2966 & 2978 Carp Road – Cheer Training Facility

Servicing and Stormwater Management Brief

Stantec

Prepared for:
Nautical Lands Group

Prepared by:
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1 Introduction

Stantec Consulting Ltd. has been commissioned by Nautical Lands Management Corporation to prepare the following Servicing and Stormwater Management Brief in support of the rezoning application for a proposed cheer training facility located at 2978 Carp Road and the residential dwelling with a municipal address of 2966 Carp Road, in the City of Ottawa, Ontario.

The approximately 1.3 ha site is situated southeast of the intersection of McGee Side Road and Carp Road, bounded by Carp Road to the Southwest, an undeveloped parcel to the North, and adjacent to a residential dwelling (2966 Carp Road) to the Southeast. The site is currently zoned as RC7 - Rural Commercial Zone. The key plan of the site is shown in **Figure 1.1** below. The intent of this brief is to demonstrate, to the City's satisfaction, that adequate services are available and can be allocated to support the proposal.

Figure 1.1: Key Plan of Site

The site currently consists of an existing 1,393.5 m^2 one-storey detached warehouse building, surface parking, and an existing 213.4m^2 residential dwelling with its associated landscaping area, well and septic system for servicing, and a dry pond to for stormwater management. The site currently has two asphalt

driveways with access to Carp Road in the Southwest. Nautical Lands Group has provided a topographic survey and site plan dated July 29, 2025, which is attached in **Appendix A** for more details about the existing site condition.

1.1 Objective

The objective of this servicing and stormwater management brief is to demonstrate that the existing site can accommodate the proposed demands associated with the new land uses. It is to be noted that given that the site is serviced with well and septic, the water and sanitary services have been assessed by Paterson Group in their Hydrogeological Assessment and Terrain Analysis, dated August 29, 2025, in support of this zoning application, and summarized herein.

Further, this brief confirms that the existing runoff coefficients and grading patterns are not being altered and confirms that the existing stormwater management design will not be impacted.

2 Background

Documents referenced in preparation of this stormwater and servicing report for the proposed 2966 & 2978 Carp Road site include:

- *Hydrogeological Assessment and Terrain Analysis – Re-zoning Application – 2966 and 2978 Carp Road, Ottawa(Carp), Ontario*, Paterson Group Consulting Engineers, August 29, 2025.
- *Servicing Report – 2978 Carp Road, Stantec, December 21, 2016.*

3 Water Servicing

3.1 Background

The subject site is located in an area of the City of Ottawa that requires private servicing to provide a sufficient water supply for domestic and emergency fire flow. The current storage building, as outlined in the rezoning application, is serviced by a private well located in the north portion of the site via a 19mm building service connection. The site is also equipped with precast concrete underground firewater storage tanks located in the southern portion of the site. The storage tanks receive water from the wells and are filled during off-peak hours.

Water Quantity and Quality Aquifer Analysis

Based on the *Hydrogeological Assessment and Terrain Analysis – Re-zoning Application – 2966 and 2978 Carp Road, Ottawa (Carp), Ontario,* by Paterson Group in August 2025, the existing well can provide water flow of approximately 21,600 L. This is approximately 3.2 times the maximum total daily design volume of effluent ((6,811 L/day) using 57% nitrate reduction required to support the Re-zoning Application. The 6,811 L/day is above the required flows as calculated under Part 8 – OBC for a subsequent application.

A water quality aquifer analysis has been completed by the Paterson Group and the following conclusions were noted:

- The preferred water supply intercepted by existing well contains a water supply that is potable and contains only elevated concentrations of hardness and total dissolved solids (TDS). The noted parameters can be treated with current readily available water conditioning equipment.
- Total Coliforms were detected at 4 ct/100 mL, as such, it is recommended that a UV system is installed to assist in the removal of any remnant Total Coliforms found in the groundwater, as a precautionary measure.
- If desired by the property owner, a residential grade water softener can be used to facilitate the reduction of the hardness concentration and reduce scaling. If a water softener is used for the proposed development, the owner should be made aware that additional sodium will be added to the water to reduce hardness. If desired, a point-of-use reverse osmosis system can be used to provide a drinking tap source without increasing sodium levels.
- It is recommended that either a point-of-use reverse osmosis system be used to reduce the TDS concentration, or bulk bottled water is provided as a drinking water source.

Detailed potable water aquifer analysis has been conducted by Paterson Group and is presented in the background report attached in **Appendix C.1**.

Fire Flow Calculation

Assessment of required fire flows for the existing site was originally prepared within the *Servicing Report - 2978 Carp Road* (Stantec, 2016). At the time, fire flows were determined according to the Ontario Building Code (OBC) compendium Appendix A-3.2.5.7. Based on background information supplied by the Owner, it appears that the existing building has a larger volume than that initially assumed by the 2016 Servicing Report. As such, a revised fire flow calculation is presented below to account for the building volume discrepancy and to respect the recent Technical Bulletin (IWSTB-2024-05) to the *Ottawa Design Guidelines – Water Distribution,* First Edition, dated July 2010 (City of Ottawa).

The required fire flow has been calculated based on design drawings for the prefabricated building with building heights measuring on average 7.37m and satisfying the 'non-combustible with fire resistance ratings' construction type as per OBC Appendix A-3.2.5.7.

where:

$$Minimum\ supply\ of\ Water\ (Litres) = Q = K \times V \times S_{TOT}$$

K = water supply coefficient
V = Total building volume in m3
S_{TOT} = Total of spatial coefficient values from property line exposures on all sides

This subject site is outside the municipal water service network which requires on-site fire flow storage. Three precast concrete fire flow storage tanks have been installed with an approximate capacity of 150,000L as the fire water supply. The estimated OBC fire flow is **5,400L/min (90L/s)** and requires a total storage volume of **174,658L**. It is anticipated an additional tank in conjunction with the installed three on-site fire water storage tanks would be sufficient in support of this re-zoning application. A detailed OBC fire flow analysis is provided in the **Appendix B**. Alternatively, if the building is retrofitted with a sprinkler system meeting requirements of NFPA 13, the existing fire water supply may be sufficient for the proposed redevelopment. Analysis of required fire flows is to be reassessed at site plan control to confirm the above.

4 Wastewater Servicing

Paterson Group has conducted a terrain analysis for the on-site septic system, which provides sanitary servicing for the existing storage building and residential building, as part of this rezoning application. The subject site is currently outside the City of Ottawa's sanitary collection system.

According to the *Hydrogeological Assessment and Terrain Analysis – Re-zoning Application – 2966 and 2978 Carp Road, Ottawa (Carp), Ontario* (Paterson Group, August 2025), the subject site is sufficient in size to accommodate two new sewage systems and meet all of the regulatory separation criteria. As a precautionary measure, a 30 m setback should be maintained between the drinking water well and any septic system components. In addition, the following conclusions were noted:

- A maximum sewage flow volume of **1.6 m3/day** at a nitrate concentration of 40 mg/L or **6.8 m3/day** at a nitrate concentration of 17.2 mg/L can be accommodated on the subject site based on the current layout and still be below the predictive nitrate concentration threshold of 10 mg/L at the property boundary.
- Onsite sewage disposal needs can be accommodated with a Class 4 Sewage System utilizing tertiary treatment technologies. A Sewage System Permit and Building Permit need to be issued prior to the commencement of construction on the proposed structures or amenities/services. The design and approval of the septic system will be completed as part of the SPA process.

5 Stormwater Management

5.1 Existing System

Stormwater Management (SWM) for the site was designed and constructed as part of the site development for the existing warehouse building, and it provides the required quantity and quality control for the site. In 2016, Stantec conducted a detailed stormwater management analysis for the current site, and the key analysis results are summarized below.

- The grading design incorporates emergency overland flow routes in compliance with the City of Ottawa's stormwater management standards. These routes are intended to safely convey runoff from storm events exceeding the 100-year design threshold toward the eastern portion of the site, where existing major drainage systems are located.

- On-site storage and infiltration was incorporated in the design of the dry pond as the best approach to manage site runoff so as to not increase the total uncontrolled runoff from the site.

