTIAL SUBDIVISION

10 KING STREET OTTAWA (CUMBERLAND), ONTARIO

SITE LOCATION PLAN

Scale:
NTS
Date: 04/2013
Drawn by: BA
Checked by: RAP
File: PH1292

PH1292-FIG.1

Drawing No.:

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.

Client:

LEGEND:

FINE TEXTURED
GLACIOMARINE DEPOSITS

MODERN ALLUVIAL DEPOSITS

TALOS CUSTOM HOMES N C

patersongroup

consulting engineers

PROPOSED RESIDENTIAL SUBDIVISION

10 KING STREET OTTAWA (CUMBERLAND), ONTARIO

SURFICIAL SOIL DELINEATION MAPPING

Checked by: RAP Date Scale Drawn by: 04/2013 NTS ΒA

PH1292-FIG.2

PH1292

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

LEGEND:

OXFORD

• WATER WELL RECORD WELL COMPLETED INTO
THE OXFORD FORMATION
(PUBLISHED MOE RECORDS)

WATER WELL RECORD WELL COMPLETED INTO
THE MARCH/NEPEAN FORMATION
(PUBLISHED MOE RECORDS)

•

Client:

TALOS CUSTOM HOMES N C

Consultant:

paterson group

consulting engineers

PROPOSED RESIDENTIAL SUBDIVISION

10 KING STREET OTTAWA (CUMBERLAND), ONTARIO

Drawing

IJ X

MAPPING	TEGIONAL BECK
	KOC

	PH1292
	File:
	RAP
	Checked by:
	BA
	Drawn by:
	04/2013
	Date:
	N.T.S.
Seal	Scale:

Drawing No.:

PH1292-FIG.3

WATER WELL RECORD WELL COMPLETED INTO
THE OXFORD FORMATION
(PUBLISHED MOE RECORDS)

•

WATER WELL RECORD WELL COMPLETED INTO
THE MARCH/NEPEAN FORMATION
(PUBLISHED MOE RECORDS)

•

Client:

TALOS CUSTOM HOMES NC.

paterson@roup

consulting engineers

PROPOSED RESIDENTIAL SUBDIVISION

10 KING STREET OTTAWA (CUMBERLAND), ONTARIO

Drawing

SURROUNDING WELL INFORMATION PLAN

Scale:	Seal:
NTS	
Date:	
04/2013	
Drawn by:	
BA	
Checked by:	
RAP	
File:	

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