Geotechnical Engineering

Environmental Engineering

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Preliminary Hydrogeological Assessment for Private Services:

Proposed Residential Development
10 King Street
Richmond, Ontario

Prepared For
Talos Custom Homes Ltd.

February 4, 2010

Report: PH1292-REP.01

UPDATED: APRIL 8, 2012

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Syllabus of Additional 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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APPENDICES

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: SUMMARY OF GROUNDWATER ELEVATIONS IN BOREHOLES PUTDOWN AS PART OF THE GEOTECHNICAL INVESTIGATION AT THE SITE

Test Hole Number	Ground Surface Elevation (m)	Groundwater Levels		Recording Date
		Depth (m)	Elevation (m)	
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 ll 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.

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

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.

TABLE 2: SUMMARY OF HEALTH AND AESTHETIC/OPERATION OBJECTIVE PARAMETERS FOR EXISTING NEIGHBOURING WELLS AND NEARBY DEVELOPMENTS

Parameter	Units	Neighbouring Water Wells			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)	Type	Limit
Microbiological Parameters[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 (Health 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 Objectives/ Operational Guidelines						
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
pH		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:

TABLE 3: SUMMARY OF AQUIFER CHARACTERISTICS RESULTING FROM ANALYSIS OF PUMPING TEST DATA OBTAINED FROM CONSTANT RATE TESTING

PARAMETER	TEST WELL NUMBER					
	TW1	TW2	TW3	TW4	TW5	EW
Transmissivity[1] (m^2/d)	4	2	684	56.7	118	118
Storativity[2]	n/a	n/a	n/a	1.0×10^{-4}	4.0×10^{-5}	4.0×10^{-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 (m^3/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.

TABLE 4:SUMMARY OF HEALTH AND AESTHETIC/OPERATIONAL PARAMETERS FOR THE COMBINED OXFORD FORMATION AND MARCH FORMATION WATER SUPPLY AQUIFERS AS DEFINED BY TW1, TW2 & TW3

Parameter	Units	TW1		TW2		TW3		ODWS	
		3 HR (771127)	6 HR (771144)	3 HR (777415)	6 HR (777416)	3 HR (783870)	6 HR (783871)	TYPE	LIMIT
Microbiological Parameters									
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 Parameters (Health Related)									
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 Parameters with Aesthetic Objectives/ Operational Guidelines									
Alkalinity	mg/L	258	258	254	255	252	253	OG	500
Chloride	mg/L	50	51	56	55	52	52	AO	250
Colour	TCU	<2	2	<2	2	<2	<2	AO	5
DOC	mg/L	N/A	1.3	1.2	1.2	1.2	1.2	AO	5
H_2S	mg/L	<0.01	<0.01	0.02	0.02	0.01	<0.01	AO	0.05
pH		7.97	7.95	7.93	7.94	7.96	7.98	AO	6.5-8.5
Sulphate	mg/L	46	46	47	47	54	53	AO	500
Hardness	mg/L	*292*	*308*	*288*	*297*	*287*	*287*	OG	100
Sodium	mg/L	26	29	*29*	*29*	*29*	*30*	AO	20(200)
Iron	mg/L	*0.99*	*0.81*	*0.58*	*0.59*	*0.58*	*0.4*	AO	0.3
Manganese	mg/L	0.02	0.02	0.01	0.01	0.01	<0.01	AO	0.05
TDS	mg/L	456	458	469	467	445	444	AO	500
Turbidity Laboratory	NTU	*52.3*	*27.6*	16.7	17.2	13.2	5.1	AO/MAC	5/1

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

PARAMETER	UNITS	TW1		TW2		TW3	
		3 HR (771127)	6 HR (771144)	3 HR (777415)	6 HR (777416)	3 HR (783870)	6 HR (783871)
General Chemical Parameters							
Conductivity	uS/cm	702	705	722	718	685	683
$N\text{-}NH_3$ (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

TABLE 6: SUMMARY OF HEALTH AND AESTHETIC/OPERATIONAL PARAMETERS FOR THE MARCH FORMATION WATER SUPPLY AQUIFER AS DEFINED BY TW4 & TW5

Parameter	Units	TW4		TW5		ODWS	
		3 HR (906783)	9 HR (906784)	3 HR (777415)	6 HR (777416)	TYPE	LIMIT
Microbiological Parameters							
E.coli	ct/100 mL	0	0	0	0	MAC	0
Total Coliforms	ct/100 mL	0	2	0	0	MAC	0
Chemical Parameters (Health Related)							
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 Parameters with Aesthetic Objectives/ Operational Guidelines							
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_2S	mg/L	<0.01	<0.01	<0.01	<0.01	AO	0.05
pH		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	*304*	*302*	*285*	*306*	OG	100
Sodium	mg/L	24	24	*26*	*27*	AO	20(200)
Iron	mg/L	*0.32*	*0.32*	*0.66*	*0.54*	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

TABLE 7: SUMMARY OF GENERAL CHEMISTRY PARAMETERS FOR MARCH FORMATION WATER SUPPLY AQUIFER AS DEFINED BY TW4 & TW5

PARAMETER	UNITS	TW4		TW5	
		3 HR (771127)	6 HR (771144)	3 HR (777415)	6 HR (777416)
General Chemical Parameters					
Conductivity	uS/cm	687	686	691	680
$N\text{-}NH_3$ (Ammonia)	mg/L	0.04	0.05	<0.02	<0.02
Phenols	mg/L	<0.001	<0.001	<0.001	<0.001
Tannin & Lignin	mg/L	<0.1	<0.1	<0.1	<0.1
Total Kjeldahl Nitrogen	mg/L	<0.10	<0.10	<0.10	0.12
Ion Balance	Unitless	0.95	0.95	0.91	0.96
Calcium	mg/L	79	78	73	78
Magnesium	mg/L	26	26	25	27
Potassium	mg/L	3	3	3	3

TABLE 8: SUMMARY OF HEALTH AND AESTHETIC/OPERATIONAL PARAMETERS FOR THE OXFORD FORMATION AS DEFINED BY EW

Parameter	Units	EW		ODWS	
		3 HR (773876)	9 HR (773877)	TYPE	LIMIT
Microbiological Parameters					
E.coli	ct/100 mL	0	0	MAC	0
Total Coliforms	ct/100 mL	0	0	MAC	0
Chemical Parameters (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 Parameters with Aesthetic Objectives/ Operational 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_2S	mg/L	<0.01	<0.01	AO	0.05
pH		8.12	8.16	AO	6.5-8.5
Sulphate	mg/L	49	49	AO	500
Hardness	mg/L	*290*	*283*	OG	100
Sodium	mg/L	34	34	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

TABLE 9: SUMMARY OF GENERAL CHEMISTRY PARAMETERS FOR OXFORD FORMATION WATER SUPPLY AQUIFER AS DEFINED BY EW

PARAMETER	UNITS	EW	
		3 HR (773876)	9 HR (773877)
General Chemical Parameters			
Conductivity	uS/cm	702	702
$N\text{-}NH_3$ (Ammonia)	mg/L	0.09	0.08
Phenols	mg/L	<0.001	<0.001
Tannin & Lignin	mg/L	<0.1	<0.1
Total Kjeldahl Nitrogen	mg/L	0.11	<0.10
Ion Balance	Unitless	0.97	0.95
Calcium	mg/L	70	69
Magnesium	mg/L	28	27
Potassium	mg/L	5	5

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	<2			
1,1-trichloroethane	ug/L	2	<2			
1,2,2-tetrachloroethane	ug/L	2	<2			
1,2-trichloroethane	ug/L	2	<2			
1-dichloroethane	ug/L	2	<2			
2-dibromoethane	ug/L	4	<4.0			
2-dichloropropane	ug/L	2	<2			
3,5-trimethylbenzene	ug/L	1	<1			
3-dichlorobenzene	ug/L	2	<2			
romomethane	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			
thylbenzene	ug/L	2	<2	AO	2.4	ug/L
tyrene	ug/L	2	<2			
1,2-Dichloroethylene	ug/L	2	<2			
1,3-Dichloropropylene	ug/L	0.8	<0.8			
oluene	ug/L	2	<2	AO	24	ug/L
richlorofluoromethane	ug/L	2	<2			
1-dichloroethylene	ug/L	2	<2	MAC	14	ug/L
2-dichlorobenzene	ug/L	2	<2	MAC	200	ug/L
2-dichloroethane	ug/L	2	<2	IMAC	5	ug/L
4-dichlorobenzene	ug/L	2	<2	MAC	5	ug/L
enzene	ug/L	2	<2	MAC	5	ug/L
arbon Tetrachloride	ug/L	2	<2	MAC	5	ug/L
ichloromethane	ug/L	16	<16	MAC	50	ug/L
onochlorobenzene	ug/L	0.8	<0.8	MAC	80	ug/L
etrachloroethylene	ug/L	1	<1	MAC	30	ug/L
richloroethylene	ug/L	1	<1	MAC	5	ug/L
inyl Chloride	ug/L	0.8	<0.8	MAC	2	ug/L
romodichloromethane	ug/L	1	<1			
romoform	ug/L	2	<2			
hloroform	ug/L	2	<2			
Dibromochloromethane	ug/L	1	<1			
m/p-xylene	ug/L	4	<4.0			
-xylene	ug/L	2	<2			
OC SURROGATES						
oluene-d8	%		92			
-bromofluorobenzene	%		120			
1,2-dichloroethane-d4	%		92			

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:

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 aquifers, reveals that the raw water meets all of the critical health related parameters of the Ontario Drinking Water Quality Standards (ODWS).

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

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**.**

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.

3. 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.

5. 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

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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 = 93.71m.

FILE NO. PE1623

REMARKS

HOLE NO. BH 1

BORINGS BY CME 45 Power Auger DATE 3 Jul 09

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	93.80		
TOPSOIL 0.10		AU	1						
		SS	2	25	7	1	92.80		
Brown SILTY CLAY		SS	3	58	3	2	91.80		
		SS	4	75	5	3	90.80		
- grey by 3.7m depth		SS	5	100	2	4	89.80		
		SS	6	100	1	5	88.80		
5.18		SS	7	100	1				
End of Borehole									
(Open hole GWL @ 3.7m depth)									

Lower Explosive Limit % scale: 20 40 60 80

Gastech 1314 Rdg. (ppm) scale: 100 200 300 400 500

▲ 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 = 93.71m.

FILE NO. PE1623

REMARKS

HOLE NO. BH 2

BORINGS BY CME 45 Power Auger

DATE 3 Jul 09

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	93.90		
TOPSOIL 0.13		AU	1						
		SS	2	75	3	1	92.90		
Brown SILTY CLAY		SS	3	100	4	2	91.90		
		SS	4	100	3	3	90.90		
- grey by 3.7m depth		SS	5	100	2	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)									

Lower Explosive Limit % scale: 20 40 60 80

Gastech 1314 Rdg. (ppm) scale: 100 200 300 400 500

▲ 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 = 93.71m.

FILE NO. PE1623

REMARKS

HOLE NO. BH 3

BORINGS BY CME 45 Power Auger DATE 3 Jul 09

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	94.00		
TOPSOIL 0.10		AU	1						
		SS	2	50	2	1	93.00		
		SS	3	83	4				
Brown SILTY CLAY		SS	4	100	3	2	92.00		
		SS	5	100	2	3	91.00		
- grey by 3.5m depth		SS	6	100	1	4	90.00		
		SS	7	100	1	5	89.00		
6.10						6	88.00		
End of Borehole									
(Open hole GWL @ 3.7m depth)									

Lower Explosive Limit % scale: 20 40 60 80

Gastech 1314 Rdg. (ppm) scale: 100 200 300 400 500

▲ 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 = 93.71m.

FILE NO. PE1623

REMARKS

HOLE NO. BH 4

BORINGS BY CME 45 Power Auger DATE 3 Jul 09

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	93.80		
TOPSOIL 0.10		AU	1						
		SS	2	33	5	1	92.80		
Brown SILTY CLAY		SS	3	67	4	2	91.80		
		SS	4	100	2				
		SS	5	100	1	3	90.80		▽
- grey by 3.5m deth		SS	6	100	1	4	89.80		
		SS	7	100	1	5	88.80		
5.18 End of Borehole									
(Open hole GWL @ 3.7m depth)									

Lower Explosive Limit % scale: 20 40 60 80

Gastech 1314 Rdg. (ppm) scale: 100 200 300 400 500

▲ 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 = 93.71m.

FILE NO. PE1623

REMARKS

HOLE NO. BH 5

BORINGS BY CME 45 Power Auger DATE 3 Jul 09

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	93.80
TOPSOIL 0.10							
Inferred **SILTY CLAY**						1	92.80
						2	91.80
						3	90.80
						4	89.80
						5	88.80
6.10						6	87.80
End of Borehole							
(GWL @ 1.90m-July 7/09)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone

○ Lower Explosive Limit %

20 40 60 80

Monitoring Well Construction

100 200 300 400 500

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

Geotechnical Investigation
Proposed Residential Developement-King Street
Ottawa, Ontario

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

FILE NO. **PG2022**

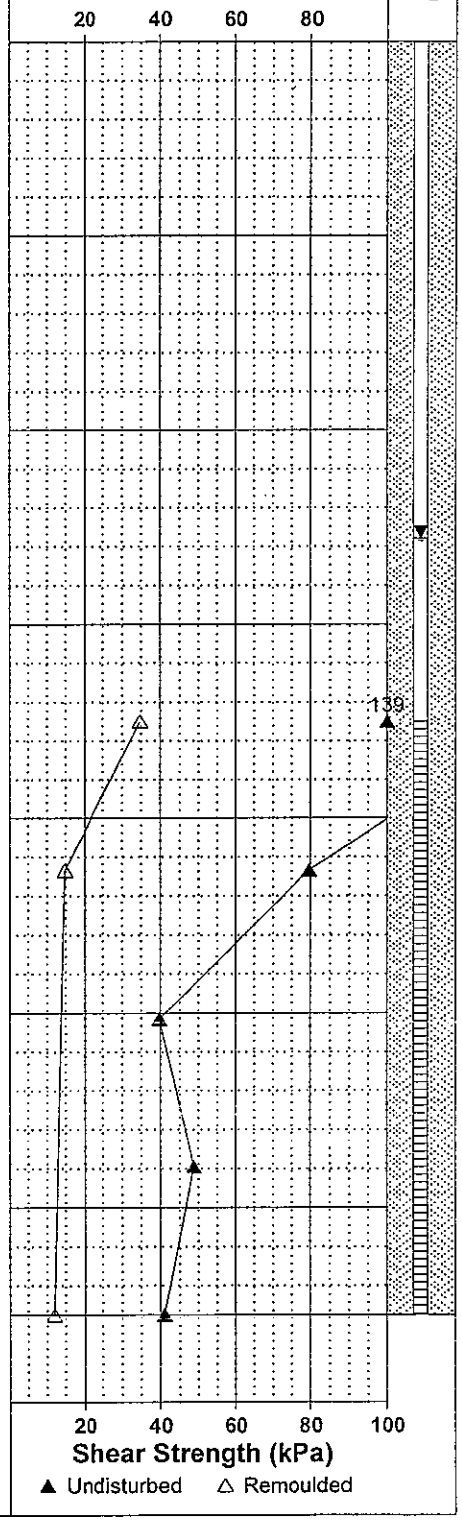
REMARKS

HOLE NO. **BH 1**

BORINGS BY CME 55 Power Auger DATE 29 Jan 10

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	94.02
		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
- stiff to firm and grey by 4.3m depth						4	90.02
						5	89.02
						6	88.02
6.55							
End of Borehole							
(GWL @ 2.56m-Feb. 5/10)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %



Piezometer Construction

patersongroup Consulting Engineers

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

FILE NO. **PG2022**

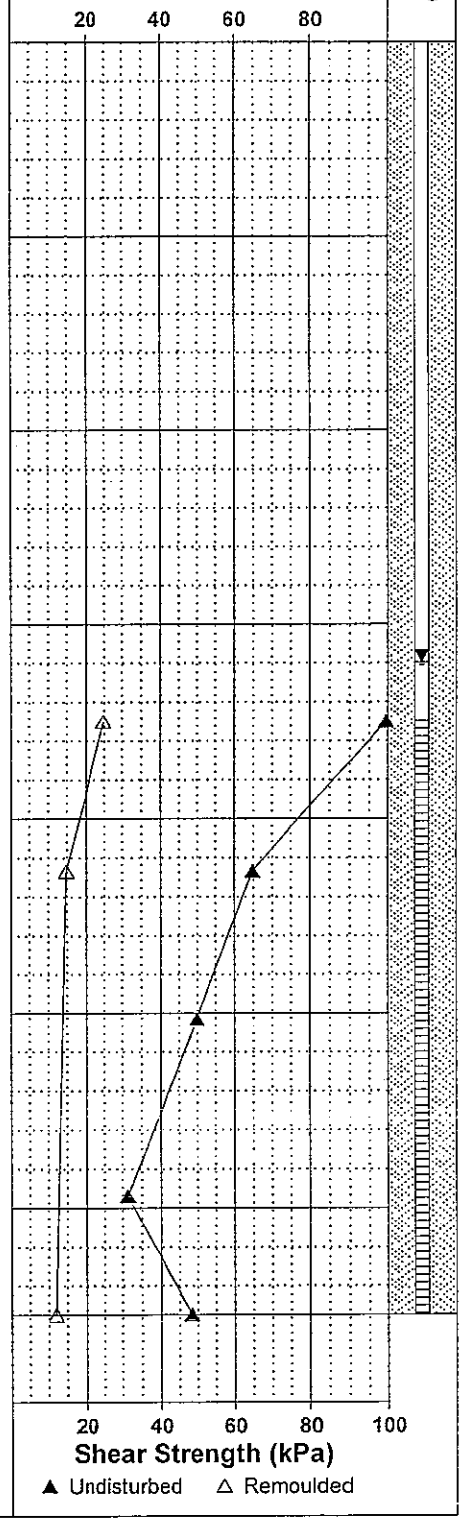
REMARKS

HOLE NO. **BH 2**

BORINGS BY CME 55 Power Auger DATE 29 Jan 10

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	93.94
		AU	1				
		SS	2	4	4	1	92.94
		SS	3	83	3		
Very stiff to stiff, brown **SILTY CLAY**						2	91.94
		SS	4	100	5		
- stiff to firm and grey-brown by 2.9m depth						3	90.94
						4	89.94
- grey by 4.3m depth						5	88.94
						6	87.94
6.55							
End of Borehole							
(GWL @ 3.20m-Feb. 5/10)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %



Piezometer Construction

patersongroup Consulting Engineers

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

FILE NO. **PG2022**

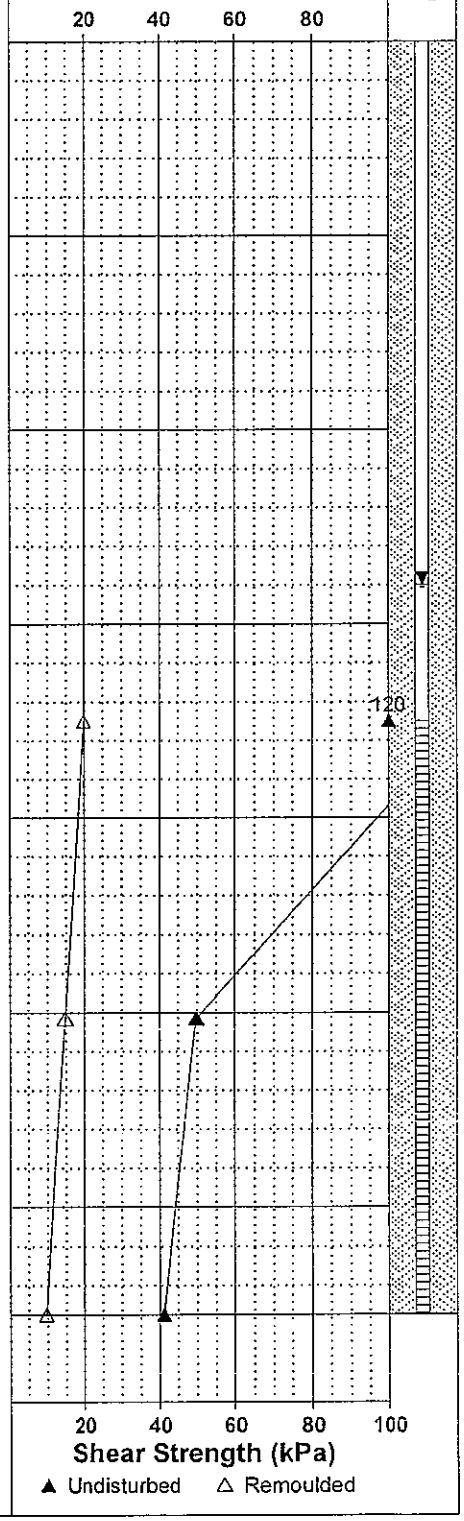
REMARKS

HOLE NO. **BH 3**

BORINGS BY CME 55 Power Auger DATE 29 Jan 10

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	94.07
		AU	1				
		SS	2	21	3	1	93.07
		SS	3	100	3	2	92.07
		SS	4	88	5		
Very stiff to stiff, brown SILTY CLAY						3	91.07
- stiff to firm and grey-brown by 3.5m depth						4	90.07
- grey by 5.0m depth						5	89.07
						6	88.07
6.55							
End of Borehole							
(GWL @ 2.80m-Feb. 5/10)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %



Piezometer Construction

patersongroup Consulting Engineers

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

FILE NO. PG2022

REMARKS

HOLE NO. BH 4

BORINGS BY CME 55 Power Auger DATE 29 Jan 10

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	93.94
		AU	1				
		SS	2	58	5	1	92.94
		SS	3	75	3	2	91.94
Very stiff to stiff, brown SILTY CLAY							
		SS	4	100	4	3	90.94
- stiff to firm and grey-brown by 2.9m depth							
						4	89.94
- grey by 4.4m depth							
						5	88.94
						6	87.94
6.55							
End of Borehole							
(GWL @ 2.90m-Feb. 5/10)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %

20 40 60 80

Piezometer Construction

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
Ottawa, Ontario

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

FILE NO. **PG2022**

REMARKS

HOLE NO. **BH 5**

BORINGS BY CME 55 Power Auger DATE 29 Jan 10

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	93.86
		AU	1				
		SS	2	58	11	1	92.86
		SS	3	71	5	2	91.86
Very stiff to stiff, brown **SILTY CLAY**							
		SS	4	100	4	3	90.86
-stiff to firm and grey by 2.9m depth						4	89.86
						5	88.86
						6	87.86
6.55							
End of Borehole							
(GWL @ 3.60m-Feb. 5/10)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %

20 40 60 80

Piezometer Construction

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	65-85
Very Dense	>50	>85

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

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

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

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

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

ROCK DESCRIPTION

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

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

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

SAMPLE TYPES

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

SYMBOLS AND TERMS (continued)