- The existing On-site Dry Pond controls post-development storm runoff to below pre-development target release rates through infiltration of all storm events up to and including the 100-year storm event. **Table 5.3** below summarizes the storage and outflow characteristics for the dry pond

Table 5.1: Pond Storage and Outflow Characteristics

ID	100-Year Discharge (L/s) (Infiltration)	100-Year Storage Required (m^3)	Available Storage (m^3)
Pond	9.8	385.3	389.6

- On-site quality control with a minimum target of 70% TSS removal was established with a treatment train approach as per the requirements of MVCA. The grading design allows most of the surface runoff to flow through grassed areas for an initial infiltration and treatment of TSS. In addition, a vegetated buffer was incorporated around the dry pond to achieve a minimum 70% TSS removal efficiency as per the US EPA design manual for Low Impact Development (LID). As all pond outflow is through infiltration, site overall TSS removal rates would also achieve 80% TSS reduction to meet Enhanced criteria without additional modification.

The design was approved to meet the City of Ottawa Design Criteria and has received an Environmental Compliance Approval (Number: 9196-AQBQZV) on October 6, 2017 from the MECP. As there are no proposed increases to impervious areas on -site, it is anticipated that the existing SWM facility will be maintained to service the proposed use without additional modifications. Detailed SWM analysis is included in the *Site Servicing Report for 2978 Carp Roa*d included in **Appendix C.2**.

6 Conclusion

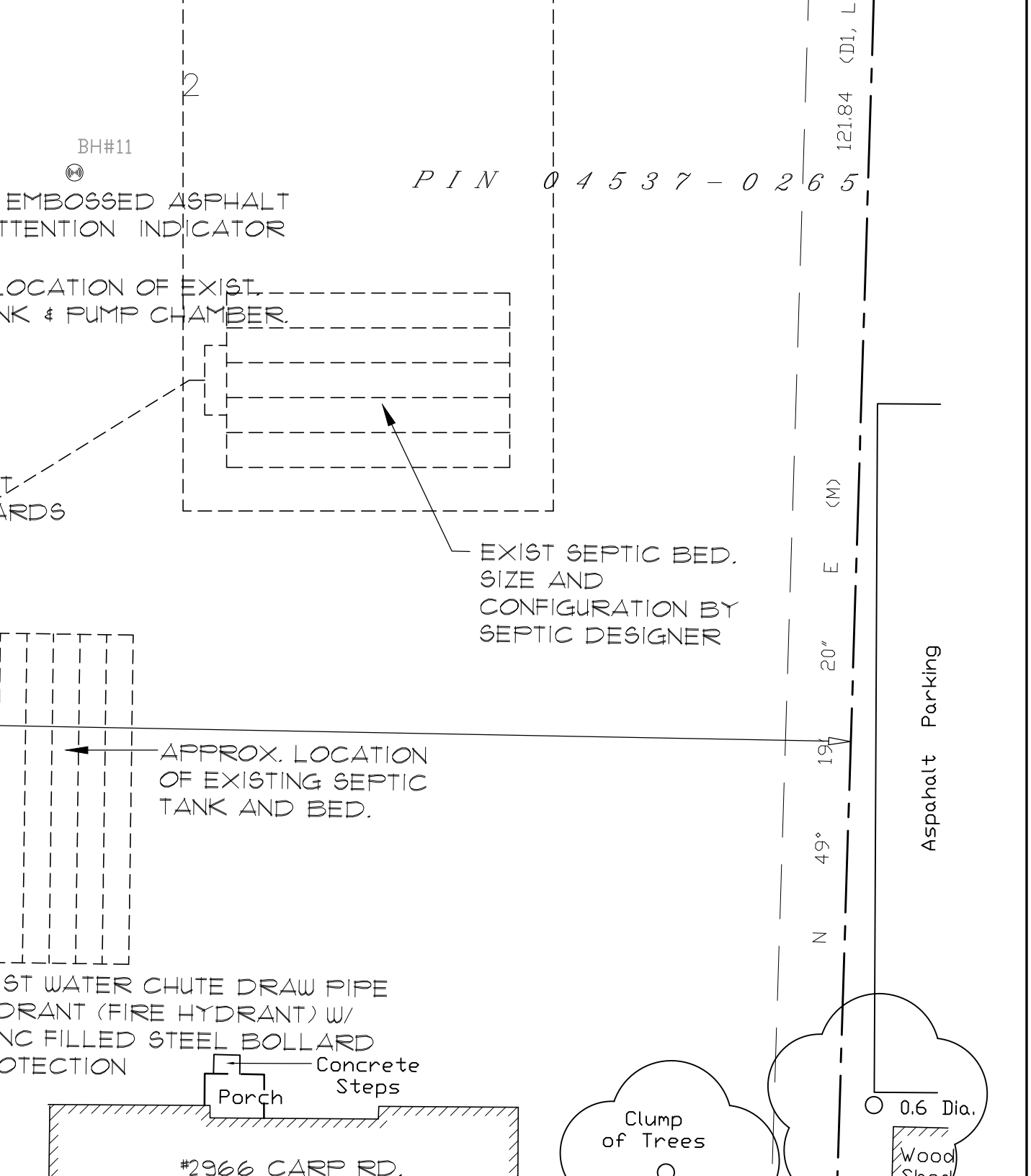
The water supply aquifer underlying the subject site is considered to be a sufficient water supply for domestic demands. The existing well contains supply that is potable and can be treated to reduce the elevated concentration of hardness and TDS, including total coliforms as a precautionary measure. The treatment can be easily accomplished with water softener, osmosis filter, and UV system. The existing fire flow storage can be expanded to accommodate the required fire flow for the development per OBC requirements.

The site is currently serviced by an on-site sewage system, which will need to be replaced with a new sewage system and meet all the regulatory separation criteria. Onsite sewage disposal needs can be accommodated with a Class 4 Sewage System utilizing tertiary treatment technologies. A Sewage System Permit and Building Permit needs to be issued prior to the commencement of construction on the proposed structures or amenities/services. The design and approval of the septic system will be completed as part of the SPA process.

The existing previously approved and constructed stormwater management system including an on-site dry pond and infiltration basin was designed and constructed to meet target discharge rates for all rainfall events up to and including the 100-year event. The system also provides sufficient quality control to meet 70% TSS removal criteria, although it can be immediately seen that the design would also meet an ‘Enhanced’ 80% TSS criteria given infiltration of all received runoff for up to the 100-year design storm event. Given that the existing runoff coefficients and grading patterns are not being altered, the existing stormwater management design will not be impacted, and is proposed to be maintained without additional modifications.

Appendices

Appendix A Topographic Survey


BH#11
EMBOSSED ASPHALT
TTENTION INDICATOR
PIN 04537-0265
121.84 (D1, L
LOCATION OF EXIST.
NK & PUMP CHAMBER.
ARDS
EXIST SEPTIC BED.
SIZE AND
CONFIGURATION BY
SEPTIC DESIGNER
20' E (M)
APPROX. LOCATION
OF EXISTING SEPTIC
TANK AND BED.
N 49° 19
Asphalt Parking
ST WATER CHUTE DRAW PIPE
DRANT (FIRE HYDRANT) W/
NC FILLED STEEL BOLLARD
OTECTION
Concrete
Steps
Porch
#2966 CARP RD.
Clump
of Trees
0.6 Dia.
Wood

Appendix B OBC Fire Flow Calculation

Fire Flow Calculations as per Ontario Building Code 2024 (Appendix A)

Job#	160401271	Designed by:	ZW
Date	16-Sep-25	Checked by:	DT

$Q = KVS_{tot}$

Q = Volume of water required (L)
V = Total building volume (m3)
K = Water supply coefficient from Table 1
S_{tot} = Sotal of spatial coefficeint values from property line exposures on all sides as obtained from the formula

$S_{tot} = 1.0 + [S_{side1} + S_{side2} + S_{side3} + S_{side4}]$

1	Type of construction	Building Classification		Water Supply Coefficient
	Non-Combustible with Fire-Resistance Ratings	E, F-2		17
2	Area of one floor (m^2)	number of floors	height of ceiling (m)	Total Building Volume (m^3)
	1394	1	7.37	10,274
3	Side	Exposure Distance (m)	Spatial Coefficient	Total Spatial Coeffiecient
	North	14.5	0	1
	East	28.4	0	
	South	30	0	
	West	45.4	0	
4	Established Fire Safety Plan?	Reduction in Volume (%)		Total Volume Reduction
	no	0%		0%
5				**Total Volume 'Q' (L)**
				174,658
				Minimum Required Fire Flow (L/min)
				5,400

*NOTE: North spatial coefficient reduced to 0 as the north exterior building wall maintains a fire rating of 2.0h or more and has no unprotected openings.