GRAIN SIZE DISTRIBUTION

MC%	-	Natural moisture content or water content of sample, %
LL	-	Liquid limit, % (water content above which soil behaves as a liquid)
PL	-	Plastic limit, % (water content above which soil behaves plastically)
PI	-	Plasticity index, % (difference between LL and PL)
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 x 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)

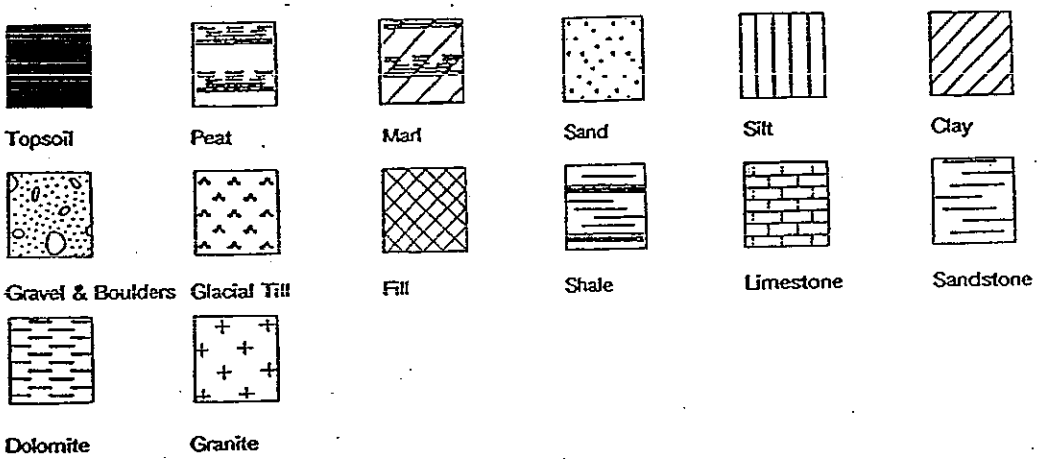
CONSOLIDATION TEST

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

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

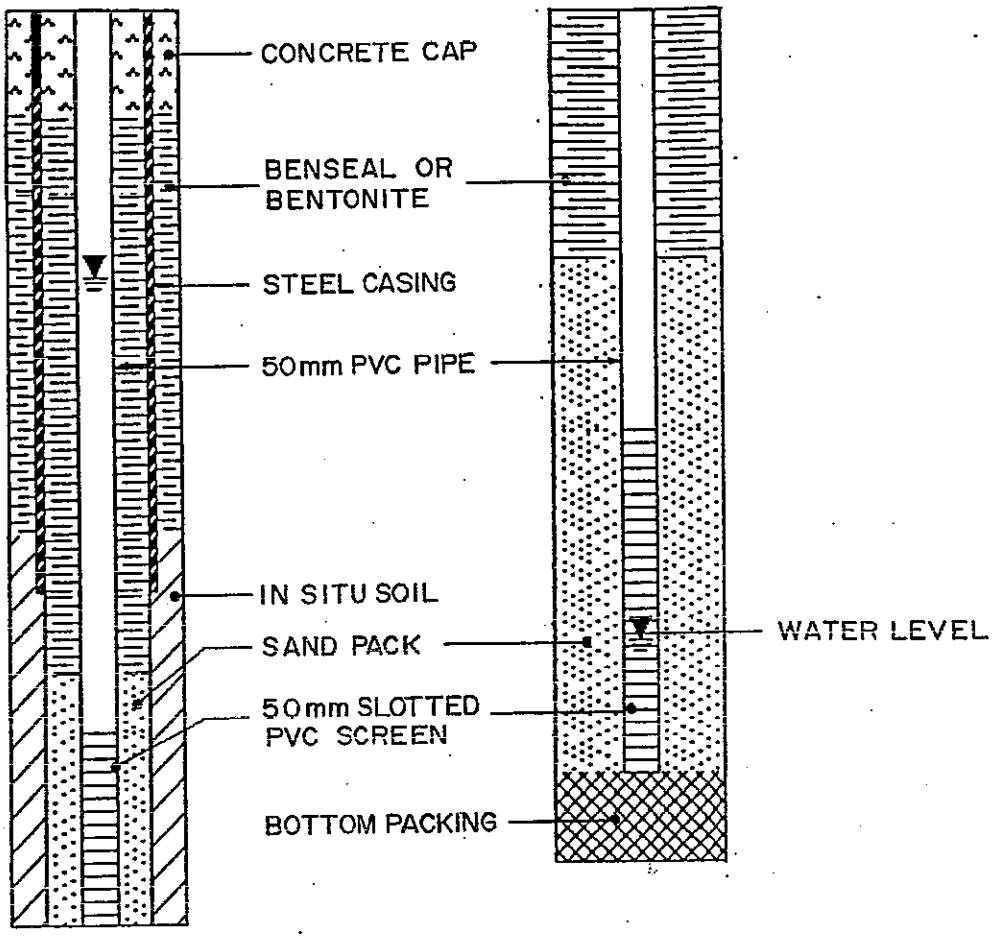
STRATA PLOT



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.

City of Ottawa
Infrastructure Services and Community Sustainability
110 Laurier Avenue West
Ottawa ON K1P 1J1
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 K1P 1J1
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 high).
e. Observation wells in the same formation being tested are to be monitored during pumping.
f. 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.
g. 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
Planner
Planning and Growth Management Department

Attach:

c.c. Kevin Hall
Michel Kearney
Jocelyn Chandler RVCA

Conservation Partners
Partenaires de conservation

Mississippi Valley Conservation
de la vallée Mississippi

OFFICE DE PROTECTION DE LA NATURE DE LA VALLÉE RIDEAU
RIDEAU VALLEY CONSERVATION AUTHORITY

SOUTH NATION CONSERVATION
DE LA NATION SUD

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,

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.

RIDEAU VALLEY CONSERVATION AUTHORITY

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.

b 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.

c 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.

2 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.).

c 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.

3 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.

b 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.

4 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.

5 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

TEST WELL No.1 (TW1)

A093649

Ontario Ministry of the Environment

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Well Tag (Yellow) A093649

Measurements recorded in: ☐ Metric ☒ Imperial

Well Owner's Information

First Name: TALUS | Last Name / Organization: CUSTOM HOMES LTD | Email Address: c/o Paterson Group | ☐ Well Constructed by Well Owner

Mailing Address (Street Number/Name): #1-5509 Canotek Road | Municipality: Ottawa | Province: Ont | Postal Code: K1J 9J8 | Telephone No. (inc. area code)

Well Location

Address of Well Location (Street Number/Name): #10 King Street | Township: Gaulbourn | Lot: see below | Concession: | City/Town/Village: Richmond | Province: Ontario | Postal Code:

County/District/Municipality: Ottawa-Carleton | Municipal Plan and Sublot Number: | Other:

UTM Coordinates: NAD 83 | Zone: 18 | Easting: 434951 | Northing: 5005021

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
	Grey	Clay		0'	25½'
	Grey	limestone		25½'	205'
	Grey	Sandstone + lime stone Mix		205'	242'

*PLAN D-13 Unit 59 / PLAN 4R-5234 Part 1 & 2 *LESS 4R 11108 Part 2 + 4

Paterson File PH1292 Test Well #1

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (L/min)
32'	22'	Neat Cement Slurry	9.36
22'	0'	Neat Bentonite Slurry	8.4

Method of Construction

☐ Cable Tool ☐ Rotary (Conventional) ☐ Rotary (Reverse) ☐ Boring ☒ Air percussion ☐ Other, specify

☐ Diamond ☐ Jetting ☐ Driving ☐ Digging

Well Use

☐ Public ☒ Domestic ☐ Livestock ☐ Irrigation ☐ Industrial ☐ Other, specify

☐ Commercial ☐ Municipal ☐ Test Hole ☐ Cooling & Air Conditioning

☐ Not used ☐ Dewatering ☐ Monitoring

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
6"	Steel	.188"	+2'	32'
5 5/16"	Open hole		32'	242'

Status of Well

☒ Water Supply ☐ Replacement Well ☐ Test Hole ☐ Recharge Well ☐ Dewatering Well ☐ Observation and/or Monitoring Hole ☐ Alteration (Construction) ☐ Abandoned, Insufficient Supply ☐ Abandoned, Poor Water Quality ☐ Abandoned, other, specify ☐ Other, specify

Construction Record - Screen

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

Water Details

Water found at Depth (m/ft)	Kind of Water	Gas	Other, specify
233'	☐ Fresh ☒ Untested	☐	
	☐ Fresh ☐ Untested	☐	
	☐ Fresh ☐ Untested	☐	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0'	32'	6"
32'	242'	5 5/16"

Results of Well Yield Testing

After test of well yield, water was: ☐ Clear and sand free ☐ Other, specify: Sandy

If pumping discontinued, give reason:

Pump intake set at (m/ft): 230'

Pumping rate (l/min / GPM): 20

Duration of pumping: 1 hrs 0 min

Final water level end of pumping (m/ft): 163"

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

Recommended pump depth (m/ft): 140'

Recommended pump rate (l/min / GPM): 20

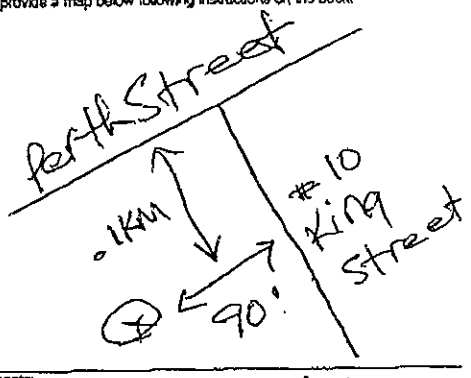
Well production (l/min / GPM): 50

Disinfected? ☐ Yes ☐ No

Time (min)	Draw Down Water Level (m/ft)	Time (min)	Recovery Water Level (m/ft)
Static Level	86"		163"
1	123"	1	117"
2	134"	2	107"
3	141"	3	101"
4	144"	4	97"
5	146"	5	94"
10	15'	10	86"
15	153"	15	
20	156"	20	
25	158"	25	
30	159"	30	
40	161"	40	
50	162"	50	
60	163"	60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments: Test Well #1

Well Contractor and Well Technician Information

Business Name of Well Contractor: Air Rock Drilling Co Ltd | Well Contractor's Licence No.: 1119

Business Address (Street Number/Name): RR#1 | Municipality: Richmond

Province: ONT | Postal Code: K0A 2Z0 | Business E-mail Address:

Bus. Telephone No. (inc. area code): (613) 838-2170 | Name of Well Technician (Last Name, First Name): Graham Ryan

Well Technician's Licence No.: 1384 | Signature of Technician and/or Contractor | Date Submitted

Well owner's information package delivered: ☒ Yes ☐ No | Date Package Delivered: 2010/04/12 | Date Work Completed: 2010/04/11

Ministry Use Only: Audit No. Z108263 | Received

Ministry's Copy

Ontario Ministry of the Environment

Well A089325 (Below)

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Measurements recorded in: ☐ Metric ☒ Imperial

Well A089325

TW2

Well Owner's Information

First Name: | Last Name / Organization: TALOS CUSTOM HOMES LTD | E-mail Address: | ☐ Well Constructed by Well Owner

Mailing Address (Street Number/Name): Unit 1-5509 Canotek Road | Municipality: Ottawa | Province: Ont | Postal Code: K1J 9J8 | Telephone No. (inc. area code):

Well Location

Address of Well Location (Street Number/Name): #10 King Street | Township: Goulbourn | Lot: See below | Concession:

County/District/Municipality: Ottawa-Carleton | City/Town/Village: Richmond | Province: Ontario | Postal Code:

UTM Coordinates: Zone | Easting | Northing | Municipal Plan and Sublot Number | Other:

NAD 83: 18 434567 5005209

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	To
	Grey Clay			0'	30'
	Grey limestone			30'	185'
	Grey & White limestone & Sandstone Mix			185'	229'
	White sandstone			229'	235'

* PLAN D-13 Unit 59 / PLAN 4R5234 Part 1+2
* LESS AR111108 Part 2+4
* PATTERSON FILE PH 1292

TEST WELL #2

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
38'	28'	Neat Cement Slurry	10.92
28'	0'	Neat Bentonite Slurry	12.6

Method of Construction

☐ Cable Tool ☐ Diamond ☐ Rotary (Conventional) ☐ Jetting ☐ Rotary (Reverse) ☐ Driving ☐ Boring ☐ Digging ☒ Air percussion ☐ Other, specify

Well Use

☐ Public ☐ Commercial ☐ Not used ☒ Domestic ☐ Municipal ☐ Dewatering ☐ Livestock ☐ Test Hole ☐ Monitoring ☐ Irrigation ☐ Cooling & Air Conditioning ☐ Industrial ☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
6"	Steel	.188"	+2'	38'
6"	Open Hole		38'	235'

Status of Well

☒ Water Supply ☐ Replacement Well ☐ Test Hole ☐ Recharge Well ☐ Dewatering Well ☐ Observation and/or Monitoring Hole ☐ Alteration (Construction) ☐ Abandoned, Insufficient Supply ☐ Abandoned, Poor Water Quality ☐ Abandoned, other, specify ☐ Other, specify

Construction Record - Screen

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

Water Details

Water found at Depth (m/ft)	Kind of Water	Gas	Other, specify
227'	☐ Fresh ☐ Untested	☐	
229'	☐ Fresh ☒ Untested	☐	
	☐ Fresh ☐ Untested	☐	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0'	235'	6"

Results of Well Yield Testing

After test of well yield, water was: ☒ Clear and sand free ☐ Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft): 200'

Pumping rate (l/min / GPM): 20

Duration of pumping: 1 hr + 0 min

Final water level end of pumping (m/ft): 91'2"

If flowing give rate (l/min / GPM)

Recommended pump depth (m/ft): 190'

Recommended pump rate (l/min / GPM): 20

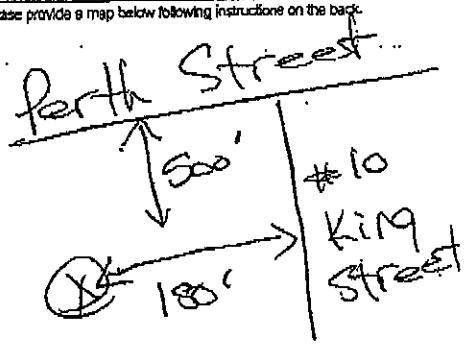
Well production (l/min / GPM): 20+

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
Static Level	61'8"		91'2"
1	71'5"	1	71'1"
2	71'8"	2	61'8"
3	71'9"	3	61'7"
4	81'1"	4	66"
5	81'2"	5	66"
10	81'4"	10	63"
15	81'6"	15	62"
20	81'7"	20	62"
25	81'8"	25	61"
30	81'9"	30	61"
40	81'9"	40	51'9"
50	91'1"	50	51'9"
60	91'2"	60	51'8"

Map of Well Location

Please provide a map below following instructions on the back.



Comments: Test Well #2

Well Contractor and Well Technician Information

Business Name of Well Contractor: A1 Rock Drilling Co Ltd | Well Contractor's Licence No.: 1119

Business Address (Street Number/Name): RR#1 | Municipality: Richmond

Province: ONT | Postal Code: K0A 2Z0 | Business E-mail Address:

Bus. Telephone No. (inc. area code): 613 838 2470 | Name of Well Technician (Last Name, First Name): Fulcher, Shannon

Well Technician's Licence No.: 1012 | Signature of Technician and/or Contractor | Date Submitted

Well owner's information package delivered: ☒ Yes ☐ No | Data Package Delivered: 2010/02/12 | Date Work Completed: 2010/02/11

Ministry Use Only: Audit No. Z 108239 | Received

0506E (12/2007) Ministry's Copy © Queen's Printer for Ontario, 2

TW3

Ontario Ministry of the Environment

Well T: A095979 (Below)

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Measurements recorded in: ☐ Metric ☒ Imperial

Well Owner's Information

First Name | Last Name / Organization | E-mail Address | ☐ Well Constructed by Well Owner

Atlas Custom Homes LTD c/o Paterson Group

Mailing Address (Street Number/Name) | Municipality | Province | Postal Code | Telephone No. (inc. area code)

#1-5509 Canotek Road | Ottawa | Ont | K1J 9G8

Well Location

Address of Well Location (Street Number/Name) | Township | Lot | Concession

#10 King Street | Goulbourn | See BELOW

County/District/Municipality | City/Town/Village | Province | Postal Code

Ottawa-Carleton | Richmond | Ontario

UTM Coordinates | Zone | Easting | Northing | Municipal Plan and Sublot Number | Other

NAD 8 3 | 18 | 434490 | 5005077

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	To
	Gray Clay			0'	33'
	Grey limestone			33'	155'
	Grey + White limestone & Sandstone Mix			155'	195'
	White Sandstone			195'	210'
	Grey + Brown limestone Sandstone Mix			210'	240'

*PLAN D-13 Unit 59/PLAN 4R5234 Part 192
*LESS 4R11108 Part 2&4
*PATERSON FILE PH 1292

TEST WELL #3

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
40'	30'	Neat Cement Slurry	7.8
30'	0'	Neat Bentonite Slurry	16.8

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☒ Air percussion
☐ Other, specify

Well Use

☐ Public ☐ Commercial ☐ Not used
☒ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☐ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
6"	Steel	.188"	+2'	40'
6 1/8"	Open hole		40'	240'

Status of Well

☒ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, specify
☐ Other, specify

Construction Record - Screen

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

Water Details

Water found at Depth (m/ft)	Kind of Water: ☐ Fresh ☒ Untested ☐ Gas ☐ Other, specify
133	
Water found at Depth (m/ft)	Kind of Water: ☐ Fresh ☒ Untested ☐ Gas ☐ Other, specify
216	
Water found at Depth (m/ft)	Kind of Water: ☐ Fresh ☒ Untested ☐ Gas ☐ Other, specify
228	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0'	40'	6"
40'	240'	6 1/8"

Results of Well Yield Testing

After test of well yield, water was: ☒ Clear and sand free ☐ Other, specify

If pumping discontinued, give reason: X

Pump intake set at (m/ft): 230'

Pumping rate (l/min / GPM): 20

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 7'

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

Recommended pump depth (m/ft): 100'

Recommended pump rate (l/min / GPM): 20

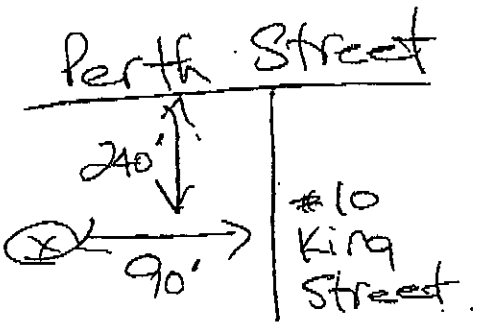
Well production (l/min / GPM): 20

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
Static Level	32"		7'
1	5'3"	1	4'7"
2	5'6"	2	3'2"
3	5'8"	3	
4	5'9"	4	
5	6'	5	
10	6'3"	10	
15	6'5"	15	
20	6'7"	20	
25	6'8"	25	
30	↓	30	
40	6'9"	40	
50	↓	50	
60	7'	60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments: Test Well #3

Well Contractor and Well Technician Information

Business Name of Well Contractor | Well Contractor's Licence No.

Air Rock Drilling Co. LTD | 1117

Business Address (Street Number/Name) | Municipality

Richmond

Province | Postal Code | Business E-mail Address

ONT | K0A2Z0

Bus. Telephone No. (inc. area code) | Name of Well Technician (Last Name, First Name)

6138382176 | Graham Ryan

Well Technician's Licence No. | Signature of Technician and/or Contractor | Date Submitted

13484

Well owner's information package delivered: ☒ Yes ☐ No

Date Package Delivered: 2010 03 10

Date Work Completed: 2010 03 10

Ministry Use Only

Audit No. Z 108297

Received

Ontario — Ministry of the Environment

Measurements recorded in: ☐ Metric ☒ Imperial

A 093641 (Print Below)

A093641

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
	Talos Custom Homes Ltd		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
Unit 1-5509 Canotek Road	Ottawa	ON	K1J 9B8	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
10 King Street	Goulbourn	SEE	BELOW

County/District/Municipality	City/Town/Village	Province	Postal Code
Ottawa-Carleton	Richmond	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	434437	5004993	4R5234	Part 1&2

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
	Clay	& Gravel		0	29
Grey	Limestone			29	175
Grey & White	Sandstone			175	223
Grey White	Sandstone			223	225

Plan 2R-13 - Unit 59 - Plan 4R5234 Part 1+2 Less A R11108 Part 2+4

Test Well #4

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
185	175	Neat cement slurry	7.8
175	0	Bentonite slurry	50.4

Method of Construction

☐ Cable Tool ☐ Rotary (Conventional) ☐ Rotary (Reverse) ☐ Boring ☒ Air percussion ☐ Other, specify

☐ Diamond ☐ Jetting ☐ Driving ☐ Digging

Well Use

☐ Public ☒ Domestic ☐ Livestock ☐ Irrigation ☐ Industrial ☐ Other, specify

☐ Commercial ☐ Municipal ☐ Test Hole ☐ Cooling & Air Conditioning

☐ Not used ☐ Dewatering ☐ Monitoring

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
6"	Steel	.188"	+0	185
5⅞"	Open Hole		185	225

Status of Well

☒ Water Supply ☐ Replacement Well ☐ Test Hole ☐ Recharge Well ☐ Dewatering Well ☐ Observation and/or Monitoring Hole ☐ Alteration (Construction) ☐ Abandoned, Insufficient Supply ☐ Abandoned, Poor Water Quality ☐ Abandoned, other, specify TW#4 ☐ Other, specify

Construction Record - Screen

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

Water Details

Water found at Depth (m/ft)	Gas	Kind of Water	Other, specify
223	☐	☐ Fresh ☒ Untested	
	☐	☐ Fresh ☐ Untested	
	☐	☐ Fresh ☐ Untested	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	185	6"
185	225	5⅞"

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Air Rock Drilling Co. Ltd.	1119

Business Address (Street Number/Name)	Municipality
6659 Franktown Road, RR#1	Richmond

Province	Postal Code	Business E-mail Address
ON	K0A 2Z0	air-rock@sympatico.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
6138382170	Purcell, Shannon

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted (Y Y Y Y M M D D)
T2122		2011 08 31

Results of Well Yield Testing

After test of well yield, water was: ☐ Clear and sand free ☐ Other, specify Not tested

If pumping discontinued, give reason: X

Pump intake set at (m/ft): 200

Pumping rate (l/min / GPM): 20

Duration of pumping: 1 hrs + 0 min.

Final water level end of pumping (m/ft): 9

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

Recommended pump depth (m/ft): 100

Recommended pump rate (l/min / GPM): 20

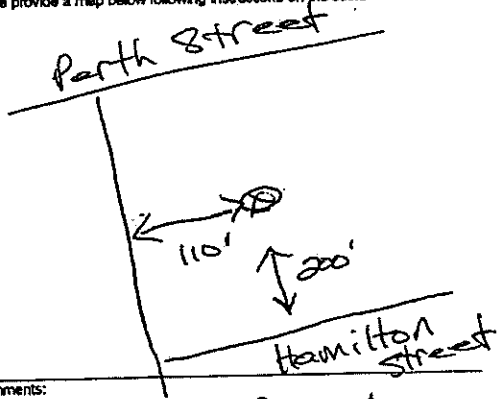
Well production (l/min / GPM): 20

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	7.1		9
1	8.2	1	7.1
2	8.2	2	7.1
3	8.3	3	7.1
4	8.4	4	7.1
5	8.4	5	7.1
10	8.5	10	7.1
15	8.6	15	7.1
20	8.7	20	7.1
25	8.8	25	7.1
30	8.8	30	7.1
40	8.9	40	7.1
50	8.9	50	7.1
60	9	60	7.1

Map of Well Location

Please provide a map below following instructions on the back.



Comments: Test Well #4

Well owner's information package delivered	Date Package Delivered (Y Y Y Y M M D D)	Date Work Completed (Y Y Y Y M M D D)
☒ Yes ☐ No	2011 08 23	2011 08 22

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Date Received

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Well A093639 (see Below)

A093639

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Measurements recorded in: ☐ Metric ☒ Imperial

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
	Talos Custom Homes Ltd		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
Unit 1-5509 Canotek Road	Ottawa	ON	K1J 9B8	

Well Location

Address of Well Location (Street Number/Name)	Township	Concession
10 King Street	Goulbourn	Lot SEE BELOW.

County/District/Municipality	City/Town/Village	Province	Postal Code
Ottawa-Carleton	Richmond	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	434515	5005061	4R5234	Part 1&2

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Grey	Clay			0	26
	Gravel			26	28
Grey	Limestone			28	176
Grey & White	Sandstone	Mix		176	208
Grey & White	Sandstone	Mix		208	216

Plan R13 - Unit 59 - Plan 4R5234 Part 1+2 Less 4R11108 Part 2+4

Test Well #5

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
187	177	Neat cement slurry	9.36
177	0	Bentonite slurry	50.4

Method of Construction

☐ Cable Tool ☐ Diamond ☐ Rotary (Conventional) ☐ Jetting ☐ Rotary (Reverse) ☐ Driving ☐ Boring ☐ Digging ☒ Air percussion ☐ Other, specify

Well Use

☐ Public ☐ Commercial ☐ Not used ☒ Domestic ☐ Municipal ☐ Dewatering ☐ Livestock ☐ Test Hole ☐ Monitoring ☐ Irrigation ☐ Cooling & Air Conditioning ☐ Industrial ☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
6"	Steel	.188"	+2	187
6"	Open Hole		187	216

Status of Well

☒ Water Supply ☐ Replacement Well ☐ Test Hole ☐ Recharge Well ☐ Dewatering Well ☐ Observation and/or Monitoring Hole ☐ Alteration (Construction) ☐ Abandoned, Insufficient Supply ☐ Abandoned, Poor Water Quality ☐ Abandoned, other, specify ☐ Other, specify

Construction Record - Screen

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

Water Details

Water found at Depth (m/ft)	Kind of Water	Gas	Other, specify
208	☐ Fresh ☒ Untested	☐	
Water found at Depth (m/ft)	Kind of Water: ☐ Fresh ☐ Untested	☐ Gas	☐ Other, specify
Water found at Depth (m/ft)	Kind of Water: ☐ Fresh ☐ Untested	☐ Gas	☐ Other, specify

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	187	6"
187	216	6"

Results of Well Yield Testing

After test of well yield, water was: ☐ Clear and sand free ☐ Other, specify Not tested

If pumping discontinued, give reason: X

Pump intake set at (m/ft): 210

Pumping rate (l/min / GPM): 20

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 32.3

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

Recommended pump depth (m/ft): 100

Recommended pump rate (l/min / GPM): 20

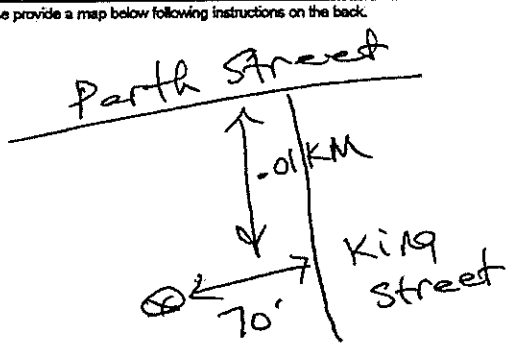
Well production (l/min / GPM): 20

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
Static Level	7.2		32.3
1	16.1	1	16.3
2	21.5	2	7.2
3	23.7	3	7.2
4	26.4	4	7.2
5	27	5	7.2
10	30.1	10	7.2
15	30.5	15	7.2
20	30.9	20	7.2
25	31.2	25	7.2
30	31.6	30	7.2
40	31.9	40	7.2
50	32.1	50	7.2
60	32.3	60	7.2

Map of Well Location

Please provide a map below following instructions on the back.



Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Air Rock Drilling Co. Ltd.	1119

Business Address (Street Number/Name)	Municipality
6659 Franktown Road, RR#1	Richmond

Province	Postal Code	Business E-mail Address
ON	K0A 2Z0	air-rock@sympatico.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
6138382170	Graham, Ryan

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted Y Y Y Y M M D D
T3484		2011 08 31

Comments: Test Well #5

Well owner's information package delivered	Date Package Delivered Y Y Y Y M M D D	Date Work Completed Y Y Y Y M M D D
☒ Yes ☐ No	2011 08 26	2011 08 23

Audit No. Z1128613

Received

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Ontario

The Ontario Water Resources Act

WATER WELL RECORD

County or District	Township, Borough, City, Town, Village	Con., Block, Tract, Survey, etc.	Lot
Carleton	Richmond	[illegible]	10

Owner	Address	Date Completed
[illegible] Jack	Main St Prospect Ont	22 12 82

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General Colour	Most Common Material	Other Materials	General Description	Depth - Feet From	To
grey	Clay			0	30
grey	[illegible]			30	45

WATER RECORD

Water Found at - Feet	Kind of Water
37	Fresh

CASING & OPEN HOLE RECORD

Inside Diam. Inches	Material	Wall Thickness Inches	Depth - Feet From	To
6¼	Steel	.188	0	34
6	Open hole		34	45

PLUGGING & SEALING RECORD

Depth Set at - Feet From	To	Material and Type
0	33	Cement [illegible] grouted

PUMPING TEST

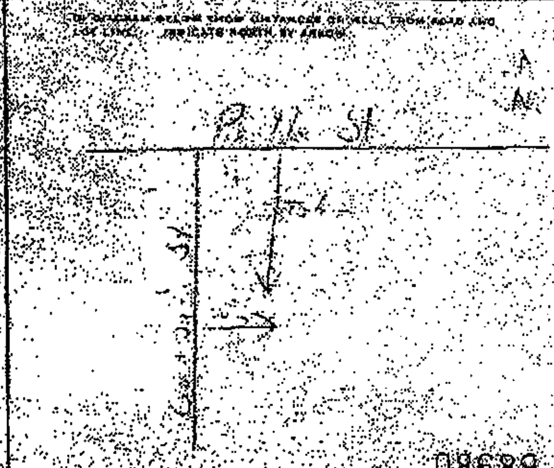
Pumping Test Method	Pumping Rate	Duration of Pumping
Pump	30	1 [illegible]

Static Level	Water Level End of Pumping	15 minutes	30 minutes	45 minutes	60 minutes
6	25	25	25	25	25

Recommended pump type: Shallow. Recommended pump setting: 35. Recommended pumping rate: 10.

LOCATION OF WELL

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



08689

FINAL STATUS OF WELL: Water supply

WATER USE: Domestic

METHOD OF DRILLING: Air percussion

CONTRACTOR

Name of Well Contractor	Licence Number
M. [illegible] Well Drilling	3644

Address: Box 520 Richmond Ont

Name of Driller or Boring: [illegible]

Signature of Contractor: [signature] — Submission Date: 22 12 82

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OWNER'S COPY

Ontario Ministry of the Environment

Well T. A095979 (Below)

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Measurements recorded in: ☐ Metric ☒ Imperial

A095979

Well Owner's Information

First Name: ATLAS CUSTOM HOMES LTD | Last Name / Organization: c/o Paterson Group | E-mail Address: | ☐ Well Constructed by Well Owner

Mailing Address (Street Number/Name): #1-5509 Canotek Road | Municipality: Ottawa | Province: Ont | Postal Code: K1J 9J3 | Telephone No. (inc. area code):

Well Location

Address of Well Location (Street Number/Name): #10 King Street | Township: Goulbourn | Lot: | Concession: SEE BELOW

County/District/Municipality: Ottawa-Carleton | City/Town/Village: Richmond | Province: Ontario | Postal Code:

UTM Coordinates NAD 83: Zone 18 | Easting 434490 | Northing 5005077 | Municipal Plan and Sublot Number: | Other:

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	To
	Gray Clay			0'	33'
	Gray limestone			33'	155'
	Gray & White limestone & Sandstone Mix			155'	195'
	White Sandstone			195'	210'
	Gray & Brown limestone Sandstone Mix			210'	240'

* PLAN D-13 Unit 59 / PLAN 4R5234 Part 1 & 2
* LESS 4R11108 Part 2 & 4
* PATERSON FILE PH 1292

TEST WELL #3

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
40'	30'	Neat Cement Slurry	7.8
30'	0'	Neat Bentonite Slurry	16.8

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☒ Air percussion
☐ Other, specify

Well Use

☐ Public ☐ Commercial ☐ Not used
☒ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☐ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
6"	Steel	.188"	+2'	40'
6 1/8"	Open hole		40'	240'

Construction Record - Screen

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

Status of Well

☒ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, specify
☐ Other, specify

Water Details

Water found at Depth (m/ft)	Kind of Water	Gas	Other, specify
133	☐ Fresh ☒ Untested	☐	
216	☐ Fresh ☒ Untested	☐	
228	☐ Fresh ☒ Untested	☐	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0'	40'	6"
40'	240'	6 1/8"

Results of Well Yield Testing

After test of well yield, water was: ☐ Clear and sand free ☐ Other, specify TESTED

If pumping discontinued, give reason: X

Pump intake set at (m/ft): 230'

Pumping rate (l/min / GPM): 20

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 7'

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

Recommended pump depth (m/ft): 100'

Recommended pump rate (l/min / GPM): 20

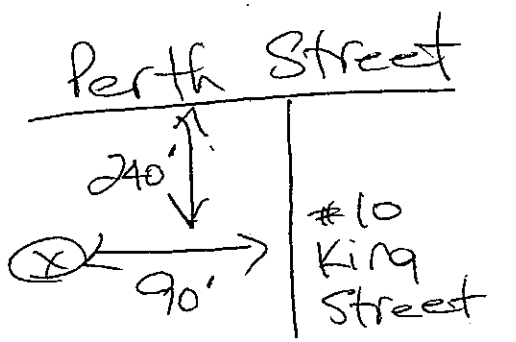
Well production (l/min / GPM): 20

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
Static Level	3'2"		7'
1	5'3"	1	4'7"
2	5'6"	2	3'2"
3	5'8"	3	
4	5'9"	4	
5	6'	5	
10	6'3"	10	
15	6'5"	15	
20	6'7"	20	
25	6'8"	25	
30	↓	30	
40	6'9"	40	
50	↓	50	
60	7'	60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments: Test Well #3

Well Contractor and Well Technician Information

Business Name of Well Contractor: AIR ROCK DRILLING Co. LTD | Well Contractor's Licence No.: 1117

Business Address (Street Number/Name): RR#1 | Municipality: RICHMOND

Province: ONT | Postal Code: K0A2Z0 | Business E-mail Address:

Bus. Telephone No. (inc. area code): (613) 838-2176 | Name of Well Technician (Last Name, First Name): GRAHAM RYAN

Well Technician's Licence No.: 13484 | Signature of Technician and/or Contractor: | Date Submitted: Y Y Y Y M M D D

Well owner's information package delivered: ☒ Yes ☐ No

Date Package Delivered: 2010 03 16

Date Work Completed: 2010 03 10

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Received

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YP

316/4f. 7A"

UTM 18 Z 413414 E 5 R 5101416 N

Elev. 4 R 01315

Basin 25

GROUND WATER BRANCH
15 No
MAY 22 1962
ONTARIO WATER RESOURCES COMMISSION

9259 C

X

The Ontario Water Resources Commission Act

WATER WELL RECORD

County or District Carleton Township, Village, ~~Town or City~~ Richmond

Con. 3 Lot — Date completed 24th (day) April (month) 1962 (year)

Owner [redacted] Address Richmond Ont.

Casing and Screen Record

Inside diameter of casing 6¼"

Total length of casing 34'

Type of screen

Length of screen

Depth to top of screen

Diameter of finished hole 6¼"

Pumping Test

Static level 10'

Test-pumping rate 10 G.P.M.

Pumping level 70 ft.

Duration of test pumping 30 min

Water clear or cloudy at end of test clear.

Recommended pumping rate 5' G.P.M.

with pump setting of 100 feet below ground surface

Well Log

Overburden and Bedrock Record	From ft.	To ft.	Water Record: Depth(s) at which water(s) found	Water Record: Kind of water (fresh, salty, sulphur)
clay.	0	31		
limestone rock.	31	122	114	fresh

For what purpose(s) is the water to be used? house

Is well on upland, in valley, or on hillside? upland

Drilling or Boring Firm Mel McLaughlin

Address Carleton Ont.

Licence Number 393

Name of Driller or Borer Melville McLaughlin

Address Carleton Ont.

Date May 19 1962

Melville McLaughlin
(Signature of Licensed Drilling or Boring Contractor)

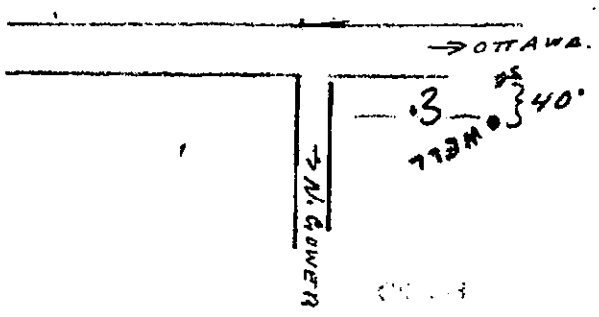
Form 7 15M Sets 60-5930

OWRC COPY

Location of Well

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

N



(N 4830) 31G/4f. "A"

UTM 1 18 Z 4 3 4 4 8 0 E
5 R 5 0 0 4 9 8 0 N

Elev. 4 R 0 3 0 1 5

Basin 2 15

The Ontario Water Resources Commission Act

WATER WELL RECORD

WATER RESOURCES DIVISION
DEC 15 1966 9301
ONTARIO WATER RESOURCES COMMISSION

County or District Carl

Township, Village, Town or City Richmond

Con. Lot

Date completed 10 (day) Sept (month) 1966 (year)

Owner [redacted] Address 40 Sherry Lane Ottawa Ont

Casing and Screen Record

Inside diameter of casing 5"

Total length of casing 37

Type of screen

Length of screen

Depth to top of screen

Diameter of finished hole 5"

Pumping Test

Static level 10'

Test-pumping rate 10 G.P.M.

Pumping level 24'

Duration of test pumping 1 hr

Water clear or cloudy at end of test clear

Recommended pumping rate 5 G.P.M.

with pump setting of 50 feet below ground surface

Well Log

Overburden and Bedrock Record	From ft.	To ft.	Water Record: Depth(s) at which water(s) found	Water Record: Kind of water (fresh, salty, sulphur)
clay	0	30	68	fresh
sand & boulders	30	32		
limestone	32	70		

For what purpose(s) is the water to be used?
new house

Is well on upland, in valley, or on hillside? upland

Drilling or Boring Firm Capital Water Supplies

Address 14 Ashford Dr. Ottawa 828-1764

Licence Number 2158

Name of Driller or Borer H. Manns

Address

Date 10 Sept 1966

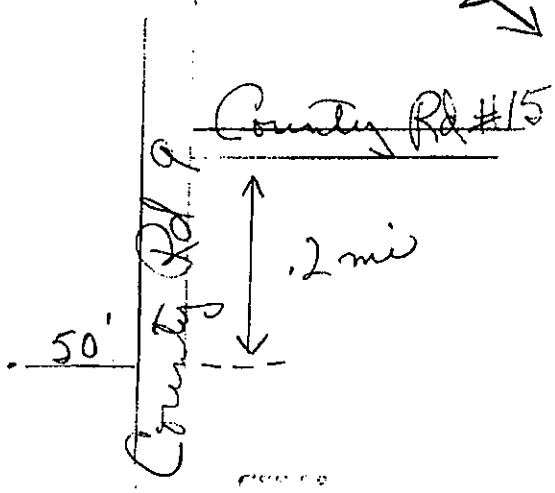
Walter Kavanagh
(Signature of Licensed Drilling or Boring Contractor)

Form 7 15M-60-4138

OWRC COPY

Location of Well

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



The Ontario Water Resources Commission Act

WATER WELL RECORD

Water management in Ontario

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 | 1510339 | MUNICIP 1570 | CON.

COUNTY OR DISTRICT: Carl | TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: Richmond | CON., BLOCK, TRACT, SURVEY, ETC. | LOT

ADDRESS: [redacted] Richmond Ont. | DATE COMPLETED: DAY 15 MO. 08 YR. 69

210 | UTM ZONE 18 | EASTING 434500 | NORTHING 4904880 | RC | ELEVATION 913013 | RC | BASIN CODE 215

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH – FEET FROM	DEPTH – FEET TO
brown	clay	boulders	hard	0	27
blue	lime		hard	27	43
grey	lime		soft	43	56

31 | 0027 | 0043 | 0056

32

41 WATER RECORD

WATER FOUND AT – FEET	KIND OF WATER
0055	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH – FEET FROM	DEPTH – FEET TO
05	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	188	0	0030
4½			30	56
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE			0056
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET
MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN FEET	

61 PLUGGING & SEALING RECORD

DEPTH SET AT – FEET FROM	DEPTH SET AT – FEET TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☒ BAILER | PUMPING RATE: 0010 GPM. | DURATION OF PUMPING: 01 HOURS 00 MINS.

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING: 15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
011 FEET	013 FEET	FEET	FEET	FEET	FEET

WATER LEVELS DURING: 1 ☐ PUMPING 2 ☐ RECOVERY

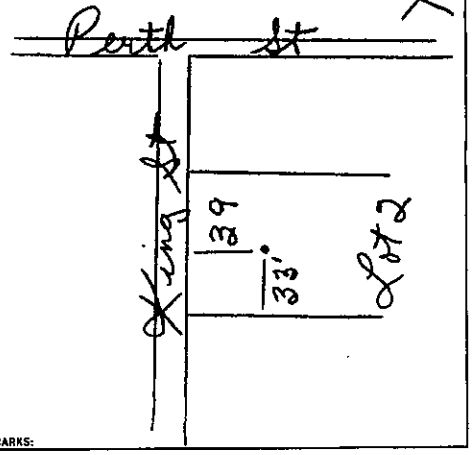
IF FLOWING, GIVE RATE: GPM. | PUMP INTAKE SET AT: FEET | WATER AT END OF TEST: 1 ☐ CLEAR 2 ☒ CLOUDY

RECOMMENDED PUMP TYPE: ☒ SHALLOW ☐ DEEP | RECOMMENDED PUMP SETTING: 030 FEET | RECOMMENDED PUMPING RATE: 0005 GPM.

0005.0 GPM./FT. SPECIFIC CAPACITY

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS:

FINAL STATUS OF WELL (54): 1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED

WATER USE (55-56) 01: 1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED

METHOD OF DRILLING (57): 1 ☒ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: Capital Water Supply Ltd | LICENCE NUMBER: 3216

ADDRESS: 14 Ashford Dr Ottawa

NAME OF DRILLER OR BORER: B Ares | LICENCE NUMBER:

SIGNATURE OF CONTRACTOR: Walter Kavanagh | SUBMISSION DATE: DAY MO. YR.

OFFICE USE ONLY

DATA SOURCE: 1 | CONTRACTOR: 1503 | DATE RECEIVED: 281169

DATE OF INSPECTION | INSPECTOR

REMARKS:

OWRC COPY

3648.

The Ontario Water Resources Commission Act

WATER WELL RECORD

Water management in Ontario

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 | 1511082 | MUNICIP. 1.5701 | CON.

COUNTY OR DISTRICT: Carleton | TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: Richmond | CON., BLOCK, TRACT, SURVEY, ETC.: Perth St | LOT

ADDRESS: [redacted] Richmond Ont. | DATE COMPLETED: DAY 27 MO [illegible] YR. 70

21 | LOT: 18 | 43 | 48 | 12 | NORTHING: 5 | 0 | 0 | 4 | 9 | 9 | 0 | RC: 4 | ELEVATION: 0 | 3 | 0 | 4 | RC: 4 | BASIN CODE: 2 | 3 | T

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH – FEET FROM	TO
grey	clay			0	28
grey	limestone			28	58

31 | 0028 | 0058

32

41 WATER RECORD

WATER FOUND AT – FEET	KIND OF WATER
0058	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH – FEET FROM	TO
05	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	.188	0	0031 31
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE			0058
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET

MATERIAL AND TYPE | DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT – FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☒ BAILER | PUMPING RATE: 0014 GPM | DURATION OF PUMPING: 01 HOURS 00 MINS.

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING: 1 ☐ PUMPING 2 ☒ RECOVERY	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
004 FEET	020 FEET		004 FEET	004 FEET	004 FEET	004 FEET

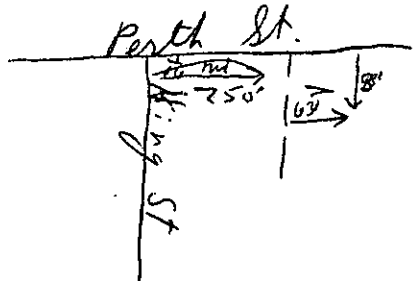
IF FLOWING, GIVE RATE: GPM | PUMP INTAKE SET AT: FEET | WATER AT END OF TEST: 1 ☐ CLEAR 2 ☒ CLOUDY

RECOMMENDED PUMP TYPE: ☒ SHALLOW ☐ DEEP | RECOMMENDED PUMP SETTING: 020 FEET | RECOMMENDED PUMPING RATE: 0005 GPM

000.2 GPM./FT. SPECIFIC CAPACITY

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS:

FINAL STATUS OF WELL
1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED

WATER USE 01
1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED

METHOD OF DRILLING
1 ☒ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: Henry Mains Well Drilling | LICENCE NUMBER: 3644
ADDRESS: Box 326, Richmond Ont.
NAME OF DRILLER OR BORER: Barry Acres | LICENCE NUMBER:
SIGNATURE OF CONTRACTOR: Henry Mains | SUBMISSION DATE: DAY 14 MO Mar YR. 70

OFFICE USE ONLY

DATA SOURCE: 1 | CONTRACTOR: 3644 | DATE RECEIVED: 070371
DATE OF INSPECTION: | INSPECTOR: Km
REMARKS: P Km. WI

OWRC COPY

MINISTRY OF THE ENVIRONMENT

The Ontario Water Resources Act.