Based on fire separation as provided on the site plan
Average height of 6.0m assumed.

Appendix C Background Reports

C.1 *Water Hydrogeological Assessment and Terrain Analysis – Re-zoning Application – 2966 and 2978 Carp Road, Ottawa(Carp), Ontario*, Paterson Group Consulting Engineers, August 29, 2025.

PATERSON GROUP

Consulting Engineers
9 Auriga Drive
Ottawa, Ontario
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Geotechnical Engineering
Environmental Engineering
Hydrogeology
Materials Testing
Building Science
Rural Development Design
Retaining Wall Design
Noise and Vibration Studies

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August 29, 2025

PH5103-LET.01

Nautical Lands Group
555 Legget Drive,
Tower A, Suite 920
Kanata, Ontario
K2K 3B8

Attention: Angela Mariani

Subject: **Hydrogeological Assessment and Terrain Analysis**
Re-zoning Application
2966-2978 Carp Road
Ottawa (Carp), Ontario

INTRODUCTION

Paterson Group Inc. (Paterson) was retained by Nautical Lands Group to conduct a Hydrogeological Assessment and Terrain Analysis in support of a Re-zoning Application for a proposed cheer academy located at 2960-2978 Carp Road in Ottawa (Carp), Ontario. It is our understanding that the current property, identified as the parcel with address 2966 Carp Road (GeoOttawa, 2025), consists of a 1.28 hectares (ha) parcel with an existing dwelling in the southern portion of the site. The proposed Re-zoning application aims to change the zoning of the 1.28 ha parcel that is designated as Rural Commercial (RC7) to include Instructional Facility. For specific planning details, please refer to the consultant report application package. Please refer to the Key Plan attached for the approximate site location.

The purpose of this work has been to determine the suitability of the water supply aquifer underlying the site and to carry out a sewage system impact assessment (terrain analysis) to determine the site's suitability for private on-site sewage systems. Specifically, the intent of the report is to determine the quality and quantity of water underlying the subject site, as well as to provide the maximum sewage flow volume which the subject site can support from a nitrate attenuation standpoint.

BACKGROUND

Subject Site

The subject property consists of a warehouse with associated landscaped areas and parking lots, and a residential dwelling with associated landscaped areas and driveways located at 2966 and 2978 Carp Road in the City of Ottawa (Carp), Ontario. The ground surface across the site is relatively flat, with a general downslope direction to the east. The general overburden groundwater flow direction is assumed to be north to northeast towards the Carp River.

The Carp Road corridor and buildings onsite are serviced by private services. The site is bordered to the northeast and northwest by undeveloped lands, to the southwest by Carp Road, followed by residential properties, and to the southeast by a commercial property.

The subject site is largely rectangular in shape with a total area of 1.28 ha. The site is currently zoned as RC7 (Rural Commercial). The land parcels to the north and east are zoned RC9 (Rural Commercial), and the residential properties to the west are zoned RR5 (Rural Residential Zone).

Regional Geology

Published surficial geology mapping (OGS MRD128) for the area in the vicinity of the subject site indicates that the subject site is underlain predominantly by stone-poor silty sand to sandy silt-textured till on Paleozoic Terrain.

Published bedrock geology mapping (OGS MRD219) indicates that the subject lands are underlain by limestone and shale of the Simcoe Group and Verulam Formation. The available bedrock mapping coincides with the well driller's description on the Ministry of the Environment, Conservation and Parks (MECP) Water Well Records (WWR) for the surrounding well supplies installed within the subject area, which generally indicate a grey limestone.

Karst Mapping

Published karst mapping (OGS GRS005) for the area indicated that the subject site is not within a potential or inferred karst area.

MISSISSIPPI-RIDEAU SOURCE PROTECTION PLAN

The Mississippi-Rideau Source Protection Plan (MRSPP) provides guidance as to which policies apply to a given property, municipality or specific activity and if there are specific designations that apply to the area. The subject site has been designated as a Highly Vulnerable Aquifer (HVA within the MRSPP) and a Significant Groundwater Recharge Area (SGRA) and is identified as two of the four groundwater related vulnerable areas identified within the Clean Water Act (2006). The four vulnerable areas consists of HVA, SGRA, Intake Protection Zones (IPZ), and Wellhead Protection Areas (WHPA).

Based upon the designation, there are no restrictions of land uses on the subject site based upon its proposed usage. Therefore, there are no related requirements for an HVA or SGRA at this location.

Hydrogeological Pre-Consultation

A City of Ottawa pre-consultation was completed on August 27, 2025 to discuss the requirements for the hydrogeological assessment and terrain analysis of the subject site. Initial discussions were completed by email prior to the meeting.

FIELDWORK PROGRAM

Well Testing

As a means to demonstrate the adequacy of the aquifer underlying the subject lands, with respect to water quality and quantity, the existing drilled well (TW1) servicing the existing warehouse was tested. TW1 has a Water Well Record (WWR) Well ID of A212621. TW1 has a 150 mm diameter steel casing that extends to 6.82 m bgs with a 0.45 m stick up. The well itself extends to a depth of 58.9 m bgs. According to the water well record, limestone bedrock was recorded at a depth of approximately 4.34 m bgs. Based on available geological mapping, the drift thickness at TW1 varies from 2 to 3 m.

As a means to evaluate the water supply aquifer intercepted by the well, the well was subjected to a 8-hour constant rate pumping test. The pumping test was conducted on March 22, 2022 under the full-time supervision of Paterson personnel. Prior to the pumping test a data-logger was installed to monitor the background groundwater levels.

The existing submersible pump was used for the 8-hour pumping test. A licensed water well technician (Air Rock) completed the necessary plumbing related activities. The discharge line was placed at a sufficient distance to ensure that the discharge water was being directed away from the well and the septic system onsite. Upon completion of the test, the system was returned to its normal configuration.

The pumping test was carried out at a pumping rate of 45 L/min for a duration of 8 hours. During the pumping test, the pumping rate was periodically measured using the timed volume correlation method. The pumping rate was maintained within 5% of the selected

pumping rate. The static water level was recorded manually and an electric datalogger (VanEssen TD-Diver) was installed in the test well prior to the start of the pumping test.

The data logger recorded water levels at 30 second intervals. In addition, manual water level readings were taken at periodic intervals during the test.

Recovery data was collected from the well following the completion of the pumping. The well was noted to have achieved 100% recovery approximately 1 minute after the completion of pumping.

Groundwater samples were collected at 4 hours and 8 hours after the start of pumping. Prior to collection of the groundwater samples, the free chlorine residual was verified as non-detectable. The water samples were submitted for comprehensive testing of bacteriological, chemical, and physical water quality parameters consistent with the standard “Subdivision Supply” suite of parameters plus trace metals along with Volatile Organic Compounds (VOCs).

All samples were collected unfiltered and unchlorinated and were placed directly into clean bottles supplied by the analytical laboratory. Samples were placed immediately into a cooler with ice and were transported directly to Environmental Testing Canada Inc.(Eurofins) laboratory in Ottawa. All samples were received by the laboratory within 24 hours of collection.

A series of field tests of the pumped water were carried out at the well head during the 8-hour pumping test. The parameters tested at the well head included: pH, total dissolved solids, conductivity, turbidity, apparent colour, and temperature. Calibration / confirmation of calibration of all field-testing equipment was performed in Paterson’s laboratory the day prior to the pumping test. Values are then confirmed again onsite prior to the start of the pumping test.