WATER WELL RECORD

Ontario

3164F

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 | 1515154 | 8 | 15701 | CON.

COUNTY OR DISTRICT: Carleton

TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: Richmond

CON., BLOCK, TRACT, SURVEY, ETC.: ~~Con 8~~ St. III

LOT:

[redacted]

ADDRESS: Richmond Ont.

DATE COMPLETED: DA 08 MO 09 YR 75

NORTHING | RC | ELEVATION | AC | BASIN CODE

1515154 18 434527 5005024 4 306 4 26 JUN 28, 1977 300

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
grey	clay			0	30
grey	limestone			30	55

31 00302105 00552105

32

41 WATER RECORD

WATER FOUND AT FEET	KIND OF WATER			
55	1 ☑ FRESH	2 ☐ SALTY	3 ☐ SULPHUR	4 ☐ MINERAL
	1 ☐ FRESH	2 ☐ SALTY	3 ☐ SULPHUR	4 ☐ MINERAL
	1 ☐ FRESH	2 ☐ SALTY	3 ☐ SULPHUR	4 ☐ MINERAL
	1 ☐ FRESH	2 ☐ SALTY	3 ☐ SULPHUR	4 ☐ MINERAL
	1 ☐ FRESH	2 ☐ SALTY	3 ☐ SULPHUR	4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

CASING DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
06	1 ☑ STEEL, 2 ☐ GALVANIZED, 3 ☐ CONCRETE, 4 ☐ OPEN HOLE	188	0	0032 30
	1 ☐ STEEL, 2 ☐ GALVANIZED, 3 ☐ CONCRETE, 4 ☐ OPEN HOLE			
	1 ☐ STEEL, 2 ☐ GALVANIZED, 3 ☐ CONCRETE, 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET

MATERIAL AND TYPE | DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
10-13	14-17	
18-21	22-25	
26-29	30-33	

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☑ PUMP 2 ☐ BAILER

PUMPING RATE: 0006 GPM

DURATION OF PUMPING: 01 HOURS 00 MINS

WATER LEVELS DURING: ☒ 1 PUMPING ☐ 2 RECOVERY

STATIC LEVEL	WATER LEVEL END OF PUMPING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
009 FEET	030 FEET	030 FEET	030 FEET	030 FEET	030 FEET

IF FLOWING, GIVE RATE: GPM

PUMP INTAKE SET AT: FEET

WATER AT END OF TEST: 1 ☐ CLEAR 2 ☑ CLOUDY

RECOMMENDED PUMP TYPE: ☑ SHALLOW ☐ DEEP

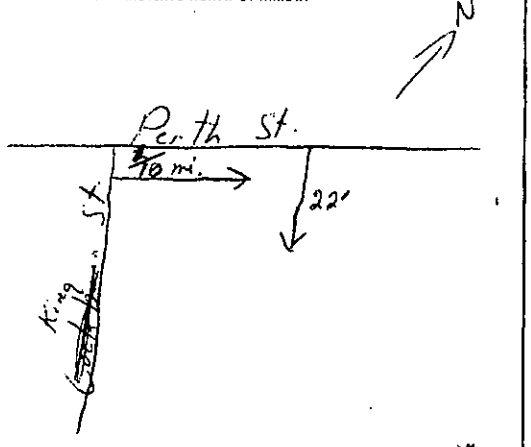
RECOMMENDED PUMP SETTING: 030 FEET

RECOMMENDED PUMPING RATE: 0005 GPM

GPM./FT. SPECIFIC CAPACITY

LOCATION OF WELL 3405

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS:

FINAL STATUS OF WELL 1

1 ☑ WATER SUPPLY, 2 ☐ OBSERVATION WELL, 3 ☐ TEST HOLE, 4 ☐ RECHARGE WELL, 5 ☐ ABANDONED, INSUFFICIENT SUPPLY, 6 ☐ ABANDONED, POOR QUALITY, 7 ☐ UNFINISHED

WATER USE 01

1 ☑ DOMESTIC, 2 ☐ STOCK, 3 ☐ IRRIGATION, 4 ☐ INDUSTRIAL, ☐ OTHER, 5 ☐ COMMERCIAL, 6 ☐ MUNICIPAL, 7 ☐ PUBLIC SUPPLY, 8 ☐ COOLING OR AIR CONDITIONING, 9 ☐ NOT USED

METHOD OF DRILLING 5

1 ☐ CABLE TOOL, 2 ☐ ROTARY (CONVENTIONAL), 3 ☐ ROTARY (REVERSE), 4 ☐ ROTARY (AIR), 5 ☑ AIR PERCUSSION, 6 ☐ BORING, 7 ☐ DIAMOND, 8 ☐ JETTING, 9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: Henry Mains Well Drilling | LICENCE NUMBER: 3644

ADDRESS: Box 326 Richmond Ont

NAME OF DRILLER OR BORER: Henry Mains | LICENCE NUMBER:

SIGNATURE OF CONTRACTOR: Henry Mains | SUBMISSION DATE: DAY 13 MO. 9 YR. 75

OFFICE USE ONLY

DATA SOURCE: 1 | CONTRACTOR: 3644 | DATE RECEIVED: 15 01 76

DATE OF INSPECTION: June 16, 1976 | INSPECTOR: CE/Century

REMARKS: I. Gunning - owner

P UCP

WI

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FORM 7 MOE 07-091

MINISTRY OF THE ENVIRONMENT
The Ontario Water Resources Act

WATER WELL RECORD

Ontario

3164F

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

(11) 1516749 (15) 7701 CON. (16) (17)

COUNTY OR DISTRICT: Carleton
TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: Richmond
CON., BLOCK, TRACT, SURVEY, ETC.: III
LOT: 62
ADDRESS OF WELL LOCATION (STREET AND NUMBER): [redacted] (617) Richmond Ont.
DATE COMPLETED: DAY 22 MO 05 YR 78

(21) (22) UTM ZONE 18 (23) NORTHING 4344660 (24) EASTING 5004960 (25) LOC. 4 (26) ELEVATION 0305 (27) LOC. 4 (28) BASIN CODE 26

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
grey	clay			0	10
blue	clay		soft	10	24
grey	limestone			24	44

(31) 0010295 0029305 0044815

(32)

(41) WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
039	1 ☒ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL

(51) CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
06	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	188	0	032
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SLOT NO.	DIAMETER INCHES	LENGTH FEET

MATERIAL AND TYPE: DEPTH TO TOP OF SCREEN FEET

(61) PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT LEAD PACKER, ETC.)

(71) PUMPING TEST

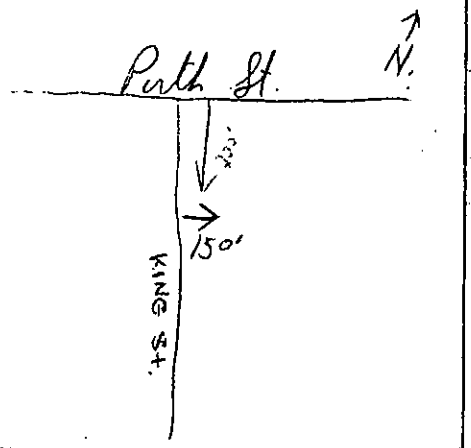
PUMPING TEST METHOD: 1 ☒ PUMP 2 ☐ BAILER
PUMPING RATE: 020 GPM
DURATION OF PUMPING: 01 HOURS 00 MINS
WATER LEVELS DURING: 1 ☒ PUMPING 2 ☐ RECOVERY

STATIC LEVEL	WATER LEVEL END OF PUMPING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
006 FEET	025 FEET	025 FEET	025 FEET	025 FEET	025 FEET

IF FLOWING, GIVE RATE: GPM
PUMP INTAKE SET AT: FEET
WATER AT END OF TEST: 1 ☐ CLEAR 2 ☒ CLOUDY
RECOMMENDED PUMP TYPE: ☒ SHALLOW ☐ DEEP
RECOMMENDED PUMP SETTING: 025 FEET
RECOMMENDED PUMPING RATE: 010 GPM
GPM/FT SPECIFIC CAPACITY

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS:

FINAL STATUS OF WELL (34): 1 ☒ WATER SUPPLY; 2 ☐ OBSERVATION WELL; 3 ☐ TEST HOLE; 4 ☐ RECHARGE WELL; 5 ☐ ABANDONED, INSUFFICIENT SUPPLY; 6 ☐ ABANDONED, POOR QUALITY; 7 ☐ UNFINISHED

WATER USE (35-36): 01 — 1 ☒ DOMESTIC; 2 ☐ STOCK; 3 ☐ IRRIGATION; 4 ☐ INDUSTRIAL; ☐ OTHER; 5 ☐ COMMERCIAL; 6 ☐ MUNICIPAL; 7 ☐ PUBLIC SUPPLY; 8 ☐ COOLING OR AIR CONDITIONING; 9 ☐ NOT USED

METHOD OF DRILLING (37): 5 — 1 ☐ CABLE TOOL; 2 ☐ ROTARY (CONVENTIONAL); 3 ☐ ROTARY (REVERSE); 4 ☐ ROTARY (AIR); 5 ☒ AIR PERCUSSION; 6 ☐ BORING; 7 ☐ DIAMOND; 8 ☐ JETTING; 9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: Henry Mains Well Drilling — LICENCE NUMBER: 3644
ADDRESS: Box 326, Richmond Ont.
NAME OF DRILLER OR BORER: Henry Mains — LICENCE NUMBER:
SIGNATURE OF CONTRACTOR:
SUBMISSION DATE: DAY 22 MO. 5 YR. 78

OFFICE USE ONLY

DATA SOURCE: 1 (50) — CONTRACTOR: 3644 (59-62) — DATE RECEIVED: 78 11 8 (63-68) (69)
DATE OF INSPECTION: 14/5/79 — INSPECTOR: Km G.P.P.
REMARKS:
P
WI

MINISTRY OF THE ENVIRONMENT COPY

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

REPORT OF ANALYSIS

Exova Accutest

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

Report Number: 1000779
Date: 2010-01-18
Date Submitted: 2010-01-14

Project: PH1292

INVOICE: Paterson Group Inc.
Chain of Custody Number: 105597

P.O. Number: 8794
Matrix: Water

			LAB ID:	771127					GUIDELINE
			Sample Date:	2010-01-13					
			Sample ID:	TW1-WS1					ODWSOG
PARAMETER	**UNITS**	**MRL**						**TYPE**	**LIMIT**	**UNITS**
Total Coliforms	CFU/100mL		0					MAC	0	CFU/100mL
Escherichia Coli	CFU/100mL		0					MAC	0	CFU/100mL
Heterotrophic Plate Count	CFU/1mL		1							
Faecal Coliforms	CFU/100mL		0							
Faecal Streptococcus	CFU/100mL		0							

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

REPORT OF ANALYSIS

Exova Accutest

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

Report Number: 1000787
Date: 2010-01-22
Date Submitted: 2010-01-14

Project: PH 1292

INVOICE: Paterson Group Inc.
Chain of Custody Number: 105597

P.O. Number: 8794
Matrix: Water

	LAB ID:	771142					GUIDELINE		
	Sample Date:	2010-01-13							
	Sample ID:	TW1-WS1					ODWSOG		
PARAMETER	**UNITS**	**MRL**					**TYPE**	**LIMIT**	**UNITS**
Alkalinity as CaCO3	mg/L	5	258				OG	500	mg/L
Chloride	mg/L	1	50				AO	250	mg/L
Colour	TCU	2	<2				AO	5	TCU
Conductivity	uS/cm	5	702						
Fluoride	mg/L	0.1	0.31				MAC	1.5	mg/L
Hydrogen Sulphide	mg/L	0.1	<0.1				AO	0.05	mg/L
N-NH3 (Ammonia)	mg/L	0.02	0.07						
N-NO2 (Nitrite)	mg/L	0.1	<0.10				MAC	1.0	mg/L
N-NO3 (Nitrate)	mg/L	0.1	<0.10				MAC	10.0	mg/L
pH			7.97					6.5-8.5	
Phenols	mg/L	0.001	<0.001						
Sulphate	mg/L	1	46				AO	500	mg/L
Tannin & Lignin	mg/L	0.1	<0.1						
Total Dissolved Solids (COND - CALC)	mg/L	5	456				AO	500	mg/L
Total Kjeldahl Nitrogen	mg/L	0.1	<0.10						
Turbidity	NTU	0.1	52.3				MAC	1.0	NTU
Hardness as CaCO3	mg/L	1	292				OG	100	mg/L
Ion Balance		0.01	0.94						
Calcium	mg/L	1	74						
Magnesium	mg/L	1	26						
Potassium	mg/L	1	5						
Sodium	mg/L	2	26				AO	200	mg/L
Iron	mg/L	0.03	0.99				AO	0.3	mg/L
Manganese	mg/L	0.01	0.02				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:
H2S MRL elevated due to sample turbidity.

APPROVAL:
Ewan McRobbie
Inorganic Lab Supervisor

EXOVA ACCUTEST

REPORT OF ANALYSIS

Exova Accutest

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

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

Project: PH1292

INVOICE: Paterson Group Inc.
Chain of Custody Number: 105597

P.O. Number: 8794
Matrix: Water

			LAB ID:	771128					**GUIDELINE**	
			Sample Date:	2010-01-13						
			Sample ID:	TW1-WS2					ODWSOG	
PARAMETER	**UNITS**	**MRL**							**TYPE**	**LIMIT**	**UNITS**
Total Coliforms	CFU/100mL		0						MAC	0	CFU/100mL
Escherichia Coli	CFU/100mL		0						MAC	0	CFU/100mL
Heterotrophic Plate Count	CFU/1mL		8								
Faecal Coliforms	CFU/100mL		0								
Faecal Streptococcus	CFU/100mL		0								

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

REPORT OF ANALYSIS

Exova Accutest

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

Report Number: 1000789
Date: 2010-01-26
Date Submitted: 2010-01-14

Project: PH 1292

INVOICE: Paterson Group Inc.
Chain of Custody Number: 105597

P.O. Number: 8794
Matrix: Water

	LAB ID:	771144					GUIDELINE		
	Sample Date:	2010-01-13							
	Sample ID:	TW1-WS2					ODWSOG		
PARAMETER	UNITS	MRL					TYPE	LIMIT	UNITS
Alkalinity as CaCO3	mg/L	5	258				OG	500	mg/L
Chloride	mg/L	1	51				AO	250	mg/L
Colour	TCU	2	2				AO	5	TCU
Conductivity	uS/cm	5	705						
Dissolved Organic Carbon	mg/L	0.5	1.3				AO	5	mg/L
Fluoride	mg/L	0.1	0.31				MAC	1.5	mg/L
Hydrogen Sulphide	mg/L	0.1	<0.1				AO	0.05	mg/L
N-NH3 (Ammonia)	mg/L	0.02	0.06						
N-NO2 (Nitrite)	mg/L	0.1	<0.10				MAC	1.0	mg/L
N-NO3 (Nitrate)	mg/L	0.1	<0.10				MAC	10.0	mg/L
pH			7.95					6.5-8.5	
Phenols	mg/L	0.001	<0.001						
Sulphate	mg/L	1	46				AO	500	mg/L
Tannin & Lignin	mg/L	0.1	0.2						
Total Dissolved Solids (COND - CALC)	mg/L	5	458				AO	500	mg/L
Total Kjeldahl Nitrogen	mg/L	0.1	<0.10						
Turbidity	NTU	0.1	27.6				MAC	1.0	NTU
Hardness as CaCO3	mg/L	1	308				OG	100	mg/L
Ion Balance		0.01	0.99						
Calcium	mg/L	1	77						
Magnesium	mg/L	1	28						
Potassium	mg/L	1	4						
Sodium	mg/L	2	29				AO	200	mg/L
Iron	mg/L	0.03	0.81				AO	0.3	mg/L
Manganese	mg/L	0.01	0.02				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:
771144: H2S MRL elevated due to sample turbidity.

APPROVAL:
Ewen McRobbie
Inorganic Lab Supervisor

REPORT OF ANALYSIS

Exova Accutest

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

Report Number: 1000789
Date: 2010-01-26
Date Submitted: 2010-01-14
Project: PH 1292

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

			LAB ID:					GUIDELINE		
			Sample Date:							
			Sample ID:					ODWSOG		
PARAMETER	UNITS	MRL						TYPE	LIMIT	UNITS
VOLATILE ORGANIC COMPOUNDS - VOCs										
1,1,1,2-tetrachloroethane	ug/L	2	<2							
1,1,1-trichloroethane	ug/L	2	<2							
1,1,2,2-tetrachloroethane	ug/L	2	<2							
1,1,2-trichloroethane	ug/L	2	<2							
1,1-dichloroethane	ug/L	2	<2							
1,2-dibromoethane	ug/L	4	<4.0							
1,2-dichloropropane	ug/L	2	<2							
1,3,5-trimethylbenzene	ug/L	1	<1							
1,3-dichlorobenzene	ug/L	2	<2							
Bromomethane	ug/L	2	<2							
c-1,2-Dichloroethylene	ug/L	2	<2							
c-1,3-Dichloropropylene	ug/L	0.8	<0.8							
Chloroethane	ug/L	4	<4.0							
Chloromethane	ug/L	4	<4.0							
Ethylbenzene	ug/L	2	<2					AO	2.4	ug/L
Styrene	ug/L	2	<2							
t-1,2-Dichloroethylene	ug/L	2	<2							
t-1,3-Dichloropropylene	ug/L	0.8	<0.8							
Toluene	ug/L	2	<2					AO	24	ug/L
Trichlorofluoromethane	ug/L	2	<2							
1,1-dichloroethylene	ug/L	2	<2					MAC	14	ug/L
1,2-dichlorobenzene	ug/L	2	<2					MAC	200	ug/L
1,2-dichloroethane	ug/L	2	<2					IMAC	5	ug/L
1,4-dichlorobenzene	ug/L	2	<2					MAC	5	ug/L
Benzene	ug/L	2	<2					MAC	5	ug/L
Carbon Tetrachloride	ug/L	2	<2					MAC	5	ug/L
Dichloromethane	ug/L	16	<16					MAC	50	ug/L
Monochlorobenzene	ug/L	0.8	<0.8					MAC	80	ug/L
Tetrachloroethylene	ug/L	1	<1					MAC	30	ug/L

MRL = 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.

APPROVAL:
Mina Nasrai
Organic Lab Supervisor

REPORT OF ANALYSIS

Exova Accutest

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

Report Number: 1000789
Date: 2010-01-26
Date Submitted: 2010-01-14

Project: PH 1292

INVOICE: Paterson Group Inc.
Chain of Custody Number: 105597

P.O. Number: 8794
Matrix: Water

								GUIDELINE		
		LAB ID:	771144							
		Sample Date:	2010-01-13							
		Sample ID:	TW1-WS2					ODWSOG		
PARAMETER	UNITS	MRL						TYPE	LIMIT	UNITS
Trichloroethylene	ug/L	1	<1					MAC	5	ug/L
Vinyl Chloride	ug/L	0.8	<0.8					MAC	2	ug/L
Bromodichloromethane	ug/L	1	<1							
Bromoform	ug/L	2	<2							
Chloroform	ug/L	2	<2							
Dibromochloromethane	ug/L	1	<1							
m/p-xylene	ug/L	4	<4.0							
o-xylene	ug/L	2	<2							
VOC SURROGATES										
Toluene-d8	%		92							
4-bromofluorobenzene	%		120							
1,2-dichloroethane-d4	%		92							
CCME Total Petroleum Hydrocarbons										
F1 (C6-C10)	mg/L	0.1	<0.1							
F1-BTEX (C6-C10)	mg/L	0.1	<0.1							
F2 (C10-C16)	mg/L	0.1	<0.1							
F3 (C16-C34)	mg/L	0.2	<0.2							
F4 (C34-C50)	mg/L	0.2	<0.2							

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

Comment:

APPROVAL:
Mina Nasira
Organic Lab Supervisor

EXOVA ACCUTEST

CCME METHOD VERIFICATION REPORT

Exova Accutest

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

INVOICE: Paterson Group Inc.

Report Number: 1000789
Date: 2010-01-26
Date Submitted: 2010-01-14

Project: PH 1292

P.O. Number: 8794
Matrix: Water

Samples were analysed by Accutest Method AMCCME2, "Petroleum Hydrocarbons in Water and Soil, CCME/TPH"
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	HOLD TIME YES	HOLD TIME NO	ANALYSIS TIME YES	ANALYSIS TIME NO	If No then Reasons
F1 (C6-C10)	☑	☐	☑	☐	
F2 (C10-C16)	☑	☐	☑	☐	
F3 (C16-C34)	☑	☐	☑	☐	
F4 (C34-C50)	☑	☐	☑	☐	
F4 (C34-C50) gravimetric (when applicable)	☐	☐	☐	☐	

Fraction Specific Information	YES	NO	
F1			
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	☐	☑	Naphthalene (PAH) not requested/analysed
If YES was F2-Napthalene reported	☐	☐	
F3			
PAH (selected compounds) subtracted from F3 fraction	☐	☑	PAH not requested/analysed
If YES was F3-PAH reported	☐	☐	
F4			
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:
Mina Nasrai
Organic Lab Supervisor

REPORT OF ANALYSIS

Exova Accutest

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

Report Number: 1003171
Date: 2010-02-22
Date Submitted: 2010-02-17

Project: PH1292

INVOICE: Paterson Group Inc.
Chain of Custody Number: 105022

P.O. Number: 8808
Matrix: Water

		LAB ID:	777417	777418				**GUIDELINE**		
		Sample Date:	2010-02-17	2010-02-17						
		Sample ID:	TW2-WS1	TW2-WS2				ODWSOG		
PARAMETER	**UNITS**	**MRL**						**TYPE**	**LIMIT**	**UNITS**
Total Coliforms	CFU/100mL		0	0				MAC	0	CFU/100mL
Escherichia Coli	CFU/100mL		0	0				MAC	0	CFU/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:

Dragana Dzeletovic
Microbiology Analyst

REPORT OF ANALYSIS

Exova Accutest

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

Report Number: 1003170
Date: 2010-02-25
Date Submitted: 2010-02-17

Project: PH1292

INVOICE: Paterson Group Inc.
Chain of Custody Number: 105022

P.O. Number: 8808
Matrix: Water

			LAB ID:	777415	777416				GUIDELINE		
			Sample Date:	2010-02-17	2010-02-17						
			Sample ID:	TW2-WS1	TW2-WS2				ODWSOG		
PARAMETER	UNITS	MRL							TYPE	LIMIT	UNITS
Alkalinity as CaCO3	mg/L	5		254	255				OG	500	mg/L
Chloride	mg/L	1		56	55				AO	250	mg/L
Colour	TCU	2		<2	2				AO	5	TCU
Conductivity	uS/cm	5		722	718						
Dissolved Organic Carbon	mg/L	0.5		1.4	1.2				AO	5	mg/L
Fluoride	mg/L	0.1		0.29	0.29				MAC	1.5	mg/L
Hydrogen Sulphide	mg/L	0.01		0.03	0.02				AO	0.05	mg/L
N-NH3 (Ammonia)	mg/L	0.02		0.03	0.03						
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
pH				7.93	7.94					6.5-8.5	
Phenols	mg/L	0.001		<0.001	<0.001						
Sulphate	mg/L	1		47	47				AO	500	mg/L
Tannin & Lignin	mg/L	0.1		0.1	<0.1						
Total Dissolved Solids (COND - CALC)	mg/L	5		469	467				AO	500	mg/L
Total Kjeldahl Nitrogen	mg/L	0.1		<0.10	<0.10						
Turbidity	NTU	0.1		16.7	17.2				MAC	1.0	NTU
Hardness as CaCO3	mg/L	1		288	297				OG	100	mg/L
Ion Balance		0.01		0.92	0.95						
Calcium	mg/L	1		74	76						
Magnesium	mg/L	1		25	26						
Potassium	mg/L	1		4	4						
Sodium	mg/L	2		28	29				AO	200	mg/L
Iron	mg/L	0.03		0.58	0.59				AO	0.3	mg/L
Manganese	mg/L	0.01		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:

APPROVAL:
Ewan McRobbie
Inorganic Lab Supervisor

REPORT OF ANALYSIS

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

Report Number: 1005516
Date: 2010-03-22
Date Submitted: 2010-03-18

Project: PH1292

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

P.O. Number: 8811
Matrix: Water

			LAB ID:	783872	783873				GUIDELINE		
			Sample Date:	2010-03-18	2010-03-18						
			Sample ID:	TW3-WS1	TW3-WS2				ODWSOG		
PARAMETER	**UNITS**	**MRL**							**TYPE**	**LIMIT**	**UNITS**
Total Coliforms	CFU/100mL			0	0				MAC	0	CFU/100mL
Escherichia Coli	CFU/100mL			0	0				MAC	0	CFU/100mL
Heterotrophic Plate Count	CFU/1mL			3	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:
Krista Quantrill
Drinking Water Coordinator

REPORT OF ANALYSIS

Exova Accutest

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

Report Number: 1005515
Date: 2010-03-29
Date Submitted: 2010-03-18
Project: PH1292

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

P.O. Number: 8811
Matrix: Water

			LAB ID:	783870	783871				GUIDELINE		
			Sample Date:	2010-03-18	2010-03-18				ODWSOG		
			Sample ID:	TW3-WS1	TW3-WS2						
PARAMETER	UNITS	MRL							TYPE	LIMIT	UNITS
Alkalinity as CaCO3	mg/L	5	252	253					OG	500	mg/L
Chloride	mg/L	1	52	52					AO	250	mg/L
Colour	TCU	2	<2	<2					AO	5	TCU
Conductivity	uS/cm	5	685	683							
Dissolved Organic Carbon	mg/L	0.5	1.2	1.2					AO	5	mg/L
Fluoride	mg/L	0.1	0.34	0.36					MAC	1.5	mg/L
Hydrogen Sulphide	mg/L	0.01	0.01	<0.01					AO	0.05	mg/L
N-NH3 (Ammonia)	mg/L	0.02	0.05	0.05							
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
pH			7.96	7.98						6.5-8.5	
Phenols	mg/L	0.001	<0.001	<0.001							
Sulphate	mg/L	1	54	53					AO	500	mg/L
Tannin & Lignin	mg/L	0.1	0.2	0.2							
Total Dissolved Solids (COND - CALC)	mg/L	5	445	444					AO	500	mg/L
Total Kjeldahl Nitrogen	mg/L	0.1	<0.10	<0.10							
Turbidity	NTU	0.1	13.2	5.1					MAC	1.0	NTU
Hardness as CaCO3	mg/L	1	287	287					OG	100	mg/L
Ion Balance		0.01	0.93	0.93							
Calcium	mg/L	1	72	72							
Magnesium	mg/L	1	26	26							
Potassium	mg/L	1	4	4							
Sodium	mg/L	2	29	30					AO	200	mg/L
Iron	mg/L	0.03	0.58	0.40					AO	0.3	mg/L
Manganese	mg/L	0.01	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:

APPROVAL:
Ewan McRobbie
Inorganic Lab Supervisor

EXOVA ACCUTEST

REPORT OF ANALYSIS

TW4-Bact 3-9hr

Exova Accutest

Client: Paterson Group
28 Concourse Gate, Unit 1

Nepean, ON
K2E 7T7

Attention: Mr. Robert Passmore

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

Project: PH1292

INVOICE: Paterson Group Inc.
Chain of Custody Number: 146205

P.O. Number:
Matrix: Water

		LAB ID:	906781	906782				GUIDELINE	
		Sample Date:	2011-08-26	2011-08-26					
		Sample ID:	TW4-WS-26/-8/11	TW4-WS 9hr 26/08/11				ODWSOG	
PARAMETER	UNITS	MRL						TYPE	LIMIT	UNITS
Total Coliforms	CFU/100mL		6	2				MAC	0	CFU/100mL
Escherichia Coli	CFU/100mL		0	0				MAC	0	CFU/100mL
Heterotrophic Plate Count	CFU/1mL		234	490						
Faecal Coliforms	CFU/100mL		0	0						
Faecal Streptococcus	CFU/100mL		46	182						

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
Microbiology Lab Supervisor

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

EXOVA ACCUTEST

REPORT OF ANALYSIS

Exova Accutest

Client: Paterson Group
28 Concourse Gate, Unit 1

Nepean, ON
K2E 7T7
Attention: Mr. Robert Passmore

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

Report Number: 1122788
Date: 2011-10-12
Date Submitted: 2011-09-30

Project: PH1292

P.O. Number: 11627
Matrix: Water

			LAB ID:	914267					**GUIDELINE**	
			Sample Date:	2011-09-30						
			Sample ID:	TW5-WS09/2930/11					ODWSOG	
PARAMETER	**UNITS**	**MRL**							**TYPE**	**LIMIT**	**UNITS**
Alkalinity as CaCO3	mg/L	5		266					OG	500	mg/L
Chloride	mg/L	1		45					AO	250	mg/L
Colour	TCU	2		<2					AO	5	TCU
Conductivity	uS/cm	5		691							
Dissolved Organic Carbon	mg/L	0.5		1.0					AO	5	mg/L
Fluoride	mg/L	0.1		0.28					MAC	1.5	mg/L
Hydrogen Sulphide	mg/L	0.01		<0.01					AO	0.05	mg/L
N-NH3 (Ammonia)	mg/L	0.02		<0.02							
N-NO2 (Nitrite)	mg/L	0.1		<0.10					MAC	1.0	mg/L
N-NO3 (Nitrate)	mg/L	0.1		<0.10					MAC	10.0	mg/L
pH				7.97						6.5-8.5	
Phenols	mg/L	0.001		<0.001							
Sulphate	mg/L	1		49					AO	500	mg/L
Tannin & Lignin	mg/L	0.1		<0.1							
Total Dissolved Solids (COND - CALC)	mg/L	1		449					AO	500	mg/L
Total Kjeldahl Nitrogen	mg/L	0.1		<0.10							
Turbidity	NTU	0.1		6.5					MAC	1.0	NTU
Hardness as CaCO3	mg/L	1		285					OG	100	mg/L
Ion Balance		0.01		0.91							
Calcium	mg/L	1		73							
Magnesium	mg/L	1		25							
Potassium	mg/L	1		3							
Sodium	mg/L	2		26					AO	200	mg/L
Iron	mg/L	0.03		0.66					AO	0.3	mg/L
Manganese	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:
Sample was subcontracted for DOC analysis.

APPROVAL:
Lorna Wilson
Inorganic Lab Supervisor

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

EXOVA ACCUTEST

REPORT OF ANALYSIS

Tw4- 3hr- 9hr

Exova Accutest

Client: Paterson Group
28 Concourse Gate, Unit 1

Nepean, ON
K2E 7T7
Attention: Mr. Robert Passmore

Report Number: 1119874
Date: 2011-09-08
Date Submitted: 2011-08-27

Project: PH1292

INVOICE: Paterson Group Inc.
Chain of Custody Number: 146205

P.O. Number:
Matrix: Water

			LAB ID:	906783	906784				GUIDELINE		
			Sample Date:	2011-08-26	2011-08-26						
			Sample ID:	TW4-WS 26/08/11	TW4-WS 9hr 26/08/11				ODWSOG		
PARAMETER	UNITS	MRL							TYPE	LIMIT	UNITS
Alkalinity as CaCO3	mg/L	5		268	267				OG	500	mg/L
Chloride	mg/L	1		44	44				AO	250	mg/L
Colour	TCU	2		<2	3				AO	5	TCU
Conductivity	uS/cm	5		687	686						
Dissolved Organic Carbon	mg/L	0.5		1.2	1.2				AO	5	mg/L
Fluoride	mg/L	0.1		0.29	0.29				MAC	1.5	mg/L
Hydrogen Sulphide	mg/L	0.01		<0.01	<0.01				AO	0.05	mg/L
N-NH3 (Ammonia)	mg/L	0.02		0.04	0.05						
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
pH				8.17	8.17					6.5-8.5	
Phenols	mg/L	0.001		<0.001	<0.001						
Sulphate	mg/L	1		46	46				AO	500	mg/L
Tannin & Lignin	mg/L	0.1		<0.1	<0.1						
Total Dissolved Solids (COND - CALC)	mg/L	1		447	446				AO	500	mg/L
Total Kjeldahl Nitrogen	mg/L	0.1		<0.10	<0.10						
Turbidity	NTU	0.1		2.8	1.5				MAC	1.0	NTU
Hardness as CaCO3	mg/L	1		304	302				OG	100	mg/L
Ion Balance		0.01		0.95	0.95						
Calcium	mg/L	1		79	78						
Magnesium	mg/L	1		26	26						
Potassium	mg/L	1		3	3						
Sodium	mg/L	2		24	24				AO	200	mg/L
Iron	mg/L	0.03		0.32	0.32				AO	0.3	mg/L
Manganese	mg/L	0.01		<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:
Samples were subcontracted for DOC analysis.

APPROVAL: _____
Lorna Wilson
Inorganic Lab Supervisor

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

EXOVA ACCUTEST

REPORT OF ANALYSIS

TW5- Bad eCh

Exova Accutest

Client: Paterson Group
28 Concourse Gate, Unit 1

Nepean, ON
K2E 7T7
Attention: Mr. Robert Passmore

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

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

Project: PH292

P.O. Number:
Matrix: Water

								GUIDELINE		
			LAB ID:	914257						
			Sample Date:	2011-09-30						
			Sample ID:	TW5 - WS09				ODWSOG		
PARAMETER	UNITS	MRL						TYPE	LIMIT	UNITS
Total Coliforms	CFU/100mL		0					MAC	0	CFU/100mL
Escherichia Coli	CFU/100mL		0					MAC	0	CFU/100mL
Heterotrophic Plate Count	CFU/1mL		15							
Faecal Coliforms	CFU/100mL		0							
Faecal Streptococcus	CFU/100mL		0							

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
Microbiology Lab Supervisor

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

REPORT OF ANALYSIS

Client: Paterson Group
28 Concourse Gate, Unit 1

Nepean, ON
K2E 7T7
Attention: Mr. Robert Passmore

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

Report Number: 1122788
Date: 2011-10-12
Date Submitted: 2011-09-30

Project: PH1292

P.O. Number: 11627
Matrix: Water

			LAB ID:	914267					GUIDELINE	
			Sample Date:	2011-09-30						
			Sample ID:	TW5-WS09/2930/11					ODWSOG	
PARAMETER	UNITS	MRL							TYPE	LIMIT	UNITS
Alkalinity as CaCO3	mg/L	5		266					OG	500	mg/L
Chloride	mg/L	1		45					AO	250	mg/L
Colour	TCU	2		<2					AO	5	TCU
Conductivity	uS/cm	5		691							
Dissolved Organic Carbon	mg/L	0.5		1.0					AO	5	mg/L
Fluoride	mg/L	0.1		0.28					MAC	1.5	mg/L
Hydrogen Sulphide	mg/L	0.01		<0.01					AO	0.05	mg/L
N-NH3 (Ammonia)	mg/L	0.02		<0.02							
N-NO2 (Nitrite)	mg/L	0.1		<0.10					MAC	1.0	mg/L
N-NO3 (Nitrate)	mg/L	0.1		<0.10					MAC	10.0	mg/L
pH				7.97						6.5-8.5	
Phenols	mg/L	0.001		<0.001							
Sulphate	mg/L	1		49					AO	500	mg/L
Tannin & Lignin	mg/L	0.1		<0.1							
Total Dissolved Solids (COND - CALC)	mg/L	1		449					AO	500	mg/L
Total Kjeldahl Nitrogen	mg/L	0.1		<0.10							
Turbidity	NTU	0.1		6.5					MAC	1.0	NTU
Hardness as CaCO3	mg/L	1		285					OG	100	mg/L
Ion Balance		0.01		0.91							
Calcium	mg/L	1		73							
Magnesium	mg/L	1		25							
Potassium	mg/L	1		3							
Sodium	mg/L	2		26					AO	200	mg/L
Iron	mg/L	0.03		0.66					AO	0.3	mg/L
Manganese	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:
Sample was subcontracted for DOC analysis.

APPROVAL: _____
Lorna Wilson
Inorganic Lab Supervisor

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

Client: Paterson Group
28 Concourse Gate, Unit 1

Nepean, ON
K2E 7T7
Attention: Mr. Robert Passmore

Report Number: 1122839
Date: 2011-10-14
Date Submitted: 2011-10-03

Project: PH1292

P.O. Number: 11627
Matrix: Water

INVOICE: Paterson Group Inc.
Chain of Custody Number: 141372

			LAB ID:					GUIDELINE		
			Sample Date:					Provincial Water Quality Objectives - MOE 1999		
			Sample ID:							
PARAMETER	UNITS	MRL						TYPE	LIMIT	UNITS
Alkalinity as CaCO3	mg/L	5	268							
Chloride	mg/L	1	45							
Colour	TCU	2	2							
Conductivity	uS/cm	5	680							
Dissolved Organic Carbon	mg/L	0.5	1.1							
Fluoride	mg/L	0.1	0.27							
Hydrogen Sulphide	mg/L	0.01	<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							
pH			7.86						6.5-8.5	
Phenols	mg/L	0.001	<0.001					PWQO	0.001	mg/L
Sulphate	mg/L	1	49							
Tannin & Lignin	mg/L	0.1	<0.1							
Total Dissolved Solids (COND - CALC)	mg/L	1	442							
Total Kjeldahl Nitrogen	mg/L	0.1	0.12							
Turbidity	NTU	0.1	5.7							
Hardness as CaCO3	mg/L	1	306							
Ion Balance		0.01	0.96							
Calcium	mg/L	1	78							
Magnesium	mg/L	1	27							
Potassium	mg/L	1	3							
Sodium	mg/L	2	27							
Iron	mg/L	0.03	0.54					PWQO	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.

APPROVAL: _____
Lorna Wilson
Inorganic Lab Supervisor

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

EXOVA ACCUTEST

REPORT OF ANALYSIS

Exova Accutest

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

Report Number: 1001797
Date: 2010-02-01
Date Submitted: 2010-01-28

Project: PH1292

INVOICE: Paterson Group Inc.
Chain of Custody Number: 105018

P.O. Number:
Matrix: Water

			LAB ID:	773874	773875				GUIDELINE		
			Sample Date:	2010-01-28	2010-01-28						
			Sample ID:	EW-WS1	EW-WS2				ODWSOG		
PARAMETER	**UNITS**	**MRL**							**TYPE**	**LIMIT**	**UNITS**
Total Coliforms	CFU/100mL			0	0				MAC	0	CFU/100mL
Escherichia Coli	CFU/100mL			0	0				MAC	0	CFU/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:
This is an amendment and supercedes all other copies of this report. The sample ID's have been amended as per client request.

APPROVAL:
Dragana Dzeletovic
Microbiology Analyst

EXOVA ACCUTEST

REPORT OF ANALYSIS

Exova Accutest

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

Report Number: 1001798
Date: 2010-02-04
Date Submitted: 2010-01-28

Project: PH1292

INVOICE: Paterson Group Inc.
Chain of Custody Number: 105018

P.O. Number:
Matrix: Water

			LAB ID:	773876	773877				GUIDELINE		
			Sample Date:	2010-01-28	2010-01-28				ODWSOG		
			Sample ID:	EW-WS1	EW-WS2						
PARAMETER	UNITS	MRL							TYPE	LIMIT	UNITS
Alkalinity as CaCO3	mg/L	5		269	269				OG	500	mg/L
Chloride	mg/L	1		44	43				AO	250	mg/L
Colour	TCU	2		<2	<2				AO	5	TCU
Conductivity	uS/cm	5		702	702						
Dissolved Organic Carbon	mg/L	0.5		1.3	1.2				AO	5	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	0.05	mg/L
N-NH3 (Ammonia)	mg/L	0.02		0.09	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
pH				8.12	8.16					6.5-8.5	
Phenols	mg/L	0.001		<0.001	<0.001						
Sulphate	mg/L	1		49	49				AO	500	mg/L
Tannin & Lignin	mg/L	0.1		<0.1	<0.1						
Total Dissolved Solids (COND - CALC)	mg/L	5		456	456				AO	500	mg/L
Total Kjeldahl Nitrogen	mg/L	0.1		0.11	<0.10						
Turbidity	NTU	0.1		1.6	1.1				MAC	1.0	NTU
Hardness as CaCO3	mg/L	1		290	283				OG	100	mg/L
Ion Balance		0.01		0.97	0.95						
Calcium	mg/L	1		70	69						
Magnesium	mg/L	1		28	27						
Potassium	mg/L	1		5	5						
Sodium	mg/L	2		34	34				AO	200	mg/L
Iron	mg/L	0.03		0.27	0.23				AO	0.3	mg/L
Manganese	mg/L	0.01		<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:

APPROVAL:
Ewan McRobbie
Inorganic Lab Supervisor

EXOVA ACCUTEST

REPORT OF ANALYSIS

Exova Accutest

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

Report Number: 1000782
Date: 2010-01-18
Date Submitted: 2010-01-14

Project: PH1292

INVOICE: Paterson Group Inc.
Chain of Custody Number: 105597

P.O. Number: 8794
Matrix: Water

			LAB ID:	771137					GUIDELINE
			Sample Date:	2010-01-13					
			Sample ID:	20 King-WS1					ODWSOG
PARAMETER	**UNITS**	**MRL**						**TYPE**	**LIMIT**	**UNITS**
Total Coliforms	CFU/100mL		0					MAC	0	CFU/100mL
Escherichia Coli	CFU/100mL		0					MAC	0	CFU/100mL
Heterotrophic Plate Count	CFU/1mL		2							
Faecal Coliforms	CFU/100mL		0							
Faecal Streptococcus	CFU/100mL		0							

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

EXOVA ACCUTEST

REPORT OF ANALYSIS

Exova Accutest

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

Report Number: 1000794
Date: 2010-01-27
Date Submitted: 2010-01-14

Project: PH 1292

INVOICE: Paterson Group Inc.
Chain of Custody Number: 105597

P.O. Number: 8794
Matrix: Water

	LAB ID:	771149					GUIDELINE		
	Sample Date:	2010-01-13							
	Sample ID:	20 King-WS1					ODWSOG		
PARAMETER	UNITS	MRL					TYPE	LIMIT	UNITS
Alkalinity as CaCO3	mg/L	5	328				OG	500	mg/L
Chloride	mg/L	1	13				AO	250	mg/L
Colour	TCU	2	<2				AO	5	TCU
Conductivity	uS/cm	5	654						
Dissolved Organic Carbon	mg/L	0.5	1.5				AO	5	mg/L
Fluoride	mg/L	0.1	0.36				MAC	1.5	mg/L
Hydrogen Sulphide	mg/L	0.01	<0.01				AO	0.05	mg/L
N-NH3 (Ammonia)	mg/L	0.02	<0.02						
N-NO2 (Nitrite)	mg/L	0.1	<0.10				MAC	1.0	mg/L
N-NO3 (Nitrate)	mg/L	0.1	0.13				MAC	10.0	mg/L
pH			7.83					6.5-8.5	
Phenols	mg/L	0.001	<0.001						
Sulphate	mg/L	1	19				AO	500	mg/L
Tannin & Lignin	mg/L	0.1	0.1						
Total Dissolved Solids (COND - CALC)	mg/L	5	425				AO	500	mg/L
Total Kjeldahl Nitrogen	mg/L	0.1	<0.10						
Turbidity	NTU	0.1	0.2				MAC	1.0	NTU
Hardness as CaCO3	mg/L	1	296				OG	100	mg/L
Ion Balance		0.01	0.92						
Calcium	mg/L	1	74						
Magnesium	mg/L	1	27						
Potassium	mg/L	1	2						
Sodium	mg/L	2	19				AO	200	mg/L
Iron	mg/L	0.03	<0.03				AO	0.3	mg/L
Manganese	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:

APPROVAL:
Ewan McRobbie
Inorganic Lab Supervisor

REPORT OF ANALYSIS

Client: Paterson Group
28 Concourse Gate, Unit 1

Nepean, ON
K2E 7T7
Attention: Mr. Robert Passmore

Report Number: 1127252
Date: 2011-11-25
Date Submitted: 2011-11-23

Project: PH1292

INVOICE: Paterson Group Inc.
Chain of Custody Number: 141378

P.O. Number:
Matrix: Water

			LAB ID:	927122	927123				GUIDELINE		
			Sample Date:	2011-11-22	2011-11-22						
			Sample ID:	10 Cockburn - WS 22/11/11	6 King-WS 22/11/11				ODWSOG		
PARAMETER	UNITS	MRL							TYPE	LIMIT	UNITS
Total Coliforms	CFU/100mL			0	0				MAC	0	CFU/100mL
Escherichia Coli	CFU/100mL			0	0				MAC	0	CFU/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:
Krista Quantrill
Microbiology Lab Supervisor