Total coliforms were detected in the analytical testing of TW1 during the pumping test at 19 ct/100 mL (TW1-GW1) in the sample taken 4 hours into the pumping test and at 23 ct/100 mL (Tw1-GW2) at 8 hours into the pumping test.

Paterson personnel went to site on April 1, 2022 to disinfect TW1 as per the Ministry of the Environment, Conservation and Parks (MECP) disinfection instruction sheet, attached. The existing submersible pump was used to circulate the water column ion order to ensure proper mixing of the disinfectant. Paterson personnel confirmed the presence and adequate mixing of the disinfectant.

On April 4, 2022, Paterson personnel confirmed the presence of free chlorine within the well water. The well was purged using the existing submersible pump to remove residual free chlorine prior to obtaining a bacteriological sample. The discharge locations were placed at a sufficient distance to ensure that the discharge water was being directed away from the wellhead.

TW1 was pumped for 8 hours at a rate of approximately 15 L/min. Paterson personnel confirmed that the free chlorine residual was 0 mg/L prior to the collection of the bacteriological sample (GW1) at the end of 8 hours of purging the well.

All samples were collected unfiltered and unchlorinated and were placed directly into clean bottles supplied by the analytical laboratory. Sampled were placed immediately into a cooler with ice and were transported directly to the Eurofins Environmental Testing Canada Inc. (Eurofins) laboratory in Ottawa. All samples were received by the laboratory within 24 hours of collection.

Total Coliforms were reported as 4 ct/100 mL in the analytical testing of TW1 after the disinfection process. E. Coli was found to be non-detect as per the original results.

Aquifer Analysis

Water Quantity

Pumping test data was analyzed using AQTESOLV Pro Version 4 aquifer analysis software package by HydroSOLVE Inc. Drawdown data was measured using an electronic water level tape and an electronic datalogger unit.

Table 1: SUMMARY OF WATER SUPPLY AQUIFER CHARACTERISTICS OF TW1

AQUIFER PARAMETER	RESULT OF ANALYSIS
Transmissivity (m^2/day)	1,224
Pumping Rate (L/min)	45
Pre-test Static Water Level (m BTOC)	3.20
Post-test Static Water Level (m BTOC)	3.26
Maximum Drawdown (m BTOC)	3.34
Available Drawdown (m)	55.7
% Drawdown During Pumping Test (%)	0.3
Specific Capacity (L/min/m drawdown)	321

The drawdown data was analyzed using the Theis and Cooper Jacob methods of analysis. Aquifer transmissivity is estimated to be 1,224 m^2/day. Refer to the Theis and Cooper Jacob methods of analysis data sheets attached to this report.

The pumping test results show that TW1 has a high yield to support the water demands that may be required. Overall maximum drawdown at a constant pumping rate for a period of 8 hours was approximately 0.14 m (0.3% of the available drawdown), but only 0.06 m at the end of the test period. 95% recovery was achieved approximately one minute after the end of pumping. It should be noted that the water level was measured to be increasing throughout the 8-hour constant rate pumping test.

The total volume of water pumped during the 8-hour pumping event was approximately 21,600 L. This is approximately 3.2 times the maximum total daily design volume of effluent (6,811 L/d) using 57% nitrate reduction required to support the Re-zoning Application. Further discussion in the Terrain Analysis notes an additional technology that can support greater than 10,000 L/day, however the 6,811 L/day is above the required flows as calculated under Part 8 – OBC for a subsequent application.

The suitability of the aquifer to support the proposed Re-zoning application was assessed using the methodology provided in the City of Ottawa Hydrogeological and Terrain Analysis Guidelines (HTAG).

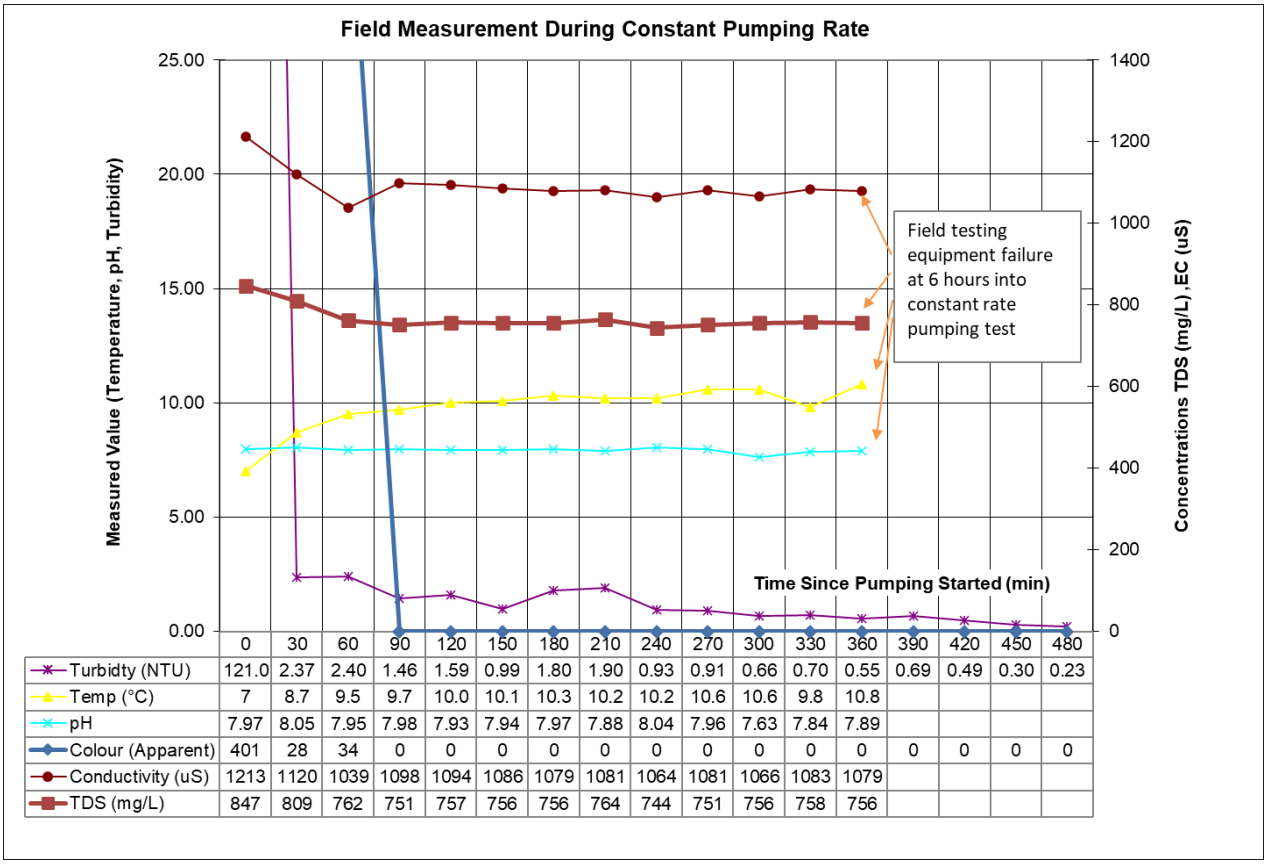
Based on the information summarized in Table 1, it is readily apparent that the water supply well has intercepted an adequately strong water supply aquifer which has sufficient quantity to service the proposed zoning usage.

Given the analyses presented and summarized above, it is our opinion that there is an adequate supply of water to support the proposed Application.

Water Quality

Field Data

Turbidity, electrical conductivity, total dissolved solids (TDS), pH, true color and temperature were measured at the wellhead during the pumping test. The measurements and time intervals for each of these parameters are summarized on the graphical representation below. In addition, a HACH Pocket Colorimeter II chlorine reader was used to measure the free chlorine residual level. No chlorine residual was detected in the discharged water prior to the collection of the water samples. During the constant rate pumping test, the field-testing equipment which tests for pH, TDS, EC, and temperature malfunctioned at the 6-hour point. These parameters were noted to have stabilized prior to the malfunction of the equipment.



	0	30	60	90	120	150	180	210	240	270	300	330	360	390	420	450	480
Turbidty (NTU)	121.0	2.37	2.40	1.46	1.59	0.99	1.80	1.90	0.93	0.91	0.66	0.70	0.55	0.69	0.49	0.30	0.23
Temp (°C)	7	8.7	9.5	9.7	10.0	10.1	10.3	10.2	10.2	10.6	10.6	9.8	10.8				
pH	7.97	8.05	7.95	7.98	7.93	7.94	7.97	7.88	8.04	7.96	7.63	7.84	7.89				
Colour (Apparent)	401	28	34	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Conductivity (uS)	1213	1120	1039	1098	1094	1086	1079	1081	1064	1081	1066	1083	1079				
TDS (mg/L)	847	809	762	751	757	756	756	764	744	751	756	758	756				

Laboratory Data

The Subdivision Package suite of parameters and trace metals laboratory water quality obtained from the pumping test of TW1 is provided in Table 2a, 2b, and 2c below and the laboratory analyses reports can be found attached. All laboratory test results can be found attached to this report.

TABLE 2a: GROUNDWATER MICROBIOLOGY & GENERAL GEOCHEMISTRY

PARAMETER	UNITS	ODWS		TW1		
		LIMIT	TYPE	GW1 (4 hr) 2022-03-22	GW2 (8 hr) 2022-03-22	GW1 2022-04-04
MICROBIOLOGICAL						
Escherichia Coli (E.Coli)	ct/100mL	0	MAC	0	0	0
Total Coliforms	ct/100mL	0	MAC	19	23	4
GENERAL CHEMICAL - HEALTH RELATED						
Fluoride (F)	mg/L	1.5	MAC	<0.10	<0.10	-
Ammonia (N-NH_3)	mg/L	-	-	<0.010	<0.010	-
Nitrite (N-NO_2)	mg/L	1	MAC	<0.10	<0.10	-
Nitrate (N-NO_3)	mg/L	10	MAC	3.15	3.02	-
Total Kjeldahl Nitrogen	mg/L	-	-	0.25	0.48	-
Turbidity (Field)	NTU	1.0 (5.0)	MAC/AO	0.93	0.23	-
Turbidity (Laboratory)	NTU	1.0 (5.0)	MAC/AO	0.50	0.50	-
GENERAL CHEMICAL - AESTHETIC RELATED						
Alkalinity (as CaCO3)	mg/L	30-500	OG	251	243	-
Chloride (Cl)	mg/L	250	AO	135	142	-
Colour	TCU	5	AO	<2	<2	-
Colour (Field - Apparent)	TCU	5	AO	0	0	-
Conductivity	uS/cm	-	-	1,180	1,180	-
Dissolved Organic Carbon	mg/L	5	AO	2.40	2.40	-
Hardness (as CaCO3)	mg/L	100	OG	454	451	-
Ion Balance	unitless	-	-	0.97	0.97	-
pH	unitless	6.5-8.5	AO	7.95	7.93	-
Phenols	mg/L	-	-	<0.001	<0.001	-
Sulphate (SO_4)	mg/L	500	AO	182	175	-
Sulphide (S_2^-)	mg/L	0.05	AO	<0.01	<0.01	-
Tannin & Lignin	mg/L	-	-	1.00	1.00	-
Total Dissolved Solids	mg/L	500	AO	767	767	-

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

TABLE 2b: GROUNDWATER GEOCHEMISTRY - METALS					
PARAMETER	UNITS	ODWS		TW1	
		LIMIT	TYPE	GW1 (4 hr) 2022-03-22	GW2 (8 hr) 2022-03-22
Volatiles					
Aluminum (Al)	mg/L	0.1	OG	<0.01	<0.01
Antimony (Sb)	mg/L	0.006	IMAC	<0.0005	<0.0005
Arsenic (As)	mg/L	0.01	IMAC	<0.001	<0.001
Barium (Ba)	mg/L	1.0	MAC	0.12	0.12
Beryllium (Be)	mg/L	-	-	<0.0005	<0.0005
Boron (B)	mg/L	5.0	IMAC	0.04	0.04
Cadmium (Cd)	mg/L	0.005	MAC	<0.0001	<0.0001
Calcium (Ca)	mg/L	-	-	162	161
Chromium (Cr)	mg/L	0.05	MAC	<0.001	<0.001
Cobalt (Co)	mg/L	-	-	<0.0002	<0.0002
Copper (Cu)	mg/L	1.0	AO	<0.001	<0.001
Iron (Fe)	mg/L	0.3	AO	<0.03	<0.03
Lead (Pb)	mg/L	0.01	MAC	<0.001	<0.001
Magnesium (Mg)	mg/L	-	-	12	12
Manganese (Mn)	mg/L	0.05	AO	<0.01	<0.01
Mercury (Hg)	mg/L	0.001	MAC	<0.0001	<0.0001
Molybdenum (Mo)	mg/L	-	-	<0.005	<0.005
Nickle (Ni)	mg/L	-	-	<0.005	<0.005
Potassium (K)	mg/L	-	-	2	2
Selenium (Se)	mg/L	0.05	MAC	<0.001	<0.001
Silver (Ag)	mg/L	-	-	<0.0001	<0.0001
Sodium (Na)	mg/L	200	AO	77	75
Strontium (Sr)	mg/L	-	-	0.879	0.876
Thallium (Tl)	mg/L	-	-	<0.0001	<0.0001
Uranium (U)	mg/L	0.02	MAC	<0.001	<0.001
Vanadium (V)	mg/L	-	-	<0.001	<0.001
Zinc (Zn)	mg/L	5.0	AO	<0.01	<0.01

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

TABLE 2c: GROUNDWATER GEOCHEMISTRY - VOLATILES					
PARAMETER	UNITS	ODWS		TW1	
		LIMIT	TYPE	GW1 (4 hr) 2022-03-22	GW2 (8 hr) 2022-03-22
VOCs Surrogates					
1,2-dichloroethane-d4	%	-	-	100	119
4-bromofluorobenzene	%	-	-	71	76
Toluene-d8	%	-	-	91	98
Volatiles					
1,1,1,2-tetrachloroethane	µg/L	-	-	<0.5	<0.5
1,1,1-trichloroethane	µg/L	-	-	<0.4	<0.4
1,1,2,2-tetrachloroethane	µg/L	-	-	<0.5	<0.5
1,1,2-trichloroethane	µg/L	-	-	<0.4	<0.4
1,1-dichloroethane	µg/L	-	-	<0.4	<0.4
1,1-dichloroethylene	µg/L	14.0	MAC	<0.5	<0.5
1,2-dichlorobenzene	µg/L	200.0	MAC	<0.4	<0.4
1,2-dichloroethane	µg/L	5.0	IMAC	<0.2	<0.2
1,2-dichloropropane	µg/L	-	-	<0.5	<0.5
1,3,5-trimethylbenzene	µg/L	-	-	<0.3	<0.3
1,3-dichlorobenzene	µg/L	-	-	<0.4	<0.4
1,3-Dichloropropylene (cis+trans)	µg/L	-	-	<0.3	<0.3
1,4-dichlorobenzene	µg/L	5.0	MAC	<0.4	<0.4
Acetone	µg/L	-	-	<30	<30
Benzene	µg/L	1.0	MAC	<0.5	<0.5
Bromodichloromethane	µg/L	-	-	<0.3	<0.3
Bromoform	µg/L	-	-	<0.4	<0.4
Bromomethane	µg/L	-	-	<0.5	<0.5
c-1,2-Dichloroethylene	µg/L	-	-	<0.4	<0.4
c-1,3-Dichloropropylene	µg/L	-	-	<0.2	<0.2
Carbon Tetrachloride	µg/L	2.0	MAC	<0.2	<0.2
Chloroethane	µg/L	-	-	<0.2	<0.2
Chloroform	µg/L	-	-	<0.5	<0.5
Dibromochloromethane	µg/L	-	-	<0.3	<0.3
Dichlorodifluoromethane	µg/L	-	-	<0.5	<0.5
Dichloromethane	µg/L	50	MAC	<4.0	<4.0
Ethylbenzene	µg/L	140	MAC	<0.5	<0.5
Ethylene Dibromide	µg/L	-	-	<0.2	<0.2
Hexane	µg/L	-	-	<5	<5
m/p-xylene	µg/L	-	-	<0.4	<0.4
Methyl Ethyl Ketone (MEK)	µg/L	-	-	<10	<10
Methyl Isobutyl Ketone (MIBK)	µg/L	-	-	<10	<10
Methyl Tert Butyl Ether (MTBE)	µg/L	15	AO	<2	<2
Monochlorobenzene	µg/L	80	MAC	<0.5	<0.5
o-xylene	µg/L	-	-	<0.4	<0.4
Styrene	µg/L	-	-	<0.5	<0.5
t-1,2-Dichloroethylene	µg/L	-	-	<0.4	<0.4
t-1,3-Dichloropropylene	µg/L	-	-	<0.2	<0.2
Tetrachloroethylene	µg/L	10	MAC	<0.3	<0.3
Toluene	µg/L	60	MAC	<0.4	<0.4
Trichloroethylene	µg/L	5	MAC	<0.3	<0.3
Trichlorofluoromethane	µg/L	-	-	<0.5	<0.5
Vinyl Chloride	µg/L	1	MAC	<0.2	<0.2
Xylene; total	µg/L	90	MAC	<0.5	<0.5