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

REPORT OF ANALYSIS

Client: Paterson Group
28 Concourse Gate, Unit 1

Nepean, ON
K2E 7T7
Attention: Mr. Robert Passmore

Report Number: 1127271
Date: 2011-11-25
Date Submitted: 2011-11-23

Project: PH1292

P.O. Number:
Matrix: Water

INVOICE: Paterson Group Inc.
Chain of Custody Number: 141378

			LAB ID:	927147	927148				GUIDELINE		
			Sample Date:	2011-11-22	2011-11-22				ODWSOG		
			Sample ID:	10 Cockburn-WS 22/11/11	6 King-WS 22/11/11						
PARAMETER	UNITS	MRL							TYPE	LIMIT	UNITS
Alkalinity as CaCO3	mg/L	5		260	260				OG	500	mg/L
Chloride	mg/L	1		46	46				AO	250	mg/L
Colour	TCU	2		<2	2				AO	5	TCU
Conductivity	uS/cm	5		694	698						
Dissolved Organic Carbon	mg/L	0.5		1.1	1.2				AO	5	mg/L
Fluoride	mg/L	0.1		0.36	0.38				MAC	1.5	mg/L
Hydrogen Sulphide	mg/L	0.01		0.01	<0.01				AO	0.05	mg/L
N-NH3 (Ammonia)	mg/L	0.02		0.06	0.09						
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
pH				7.90	7.94					6.5-8.5	
Phenols	mg/L	0.001		<0.001	<0.001						
Sulphate	mg/L	1		47	47				AO	500	mg/L
Tannin & Lignin	mg/L	0.1		<0.1	<0.1						
Total Dissolved Solids (COND - CALC)	mg/L	1		451	454				AO	500	mg/L
Total Kjeldahl Nitrogen	mg/L	0.1		<0.10	0.28						
Turbidity	NTU	0.1		6.5	3.4				MAC	1.0	NTU
Hardness as CaCO3	mg/L	1		303	298				OG	100	mg/L
Ion Balance		0.01		1.02	1.01						
Calcium	mg/L	1		75	73						
Magnesium	mg/L	1		28	28						
Potassium	mg/L	1		4	4						
Sodium	mg/L	2		34	35				AO	200	mg/L
Iron	mg/L	0.03		0.43	0.36				AO	0.3	mg/L
Manganese	mg/L	0.01		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:

APPROVAL:
Lorna Wilson
Inorganic Lab Supervisor

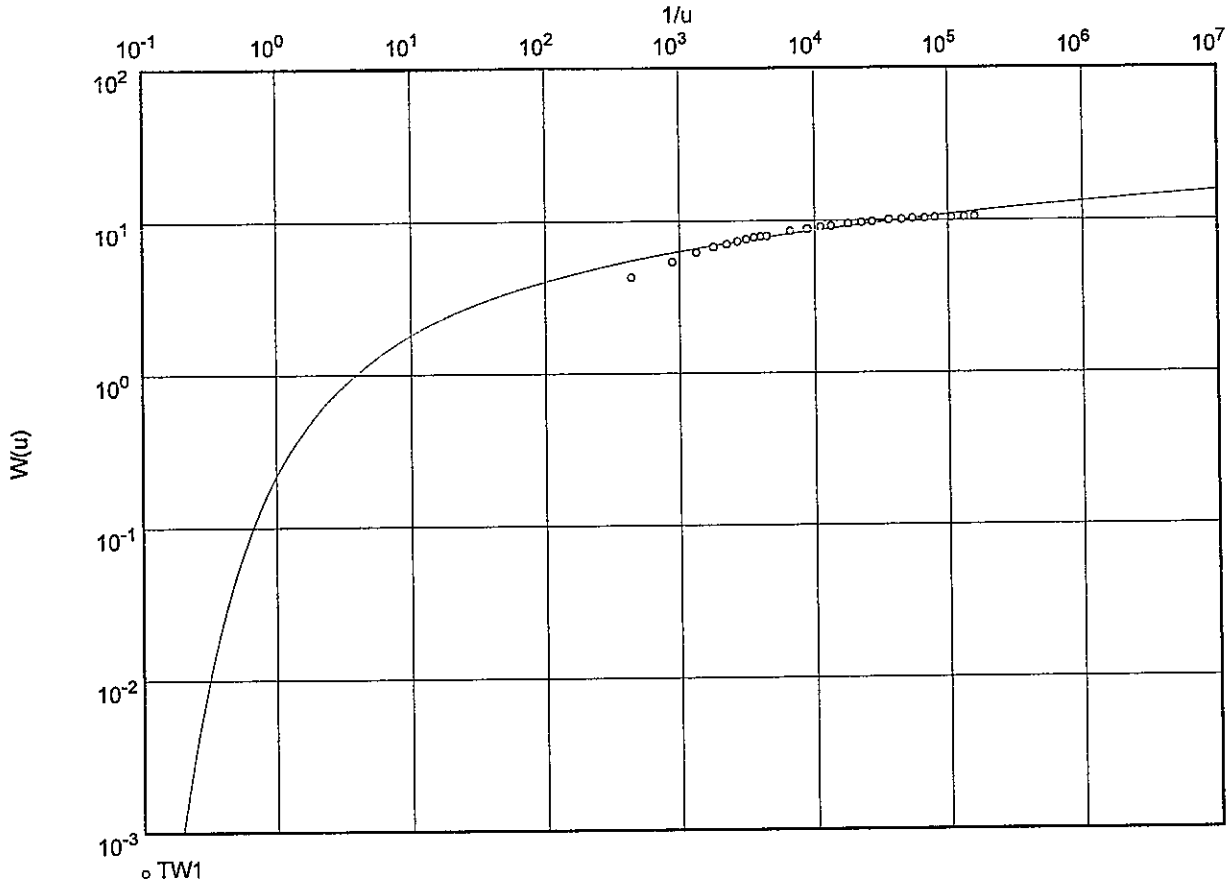
Methods references and/or additional QA/QC information available on request.

APPENDIX 4

- 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

Waterloo Hydrogeologic 180 Columbia St. W. Waterloo,Ontario,Canada ph.(519)746-1798	Pumping test analysis Theis analysis method Confined aquifer	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	



Transmissivity [m²/min]: 2.21×10^{-2}

Storativity: 2.21×10^{-3}

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

Pumping test analysis
Theis analysis method
Confined aquifer

Project: PH1292

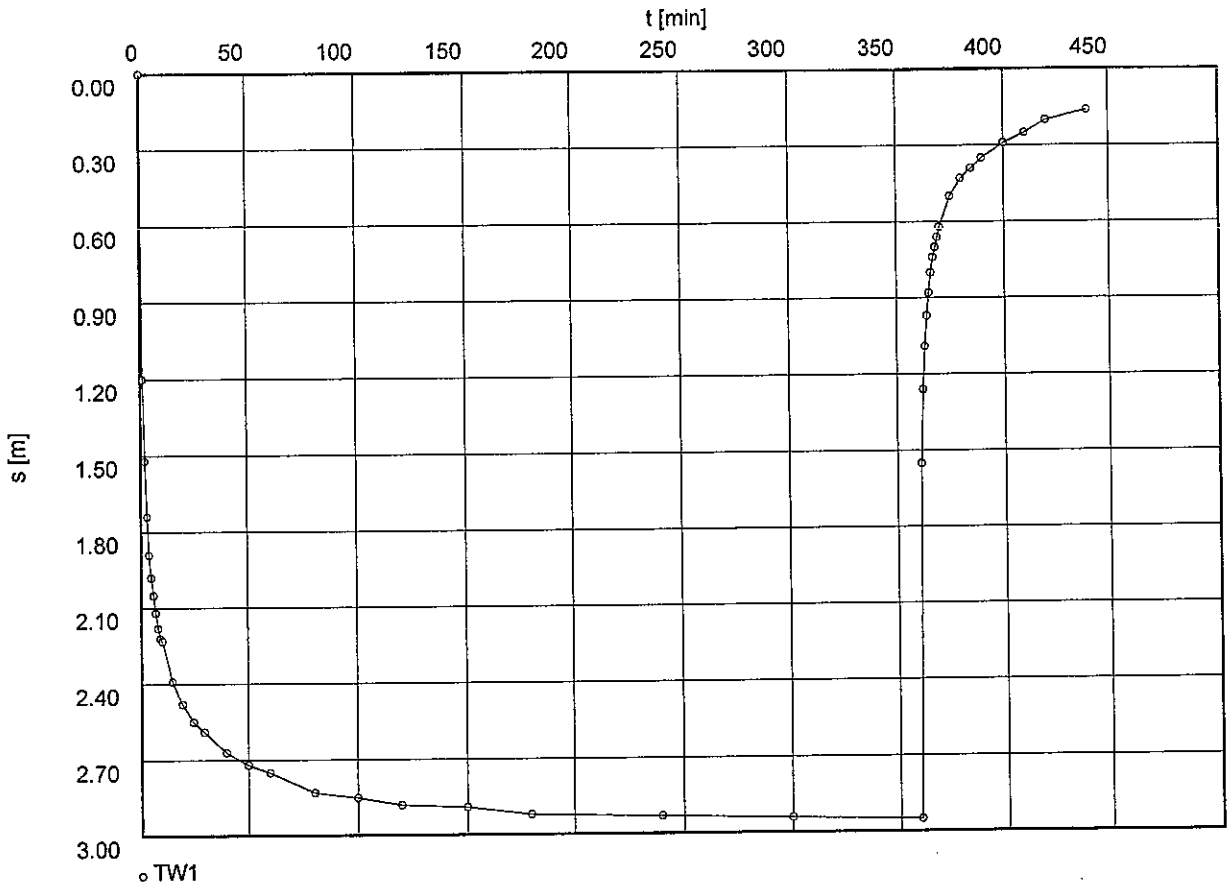
Evaluated by: RAP

Pumping Test No. 1	Test conducted on: Jan. 13/2010
TW1	TW1
Discharge 1.30 l/s	Distance from the pumping well 0.300 m
Static water level: 2.090 m below datum	

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
2	1.00	3.290	1.200	
3	2.00	3.610	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	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	
15	30.00	4.680	2.590	
16	40.00	4.760	2.670	
17	50.00	4.810	2.720	
18	60.00	4.840	2.750	
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	
26	360.00	5.040	2.950	

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

Pumping test analysis
Time-Drawdown plot

Project: PH1292

Evaluated by: RAP

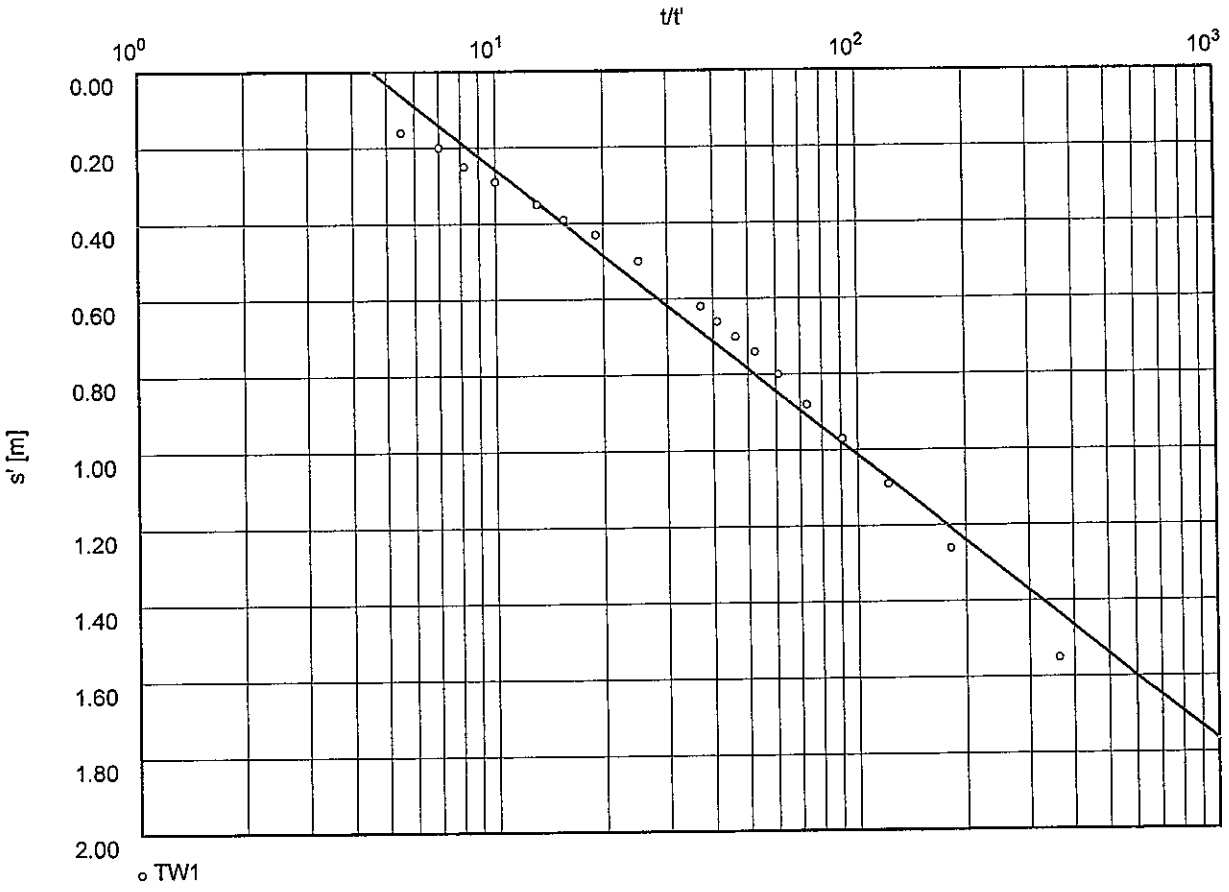
Pumping Test No. 1	Test conducted on: Jan. 13/2010
TW1	TW1
Discharge 1.30 l/s	Distance from the pumping well 0.300 m

Static water level: 2.090 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]
1	0.00	2.090	0.000
2	1.00	3.290	1.200
3	2.00	3.610	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	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
15	30.00	4.680	2.590
16	40.00	4.760	2.670
17	50.00	4.810	2.720
18	60.00	4.840	2.750
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
26	360.00	5.040	2.950
27	361.00	3.640	1.550
28	362.00	3.350	1.260
29	363.00	3.180	1.090
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
36	370.00	2.710	0.620
37	375.00	2.590	0.500
38	380.00	2.520	0.430
39	385.00	2.480	0.390
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

Waterloo Hydrogeologic 180 Columbia St. W. Waterloo,Ontario,Canada ph.(519)746-1798	Pumping test analysis Recovery method after THEIS & JACOB Confined aquifer	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	
	Pumping test duration: 360.00 min



Transmissivity [m²/min]: 1.89×10^{-2}

Waterloo Hydrogeologic 180 Columbia St. W. Waterloo,Ontario,Canada ph.(519)746-1798	Pumping test analysis Recovery method after THEIS & JACOB Confined aquifer	Date: 04.02.2010	none, Page 2
		Project: PH1292	
		Evaluated by: RAP	

Pumping Test No. 1	Test conducted on: Jan. 13/2010
TW1	TW1
Discharge 1.30 l/s	Distance from the pumping well 0.300 m
Static water level: 2.090 m below datum	Pumping test duration: 360.00 min

	Time from end of pumping [min]	Water level [m]	Residual drawdown [m]
1	1.00	3.640	1.550
2	2.00	3.350	1.260
3	3.00	3.180	1.090
4	4.00	3.060	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
14	30.00	2.440	0.350
15	40.00	2.380	0.290
16	50.00	2.340	0.250
17	60.00	2.290	0.200
18	80.00	2.250	0.160

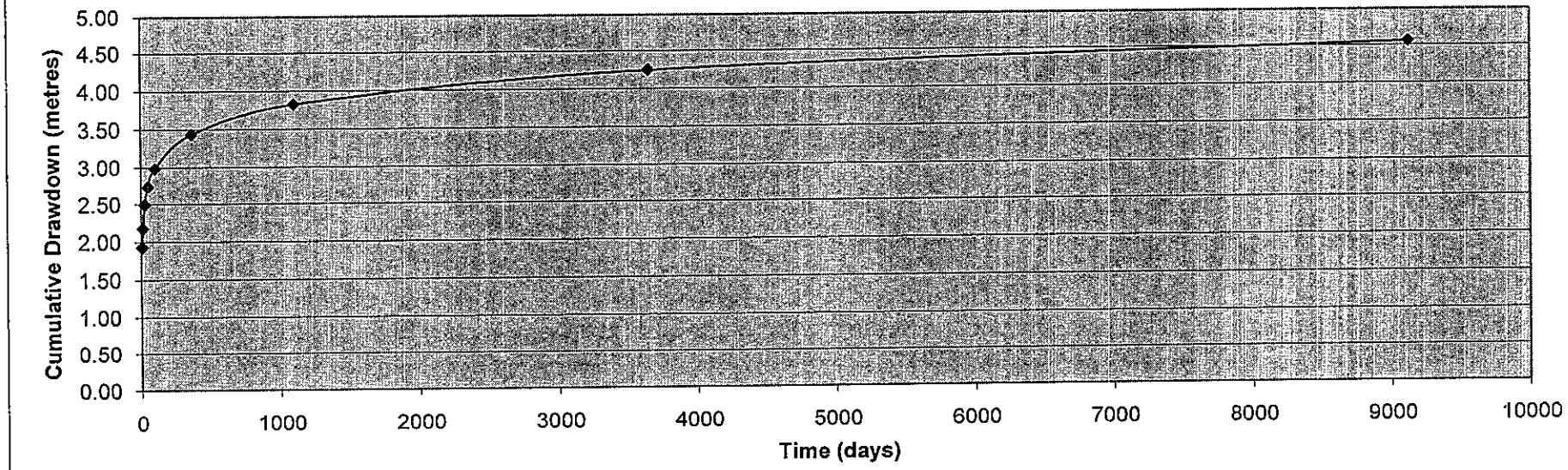
Determination of Potential Well Interference

Pumping Rate (Q) m3/day	2
Transmissivity (T) m2/day	27.2
Average Well Spacing (m) r	15
Coefficient of Storage S	0.00221

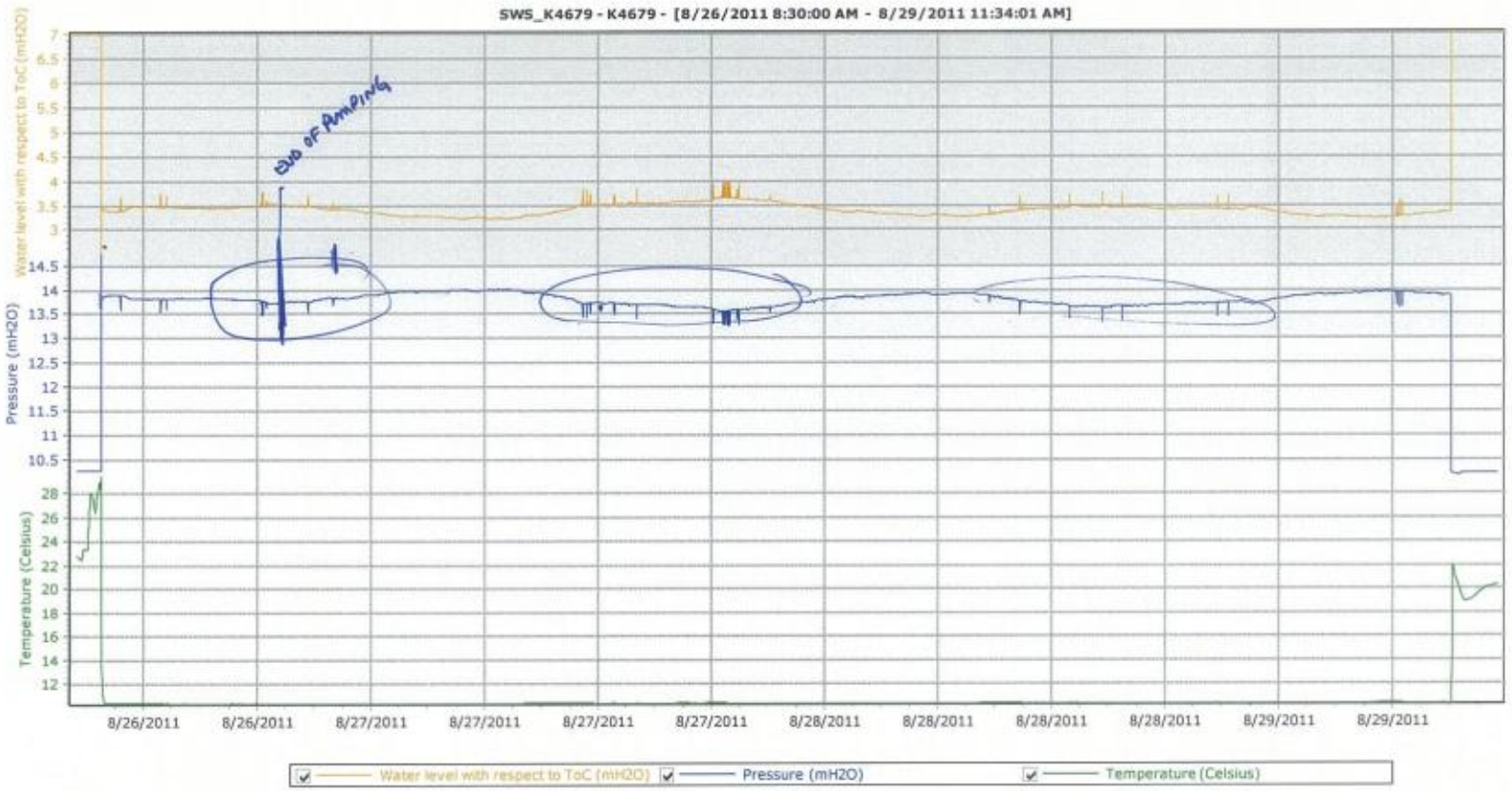
Notes: Analysis Assumes Continuous Pumping of 61 Wells

Time (days)	1st Well Grouping u	1st Well Grouping W(u)	2nd Well Grouping u	2nd Well Grouping W(u)	3rd Well Grouping u	3rd Well Grouping W(u)	4th Well Grouping u	4th Well Grouping W(u)	Drawdown
5	4.6E-04	7.11	1.4E-03	6.00	2.3E-03	5.50	3.2E-03	5.17	1.93
10	2.3E-04	7.80	6.9E-04	6.70	1.1E-03	6.24	1.6E-03	5.86	2.18
25	9.1E-05	8.73	2.7E-04	7.64	4.6E-04	7.11	6.4E-04	6.78	2.50
50	4.6E-05	9.41	1.4E-04	8.30	2.3E-04	7.80	3.2E-04	7.47	2.74
100	2.3E-05	10.10	6.9E-05	9.00	1.1E-04	8.54	1.6E-04	8.16	2.99
365	6.3E-06	11.40	1.9E-05	10.29	3.1E-05	9.80	4.4E-05	9.45	3.44
1100	2.1E-06	12.50	6.2E-06	11.41	1.0E-05	10.94	1.5E-05	10.53	3.82
3650	6.3E-07	13.70	1.9E-06	12.60	3.1E-06	12.11	4.4E-06	11.76	4.25
9125	2.5E-07	14.62	7.5E-07	13.53	1.3E-06	12.98	1.8E-06	12.65	4.56