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

The bacteriological test results (Certificate of Analysis – Report No. 1973843) indicated that the test samples at the 4- and 8-hour interval were non-detect (0 ct/100 mL) for E.Coli, however, Total Coliforms were detected at concentrations of 19 ct/100 mL and 23 ct/100 mL, respectively.

Paterson personnel returned to site to disinfect the well. After the disinfection of the well and subsequent pumping, a bacteriological test was performed on the well water (Certificate of Analysis – Report No. 1974461) which indicated that E. Coli was not present (0 ct/100 mL) and that only 4 ct/100 mL Total Coliforms were present in the well water. Paterson personnel confirmed that the free chlorine residual was 0 mg/L prior to the collection of the bacteriological sample.

The water quality of the subject water supply well meets all the Ontario Drinking Water Standards maximum acceptable concentrations (MAC). Furthermore, the water meets all of the Aesthetic Objectives (AO) and Operational Guidelines (OG) with the exception of the following.

- ❑ Hardness (as $CaCO_3$)
- ❑ Total Dissolved Solids (TDS)

Exceedances of the above parameters are not uncommon of the water supply in the subject aquifer. Each of these groundwater parameters are discussed in detail below.

Should any water treatment be desired by the owner, it is recommended that a water treatment specialist be retained to ensure that water treatment occurs in a safe manner.

Hardness as $CaCO_3$

Hardness, expressed as calcium carbonate, is an operation guideline and does not appear in the ODWS. Rather, it appears in the Technical Support Documents for Ontario Drinking Water Standards, Objectives and Guidelines as a parameter with an operational guideline at 100 mg/L. At the measured concentrations of 454 and 451 mg/L, the water is considered to be very hard, however, it is below the reasonable treatable limit of 500 mg/L specified in Table 3 of the MOECC guidance document Procedure D-5-5 (1996), thus, hardness can be treated with readily available technologies.

It is recommended that water hardness be treated using conventional technologies such as water softening or reverse osmosis, if desired by the owner. Without treating hardness, scaling can occur which can result in discolouration and residue buildup on water fixtures, or reduction in boiler efficiency due to scale build-up. According to Health Canada's *Guidelines for Canadian Drinking Water Quality - Summary Tables* "Although hardness may have significant aesthetic effects, a guideline has not been established because public acceptance of hardness may vary considerably according to the local conditions; major contributors to hardness (calcium and magnesium) are not of direct public health concern".

Total Dissolved Solids (TDS)

TDS refers to the concentration of inorganic substances dissolved in water. The main constituents are typically chloride, sulphates, calcium, magnesium, and bicarbonates. The TDS concentration of 767 mg/L exceeds the Aesthetic Objective of 500 mg/L. At concentrations above 500 mg/L, some consumers may find the taste objectionable, however, as the objective is an aesthetic objective, no treatment is required. It is, however, recommended that a point-of-use reverse osmosis unit be installed or to provide bulk bottled water on an as-needed basis for drinking water purposes. As such, no taste problems will occur when the system is used, or bottled water is consumed.

The Langelier calculation provided an LSI of 0.7. Based on the evaluation of the result, the water is super saturated and tends to precipitate a scale layer of calcium carbonate (scale forming but non-corrosive). Based on the range of stability in the positive direction, it is recommended that water softening be used to prevent scaling. See Langelier Saturation Index Calculation attached for calculation details.

Total Coliforms

Total Coliforms are a type of bacteria which naturally occur in soil and decaying vegetation. Total Coliforms may also be associated with animal and/or human waste.

The maximum acceptable concentration (MAC) for Total Coliforms for potable drinking water in support of a Re-zoning application, as established by the City of Ottawa Hydrogeological and Terrain Analysis Guidelines (HTAG, 2021), is less than 6 ct/100 mL. According to the City of Ottawa HTAG, Total Coliforms counts of less than 6 per 100 mL sample shall be considered indicative of acceptable water quality.

Total Coliforms were detected at 19 and 23 count per 100 mL at the 4- and 8- hour mark of the pumping test, respectively. After disinfecting the well and purging the chlorinated water, Total Coliforms were detected at 4 ct/100 mL. 4 ct/100 mL Total Coliforms is below the City of Ottawa HTAG standard of less than 6 ct/100 mL.

As the site is not hydrogeologically sensitive (competent bedrock was encountered during the field investigations at depths of 2.4 to 5.9 m bgs), and is not located in an area which is mapped as potentially karstic, the Total Coliform level of 4 ct/100 mL is considered acceptable.

Consideration should be given to utilizing a Ultraviolet (UV) disinfection system on the water supply entering the existing warehouse and proposed development. Additionally, the turbidity was less than 1 NTU, indicating that there should be no turbidity based interference in disinfection.

Sodium

Sodium (Na), an aesthetic parameter, was detected in the laboratory test sample at a concentration of 77 and 75 mg/L, which does not exceed the ODWS aesthetic objective of 200 mg/L. Although sodium is not toxic and no MAC has been set, concentrations

above 20 mg/L require that the Medical Officer of Health be notified of the water quality results, so that this information may be passed on to local physicians for use in treatment of those requiring a sodium-restricted diet.

TERRAIN ANALYSIS

The fieldwork which was completed as part of a Geotechnical Investigation for the site (PH3834-1R, dated January 5, 2017; and PG3834-2, dated March 1, 2022) is used in support of this assessment. Additional information pertaining to this investigation was gathered from available geological mapping and surrounding WWRs.

Surficial Geology

A series of test pits were excavated on the subject parcel to delineate the subsurface soil conditions as part of a Geotechnical Field Investigation. On February 8, 2022, seven (7) test pits were completed on the property. A previous investigation (PG3834-1R, dated January 5, 2017) was completed at the subject site in June and November 2016, during which fourteen (14) test pits were excavated and eleven (11) boreholes were completed onsite. The location of the test pits are delineated on the drawing PH5103-1-Test Hole Location Plan, attached. Note that the site plan on the drawing is not reflective of the proposed usage.

The test hole locations were recorded and the subsurface conditions, including the soil morphology and depth to the groundwater table (if encountered), were carefully observed and recorded. The soils encountered were classified texturally in the field and later reviewed in the laboratory.

The boreholes and test pits were advanced to a maximum depth of 5.9 and 3.4 m below ground surface (bgs), respectively. Bedrock was recorded in the WWR for TW1 at 4.34 m bgs. Refusal to excavation was recorded at depths ranging from 0.7 m to 5.9 m bgs on fractured bedrock. Competent bedrock was encountered at depths of 2.4 to 5.9 m bgs.

The subsurface profile generally consisted of topsoil extending to a maximum depth of 0.6 m bgs, underlain by silty sand to sandy silt with gravel, cobbles, boulders and trace clay which extend to a maximum depth of 1.9 m bgs. Frost heave/ frost shattered bedrock infilled with silty sand, gravel, cobbles, and boulders (unconsolidated soils) was observed under the silty sand to sandy silt with gravel, cobbles, boulders and trace clay. The testhole logs note split spoon sampling within this layer with significant sample recovery. TP1-22, TP2-22, TP6-22, and TP7-22 noted a fill of varying composition underlying the topsoil extending to depths of 1.75 m bgs. Groundwater was observed at depths between 3.6 to 4.3 m bgs in the boreholes and test pits.

Reference should be made to the borehole logs appended to this report for the details of the soil profiles encountered at each test hole location. The client should be aware that any information pertaining to soils are furnished as a matter of general information only and borehole descriptions are not to be interpreted as descriptive of conditions at locations other than those described by the boreholes themselves.

Materials encountered during Paterson's Geotechnical Investigation were generally consistent with the available surficial and bedrock geology mapping.

Hydrogeological Sensitivity of the Site

The subject site currently consists of a warehouse and residential dwelling. The dwelling is currently unoccupied. The topography of the site is generally sloping downwards to the east. The local flow direction of the surficial aquifer is expected to be in the northeasterly direction towards the Carp River. The regional groundwater flow is considered to be in the northeast direction towards the Ottawa River.

The onsite overburden generally consists of topsoil overlying a brown silty sand with gravel, cobbles, boulders and trace clay which is underlain by a fractured bedrock (frost heave/frost shatter) infilled with unconsolidated soils. The unconsolidated soils are noted to have 50 to 80% recovery during split spoon sampling within this stratum. Competent bedrock was encountered during the field investigations at depths of 2.4 to 5.9 m bgs. The frost heave bedrock noted during the borehole field investigation contained high amounts of interspersed silty sand to sandy silt (unconsolidated soils), and some clay with fragmented bedrock. For the purposes of hydrogeological sensitivity, the "fractured bedrock" unit is considered an unconsolidated soil which would provide separation form the ground surface and the underlying competent bedrock. Furthermore, based on hydraulic conductivity testing, the fastest onsite T-time was 13.8 min/cm, which is an order of magnitude slower than the T-time of less than 1 min/ cm required for highly permeable soils. Based on this, the soils and underlying interbedded materials are not considered as highly permeable when reviewing against Ontario Building Code (OBC) Section 8.7.2.1 (1) (b)(i) and the MMAH Supplementary Standards SB-6.

Refusal to excavation was recorded on competent bedrock ranging from 2.4 to 5.9 m bgs. According to the geotechnical investigation, the overburden thickness (which includes the fractured bedrock unit with interspersed unconsolidated soils) was observed to be greater than 2 m at all borehole locations. The subject site does not have any mapped karst topography on site. Furthermore, from the TW1 WWR, bedrock was observed at a depth of 4.34 m bgs. As the proposed site does not have bedrock within 2 m of the ground surface, the site is not considered hydrogeologically sensitive. Although mitigative measures, such as increased separation distances, are not required, there is sufficient space onsite to keep the onsite well greater than 30 m away from any onsite septic components.

Conceptual Lot Development

As this Terrain Analysis is completed to support a Re-zoning Application, a Site Plan is not available.

Sewage System Design and Total Daily Design Sewage Flow

As this Terrain Analysis is completed to support a Re-zoning Application, a Site Plan is not available at this time. As such a sewage system design and flows have not yet been completed. A maximum predicted nitrate concentration will be determined for the site as a whole, and the current assessment will be completed based on existing conditions.

The proposed property will be analyzed as part of the Re-zoning Application to ensure the theoretical impacts are below the Ontario Drinking Water Objective maximum allowable concentration of 10 mg/L of nitrate in the groundwater prior to the property line.

PREDICTIVE NITRATE IMPACT ASSESSMENT

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

A detailed impact assessment is required due to the proposed zoning of the site. In order to demonstrate that private services would adequately support the proposed Re-zoning Application, a predictive nitrate impact assessment for the subject site was completed. This calculation was completed to determine the maximum sewage flow volume which could be applied to the subject site with the current site conditions. As the site is within the Carp Road Corridor, the use of tertiary treatment systems (nitrate reducing systems) are allowed to be considered in support of re-zoning. The values shown in the Predictive Nitrate Impact Assessment calculation attached to this report are summarized below:

- ❑ Site area 1.28 ha
- ❑ Impervious area % 45 %
- ❑ Concentration of nitrate in effluent 40 mg/L
  (Value based on conventional effluent concentration)
- ❑ Concentration of nitrate in effluent 17.2 mg/L
  (Value based on using NSF 245/BNQ certified 57% nitrate reduction technology)
- ❑ Surplus Water 378 mm/year

(The surplus water value was estimated based on Environment Canada Climate Office values with a soil type comprised of clay loam (urban lawn) and anthropogenic sources, which can be found attached.)

❑	Combined infiltration factor based on:	0.67
	● Topography infiltration factor	0.25
	● Soil texture infiltration factor	0.30
	● Cover infiltration factor	0.12

The topography infiltration factor of 0.25 is based upon a slope between “flat land” (<0.6 m/km) and “rolling land” (average slope of 2.8 to 3.8 m/km) based on available mapping.

The soil texture infiltration factor was based upon a soil that is between “open sandy loam” with a value of 0.4 and “medium combinations of clay and loam” with a value of 0.2 which is a reasonable generalization based upon the field investigation by Paterson, available geological mapping and surrounding WWRs.

The “vegetative cover infiltration factor” was calculated as 0.12 based upon the site being used as cultivated land with some trees throughout the site.

As part of the rezoning process, the City of Ottawa does not typically allow the use of tertiary treatment systems to support the re-zoning application, however, as the site is within the Carp Road Corridor, tertiary treatment systems can be used to support the re-zoning application. As a tertiary treatment system requires annual monitoring by the Ottawa Septic System Office (OSSO), and allows for advanced treatment of sewage effluent, a tertiary treatment system is being reviewed for the Subject Site. The mandatory monitoring required on tertiary treatment systems by the OSSO ensures that the system is properly maintained and replaced when required, whereas there is no mandatory monitoring on a conventional sewage system. In order to demonstrate the viability and sustainability aspects of private servicing on the subject site, a Nitrate Impact Assessment was completed using the above noted parameters.

The predicted nitrate concentration calculation for a conventional sewage system (system without nitrate reduction) results in a maximum of **1.6 m^3/day** of effluent using a nitrate concentration of 40 mg/L. The inclusion of nitrate reduction technology (57 % nitrogen reduction in the of the effluent nitrate) would result in a maximum of **6.81 m^3/day** of effluent using a nitrate concentration of 17.2 mg/L. The Waterloo-Biofilter technology (WaterNOx) is capable of up to 90% nitrate reduction, which would allow greater than **10 m^3/day**. Both maximum sewage flow volumes with their respective reduced nitrate concentrations meet the nitrate concentration threshold of below 10 mg/L at the property boundary. Additional re-infiltration from stormwater (up to 10%) could be used to increase the dilution of septic effluent, if needed.

A sewage system installation application for a new sewage system on any site in the City of Ottawa with a sewage flow volume of less than 10 m^3/day will require an OSSO application.

CONCLUSIONS

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

1. The water supply aquifer underlying the subject site is considered to be adequate to support the water quantity demands for the proposed zoning.

2. The preferred water supply intercepted by TW1 contains a water supply that is potable and contains only elevated concentrations of hardness and TDS. The noted parameters can be treated with current readily available water conditioning equipment.

3. Total Coliforms were detected at 4 ct/100 mL, as such, it is recommended that a UV system is installed to assist in the removal of any remnant Total Coliforms found in the groundwater, as a precautionary measure.

4. If desired by the property owner, a residential grade water softener can be used to facilitate the reduction of the hardness concentration and reduce scaling. If a water softener is used for the proposed development, the owner should be made aware that additional sodium will be added to the water to reduce hardness. If desired, a point-of-use reverse osmosis system can be used to provide a drinking tap source without increasing sodium levels.

5. It is recommended that either a point-of-use reverse osmosis system be used to reduce the TDS concentration, or bulk bottled water is provided as a drinking water source.