Graph of Drawdown vs. Time

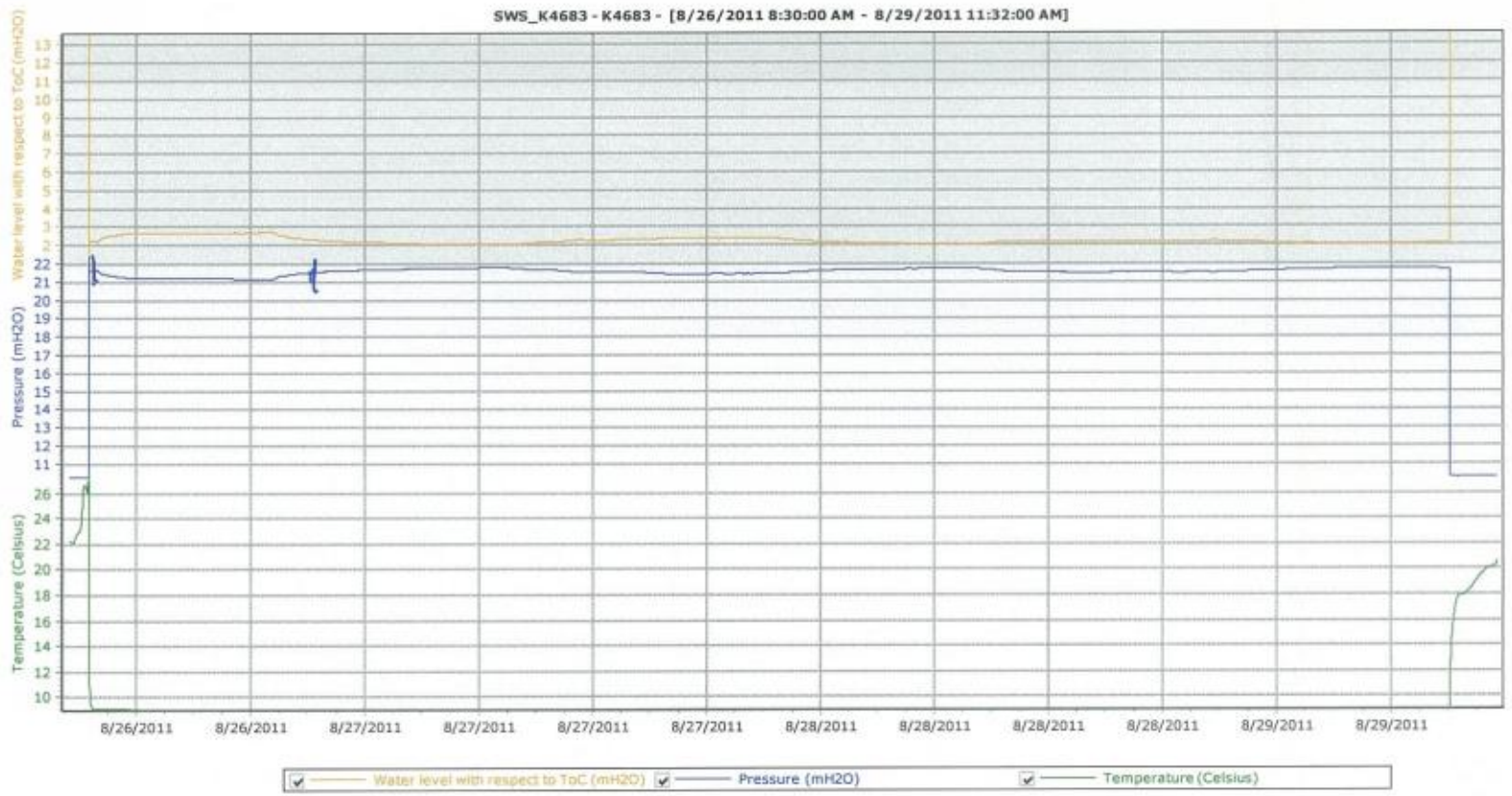


#13 COCKBURN


SWS_K4679 - K4679 - [8/26/2011 8:30:00 AM - 8/29/2011 11:34:01 AM]
END OF PUMPING
Water level with respect to ToC (mH2O)
Pressure (mH2O)
Temperature (Celsius)
8/26/2011
8/26/2011
8/27/2011
8/27/2011
8/27/2011
8/27/2011
8/28/2011
8/28/2011
8/28/2011
8/28/2011
8/29/2011
8/29/2011
Water level with respect to ToC (mH2O)
Pressure (mH2O)
Temperature (Celsius)

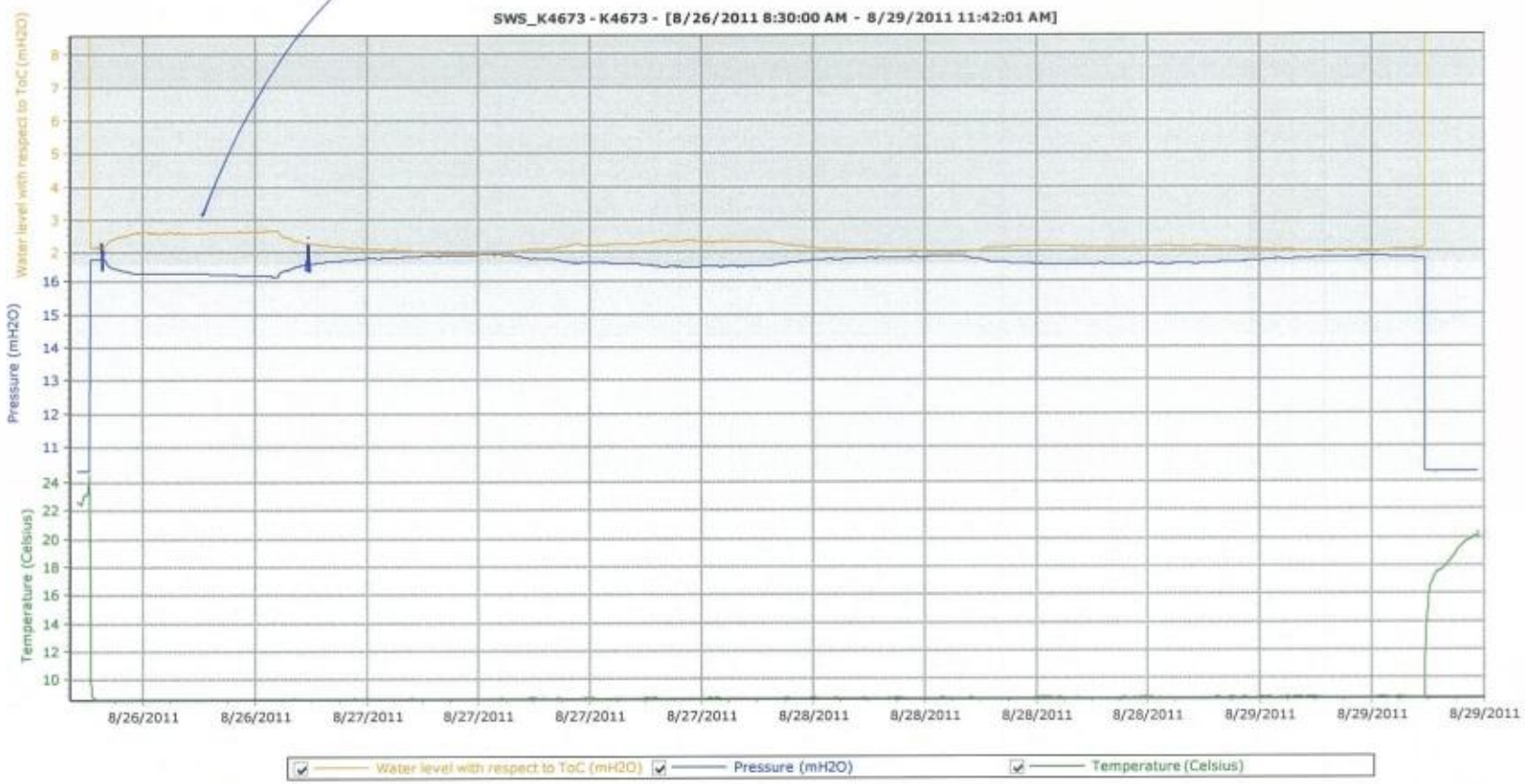
Response. ✓

TW5 (DEEP CASED)

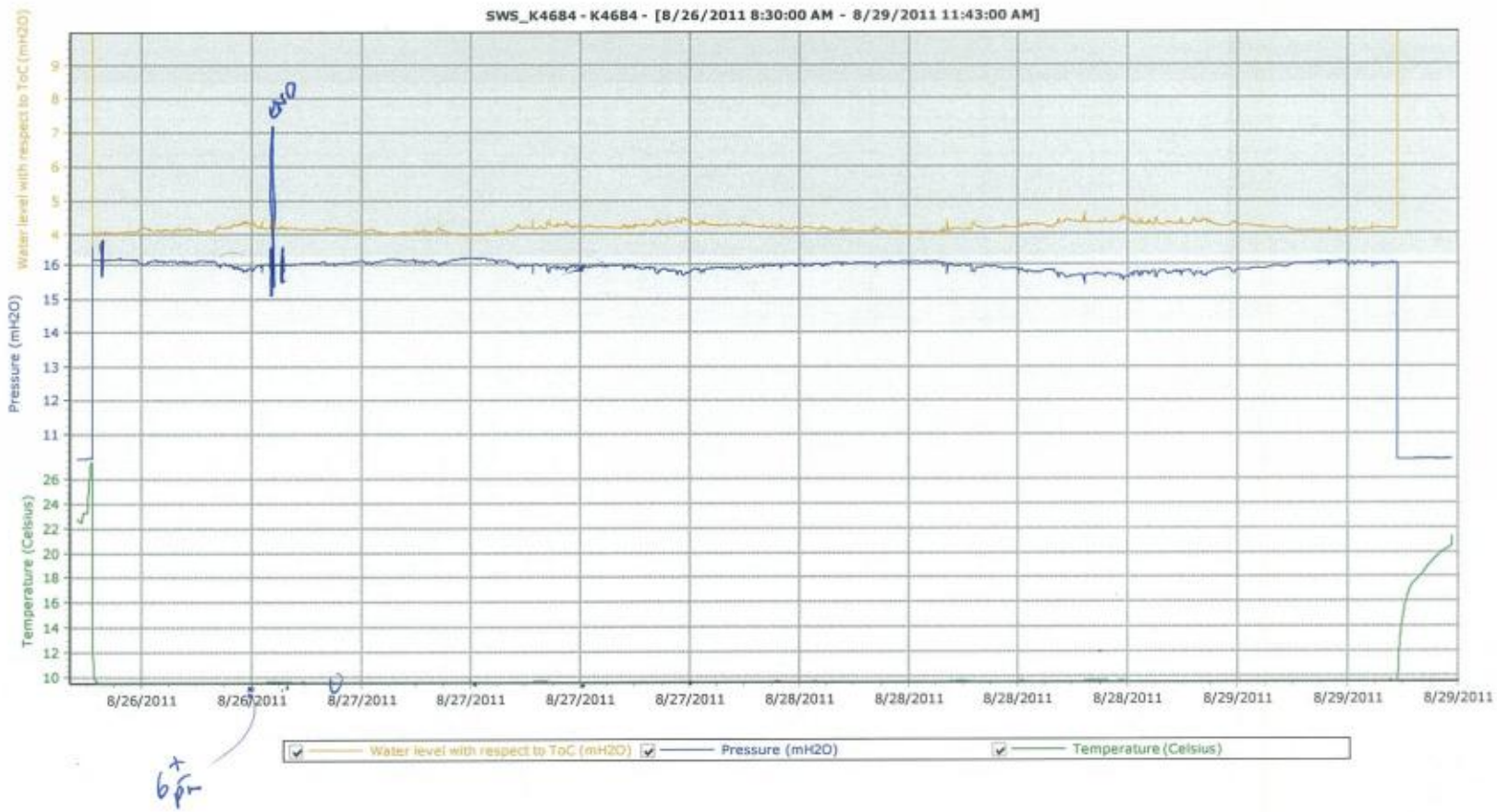


response

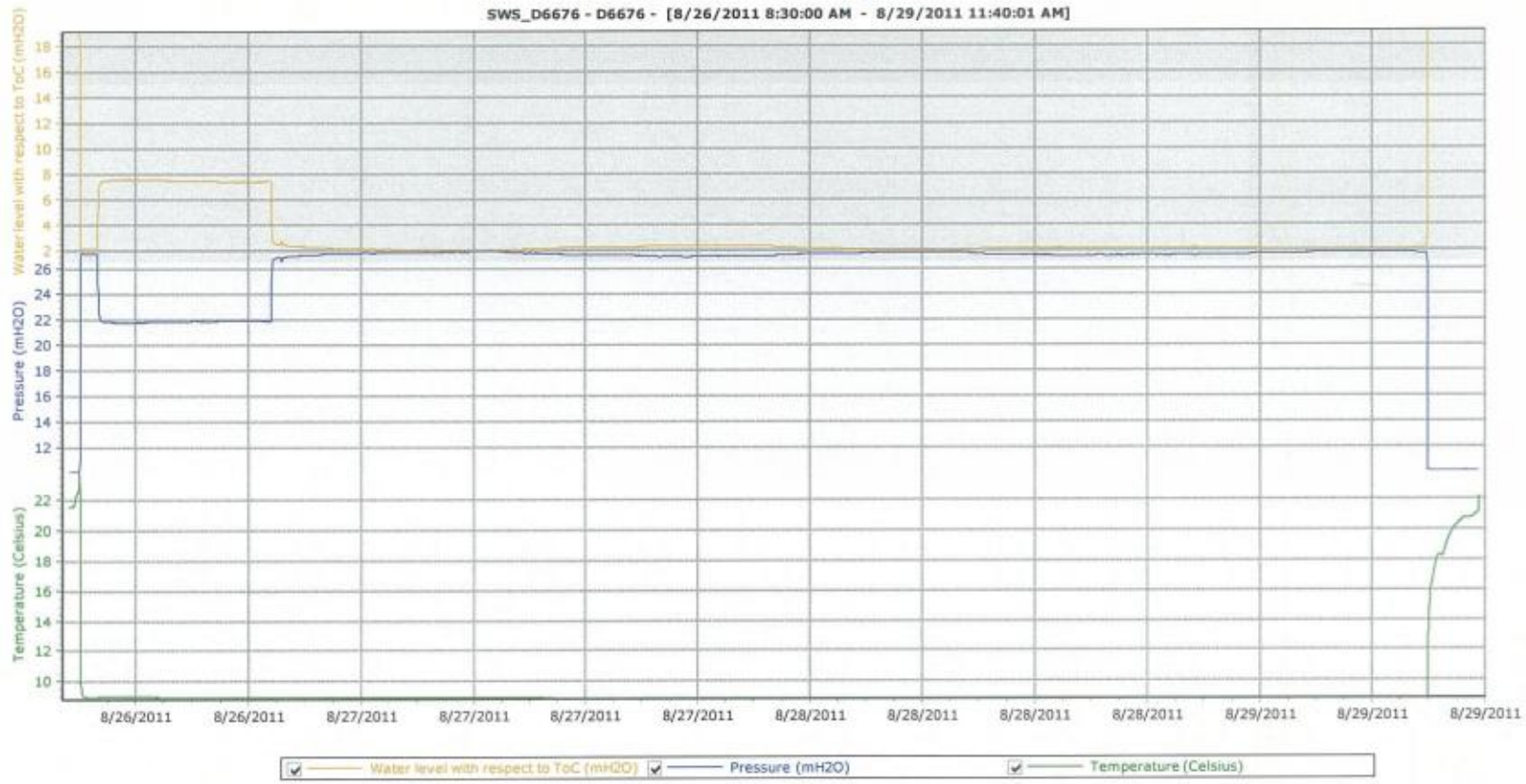
TW3.



#6 KING ST.


SWS_K4684 - K4684 - [8/26/2011 8:30:00 AM - 8/29/2011 11:43:00 AM]
Water level with respect to ToC (mH2O)
Pressure (mH2O)
Temperature (Celsius)
8/26/2011
8/26/2011
8/27/2011
8/27/2011
8/27/2011
8/27/2011
8/28/2011
8/28/2011
8/28/2011
8/28/2011
8/29/2011
8/29/2011
8/29/2011
Water level with respect to ToC (mH2O)
Pressure (mH2O)
Temperature (Celsius)
6 PT

Pumping Well (TW4)



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

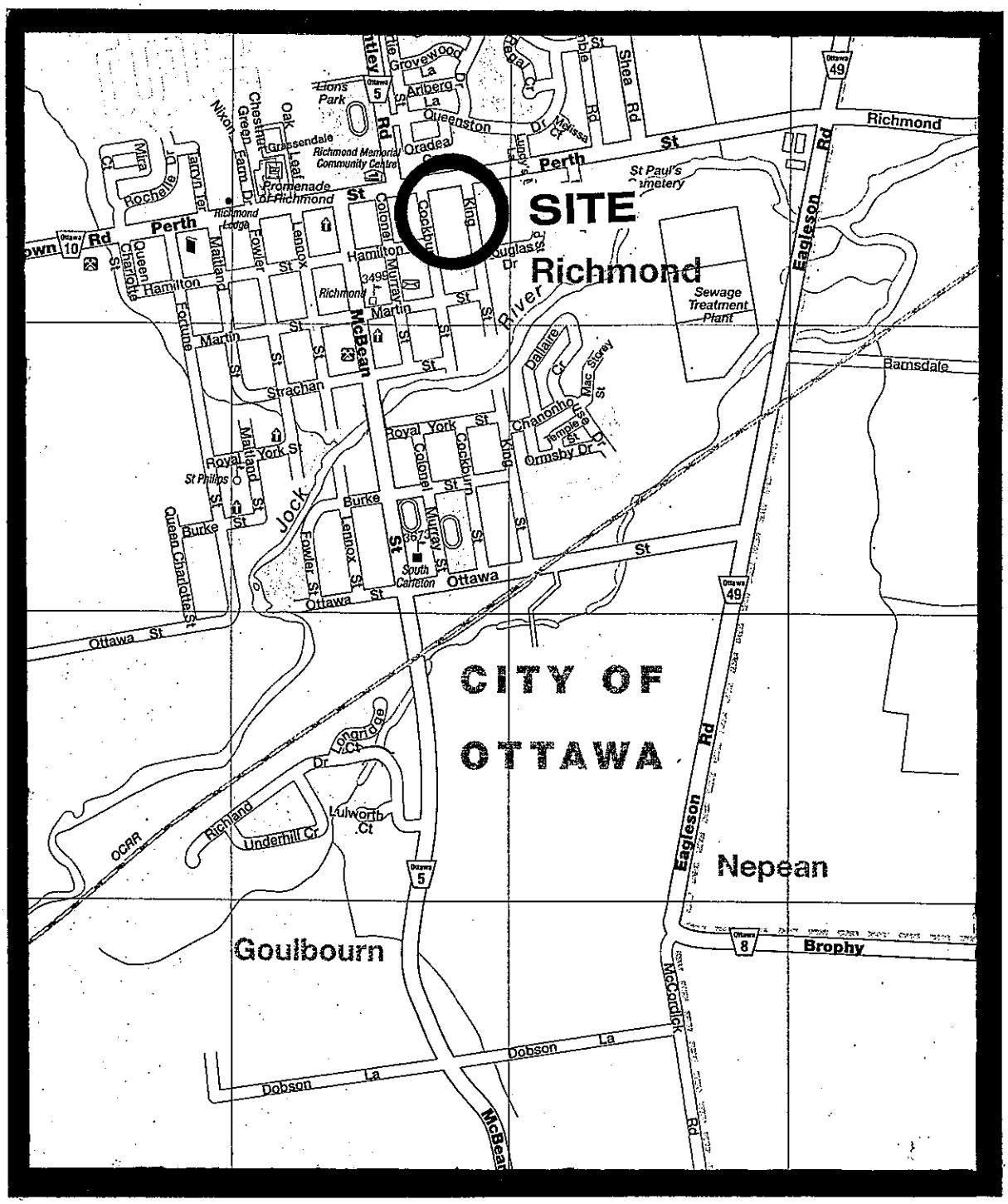


FIGURE 1

KEY PLAN

Client:

TALOS CUSTOM HOMES INC.

Consultant:

patersongroup
consulting engineers

Project:

PROPOSED RESIDENTIAL SUBDIVISION

10 KING STREET
OTTAWA (CUMBERLAND), ONTARIO

Drawing:

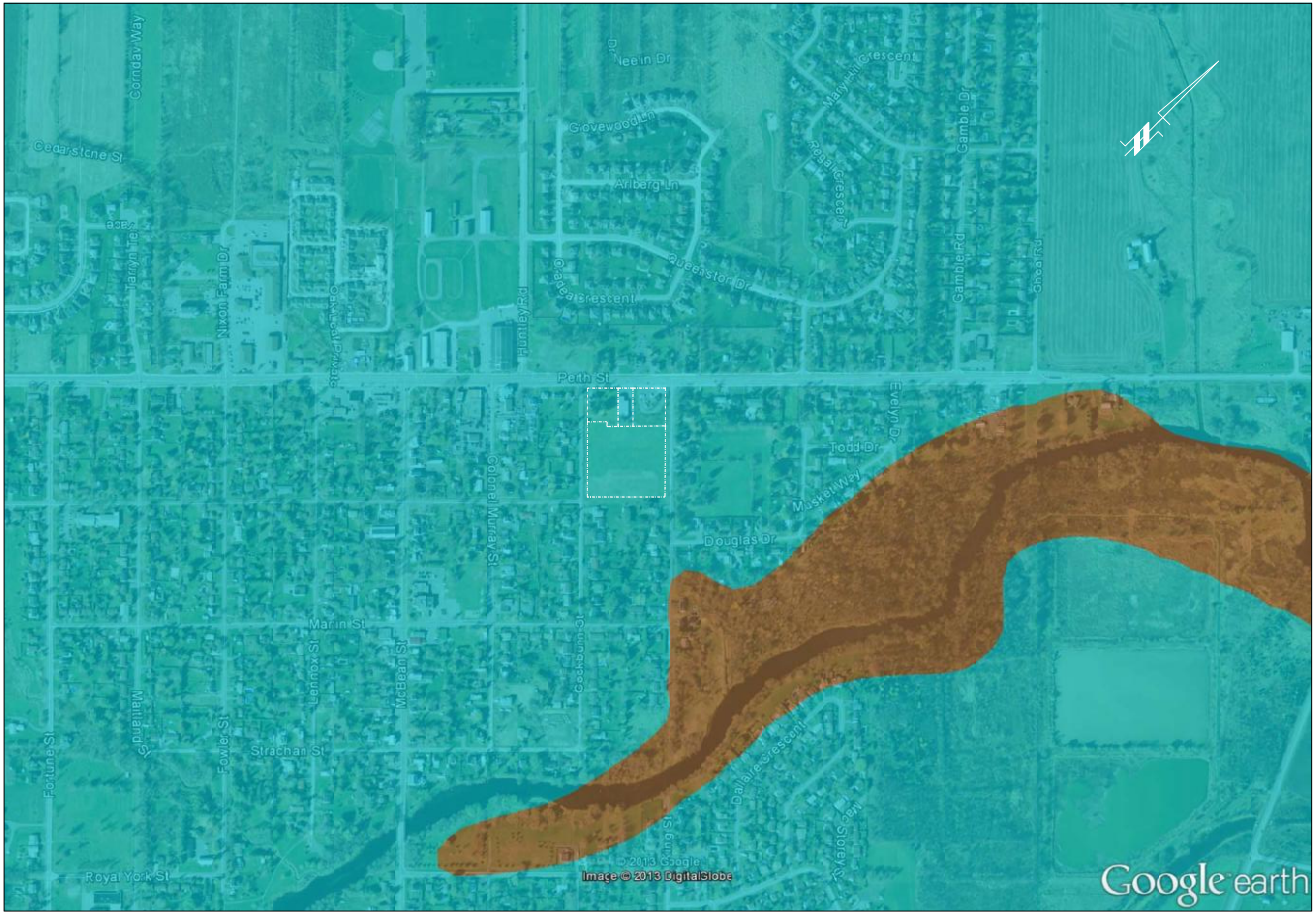
SITE LOCATION PLAN

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

Drawing No.:

PH1292-FIG.1

p:\autocad drawings\hydrogeology\ph12xx\ph1292\ph1292-figures.dwg



LEGEND:

- MODERN ALLUVIAL DEPOSITS
- FINE TEXTURED GLACIOMARINE DEPOSITS

Client:

TALOS CUSTOM HOMES INC.

Consultant:

patersongroup
consulting engineers

Project:

PROPOSED RESIDENTIAL SUBDIVISION

10 KING STREET
OTTAWA (CUMBERLAND), ONTARIO

Drawing:

SURFICIAL SOIL DELINEATION MAPPING

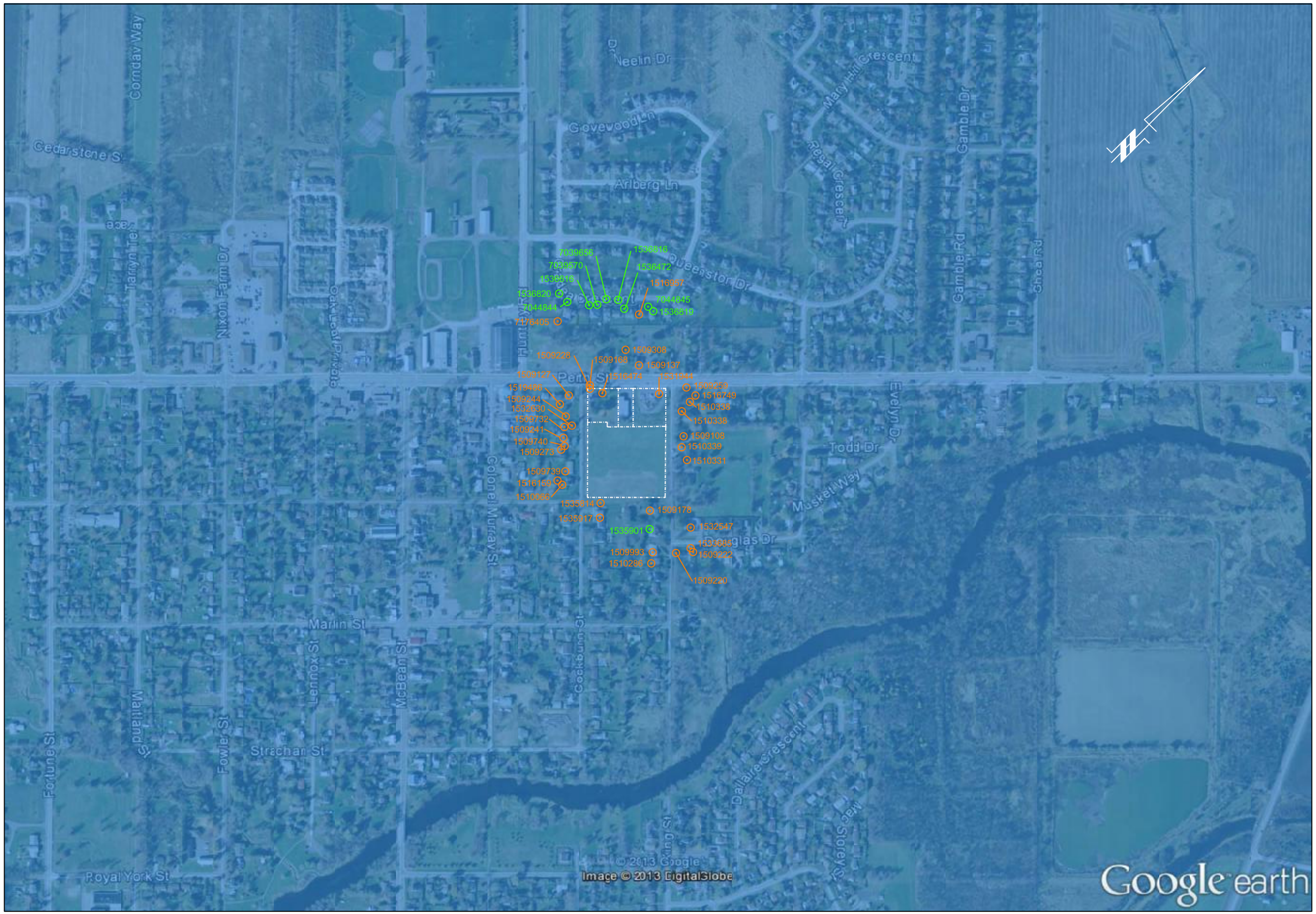
Scale: N.T.S.	Seal:
Date: 04/2013	
Drawn by: BA	
Checked by: RAP	
File: PH1292	

Drawing No.:

PH1292-FIG.2

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

p:\autocad drawings\hydrogeology\ph12xx\ph1292\ph1292-figures.dwg



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 INC.

Consultant:

patersongroup
consulting engineers

Project:

PROPOSED RESIDENTIAL SUBDIVISION

10 KING STREET
OTTAWA (CUMBERLAND), ONTARIO

Drawing:

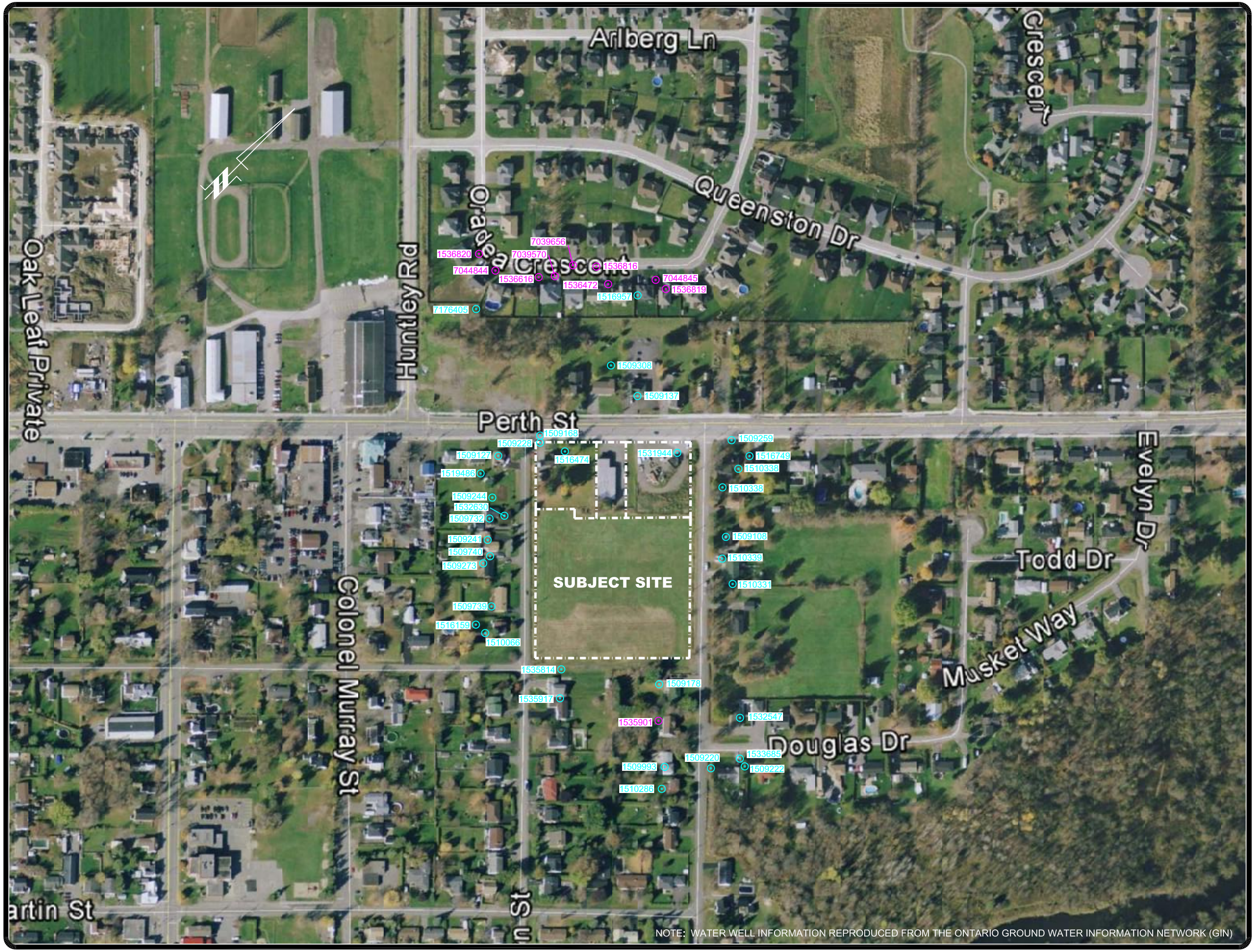
REGIONAL BEDROCK MAPPING

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

Drawing No.:

PH1292-FIG.3

p:\autocad drawings\hydrogeology\ph12xx\ph1292\ph1292-figures.dwg



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

LEGEND:

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 INC.

Consultant:

patersongroup
consulting engineers

Project:

PROPOSED RESIDENTIAL SUBDIVISION

10 KING STREET
OTTAWA (CUMBERLAND), ONTARIO

Drawing:

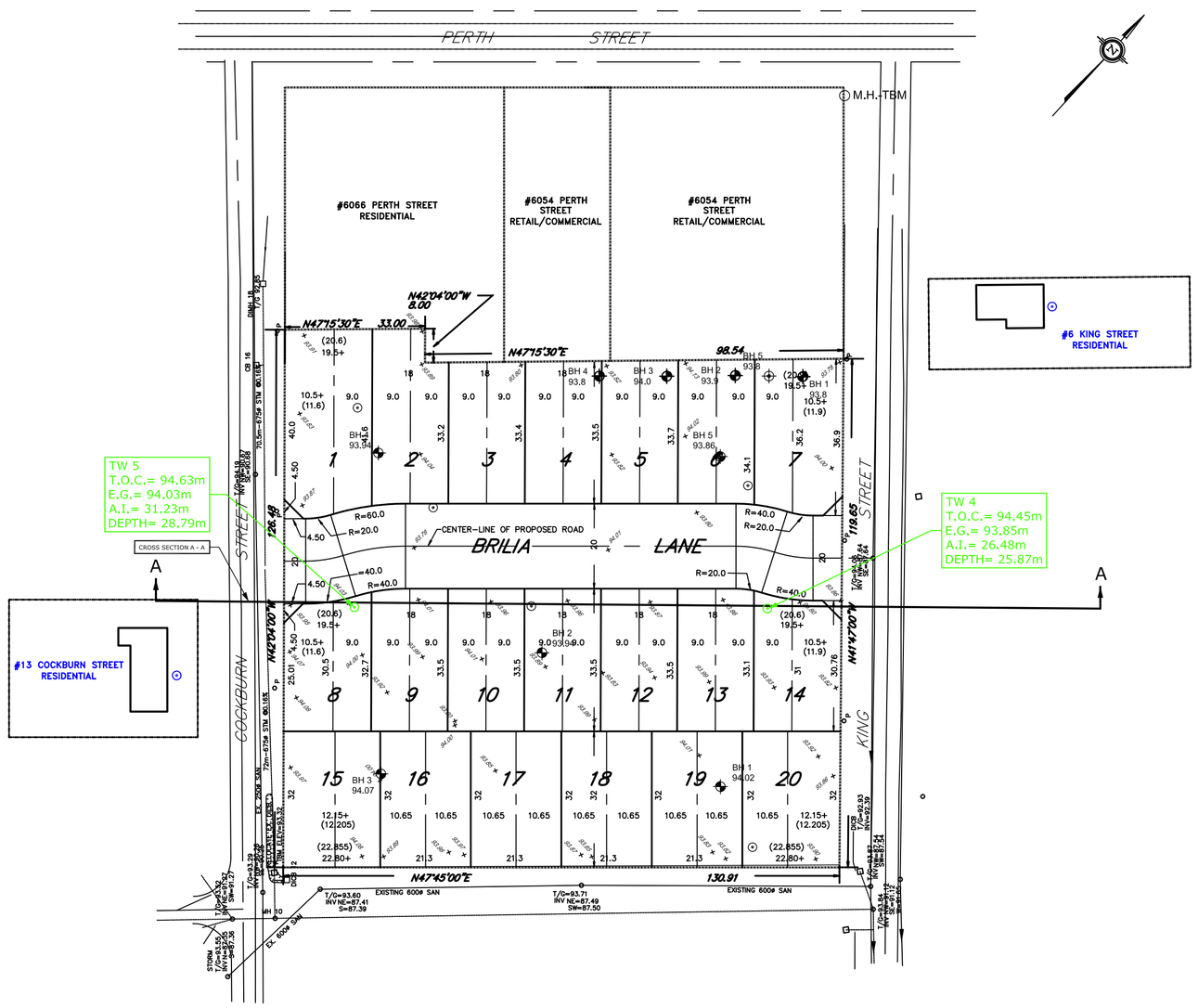
SURROUNDING WELL INFORMATION PLAN

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

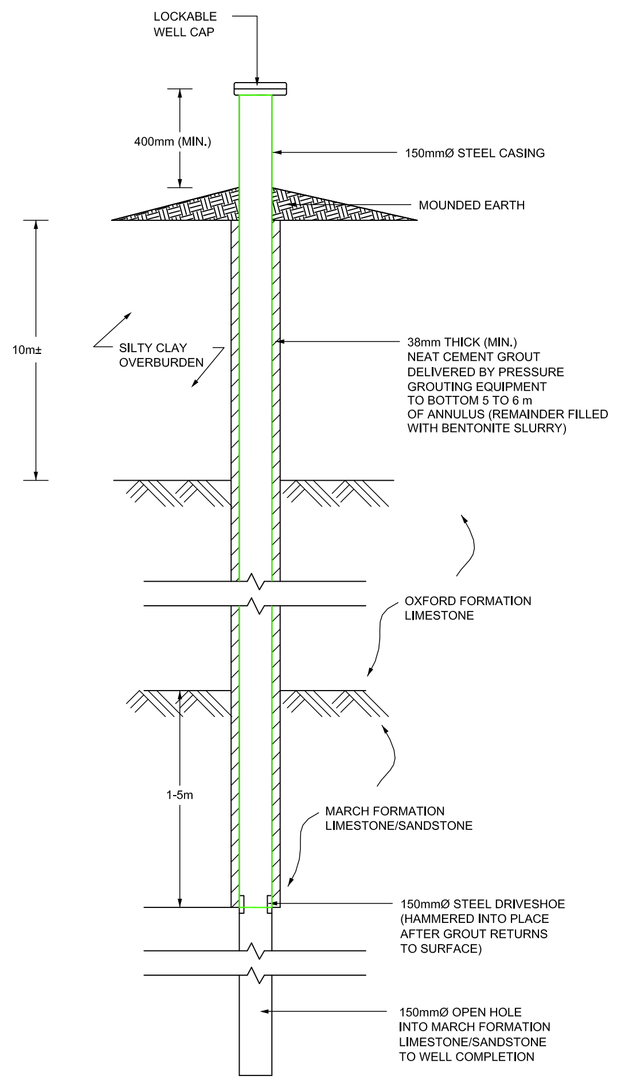
Drawing No.:

PH1292-FIG.4

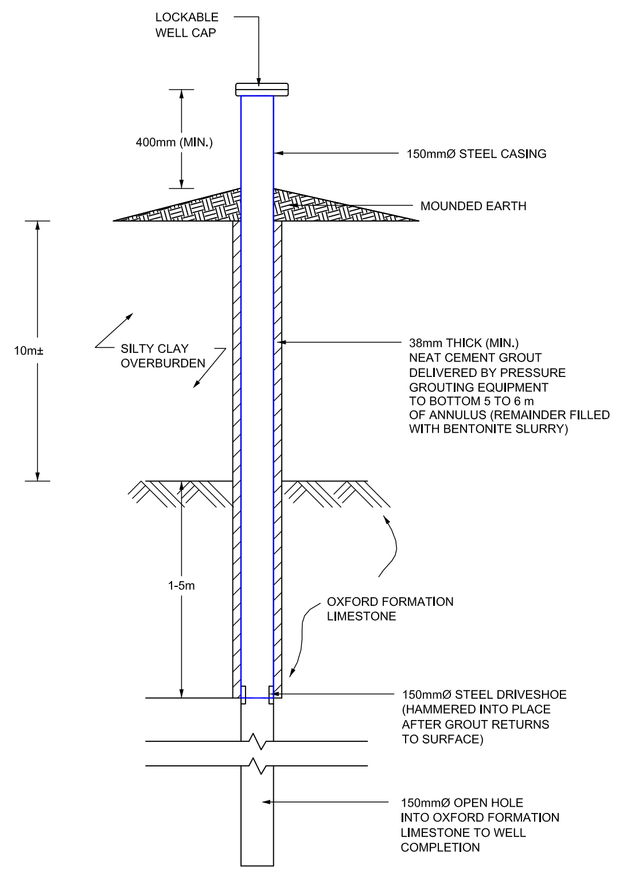
p:\autocad drawings\hydrogeology\ph12xx\ph1292\ph1292-figures.dwg



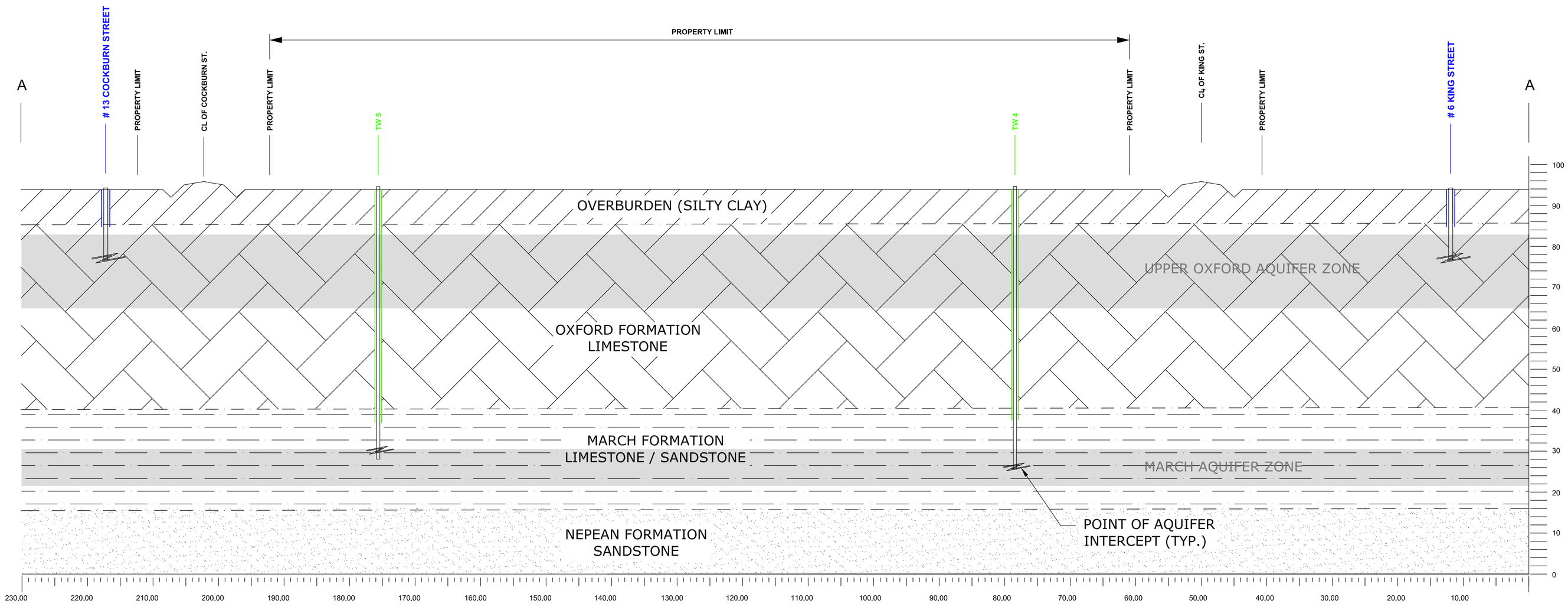
TEST WELL LOCATION PLAN



PREFERRED WELL CONSTRUCTION METHODOLOGY (ON SUBJECT SITE)



TYPICAL WELL CONSTRUCTION METHODOLOGY (IN THE AREA)



HYDROGEOLOGICAL CROSS-SECTION

NO.	DESCRIPTION	DATE

DESIGNED BY: RAP
DRAWN BY: BA
CHECKED BY: RAP
SCALE: 1:1250
DATE: 02/2012

CLIENT

TALOS CUSTOM HOMES INC.

PROJECT/LOCATION

PROPOSED RESIDENTIAL SUBDIVISION

11 KING STREET
OTTAWA (RICHMOND), ONTARIO

DRAWING

CONCEPTUAL HYDROGEOLOGICAL MODEL

DRAWING NO. **PH1292-PRE.01**

REVISION NO.

paterson group
consulting engineers
154 Colonnade Road South, Ottawa, Ontario K2E 7J5