6. The subject site is sufficient in size to accommodate two new sewage systems and meet all of the regulatory separation criteria. As a precautionary measure, a 30 m setback should be maintained between the drinking water well and any septic system components.

7. A maximum sewage flow volume of **1.6 m^3/day** at a nitrate concentration of 40 mg/L or **6.8 m^3/day** at a nitrate concentration of 17.2 mg/L can be accommodated on the subject site based on the current layout and still be below the predictive nitrate concentration threshold of 10 mg/L at the property boundary.

8. Onsite sewage disposal needs can be accommodated with a Class 4 Sewage System utilizing tertiary treatment technologies.

9. A Sewage System Permit and Building Permit need to be issued prior to the commencement of construction on the proposed structures or amenities/services.

10. The results of the Hydrogeological Assessment and Terrain Analysis have provided satisfactory evidence that the subject site can support the proposed zoning usage with respect to water quality, quantity and sewage system placement.

We trust that the current submission satisfies your immediate requirements.

Best Regards,

Paterson Group Inc.

Alexander Schopf, PhD, EIT

Michael Killam, P.Eng

Attachments:

- ❑ Key Plan
- ❑ MECP Water Well Records – 1973843 & 1974461
- ❑ Eurofins Certificate of Analysis
- ❑ Paterson PG3834 - Test Pit and Borehole Logs
- ❑ AQTESOLV - Pumping Test Analysis Reports
- ❑ Langelier Calculation
- ❑ Nitrate Impact Assessment Calculations
- ❑ Paterson Drawing PH5103-1 - Test Hole Location Plan
- ❑ Well Disinfection Instruction Sheet

C.2 *Servicing Report – 2978 Carp Road*, Stantec, December 21, 2016

Servicing Report – 2978 Carp Road

Project # 160401271

Prepared for:
Nautical Lands Group

Prepared by:
Stantec Consulting Ltd.

December 21, 2016

Revision	Description	Author		Quality Check		Independent Review	
1	1st submission	T.Rathnasooryia	2016/08/17	A.Lynch	2016/08/18	K. Kilborn	2016/08/17
2	2nd submission	T.Rathnasooryia	2016/11/22	A.Lynch	2016/11/24	K.Kilborn	2016/11/21
3	3rd submission	T.Rathnasooryia	2016/12/13	A.Lynch	2016/12/13	K.Kilborn	2016/12/13
4	4th submission	T.Rathnasooryia	2016/12/20	A.Lynch	2016/12/20	K.Kilborn	2016/12/21

Sign-off Sheet

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Prepared by  _____
(signature)

Thakshika Rathnasooriya, EIT

Reviewed by  _____
(signature)

Amanda Lynch, P.Eng.

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Stantec

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1.0 INTRODUCTION

Stantec Consulting Ltd. has been commissioned by Nautical Lands Group to prepare a servicing study in support of Site Plan Control submission of the proposed development located at 2978 Carp Road. Currently the site is divided into two parcels of land and is under approval to merge as one, 2978 and 2966 Carp Road (PIN 04537-0266 and 04537-0265). The site is situated southeast of the intersection of McGee Road and Carp Road within the City of Ottawa. The proposed development comprises approximately 1.30ha of land, and would replace a vacant property with a 15,000sq. ft pre-engineered steel storage building on the northern portion of the site. The site is zoned under Rural Commercial. The conceptual site development plan used for the purpose of this servicing brief is shown as **Figure 1**. The intent of this report is to provide a servicing scenario for the site that is free of conflicts, provides on-site servicing in accordance with City of Ottawa design guidelines, and utilizes the existing local infrastructure in accordance with the guidelines outlined per consultation with City of Ottawa staff.

Figure 1: Location Plan

2.0 BACKGROUND

Documents referenced in preparation of the design for the 2978 Carp Road development include:

- *Geotechnical Investigation – Proposed Storage Building – 2978 and 2966 Carp Road*, Patersongroup Consulting Engineers, November 11, 2016.
- *City of Ottawa Sewer Design Guidelines*, October 2012
- *Low Impact Development Stormwater Management Planning and Design Guide*, Credit Valley Conservation and Toronto Region Conservation Authority, 2010

3.0 WATER SUPPLY SERVICING

3.1 BACKGROUND

The proposed development comprises one pre-engineered steel storage building, complete with above ground parking and access areas. An existing well feeds the 1 storey building located on the south portion of the site. The proposed storage building will be serviced via a 19mm building service connection from a proposed drilled well located on the north portion of the property directly east of the proposed building. As per the Ministry of Ontario regulations the proponent must hire licensed well contractors which use licensed well technicians for installation of the on-site well, the second of two existing wells is located to the south of the access road and will be decommissioned.

3.2 PORTABLE WATER DEMANDS

Water demands for the development were estimated using the Ministry of Environment's Design Guidelines for Drinking Water Systems (2008).

The assessment for fire flow requirements was completed according to the Ontario Building Code (OBC) criteria using a "non-combustible with fire resistance" rating. The OBC indicates that low hazard occupancies include apartments, dwellings, dormitories, hotels, and schools, and as such, low hazard occupancy / limited combustible building contents credit was applied. Based on calculations per the OBC (**Appendix A.1**), the maximum required fire flows for this development are 75 L/s (4,500 L/min).

Utilizing water storage to supplement low yielding wells to meet fire flow water demands is common practice. Added water storage can be achieved by use of intermediate potable water storage tanks. The storage tanks will receive water from the well that are filled during off peak hours. The facility's water demand requires three portable storage tanks with a total 150,000 L capacity (50,000 L per tank) which is sufficient for the required volume of 149,532 L.

3.3 SUMMARY OF FINDINGS

The proposed development is located in an area of the City that will require private servicing to obtain the required domestic and emergency fire flows. The proposed servicing plan will provide sufficient water supply for fire flows for the proposed development based on OBC guidelines and as per the City of Ottawa water distribution guidelines.

4.0 WASTEWATER SERVICING

4.1 BACKGROUND

The subject site is located outside of the City's sanitary collection area. There are no special constraints for the proposed development to be serviced by a private sewage system other than those related to the Ontario Building Code (OBC) requirements. As a result, an existing septic tank and bed with private service is located on the eastern portion of PIN 04537-0265. The proposed building will require installation of a new septic tank and bed located east of the proposed storage building. Mississippi Valley authority permit approval is required. The proposed location is identified on the servicing and grading plans in **Appendix D.1** as provided by the geotechnical consultant.

5.0 STORMWATER MANAGEMENT

5.1 OBJECTIVES

The objective of this stormwater management plan is to determine the measures necessary to control the quantity/quality of stormwater released from the proposed development, and to provide sufficient detail for approval and construction.

5.2 SWM CRITERIA AND CONSTRAINTS

Criteria were established by combining current design practices outlined by the City of Ottawa Design Guidelines (2012), and through consultation with City of Ottawa staff. The following summarizes the criteria, with the source of each criterion indicated in brackets:

General

- Wherever feasible and practical, site-level measures should be used to reduce and control the volume and rate of runoff. (City of Ottawa)
- Assess impact of 100 year event outlined in the City of Ottawa Sewer Design Guidelines on major & minor drainage system (City of Ottawa)
- Water quality treatment to a 'Normal' level (70% TSS reduction) is required for the site per the Mississippi Valley Conservation Authority (MVCA)

Surface Storage & Overland Flow

- Building openings to be a minimum of 0.30m above the 100-year water level of any surface storage areas (City of Ottawa)
- Provide adequate emergency overflow conveyance off-site (City of Ottawa)

Site Specific Criteria

- Site topography indicates that no legal surface outlet exists for the site that would be feasible to discharge to. As such, on-site storage and infiltration is considered the best approach to manage site runoff so as to not increase the total uncontrolled runoff from the site (City of Ottawa and MVCA)

5.3 WATER QUANTITY CONTROL

The Modified Rational Method (MRM) was employed to assess the rate and volume of runoff generated during post-development conditions. The site was subdivided into subcatchments

(subareas) tributary to stormwater controls as defined by the location of the proposed dry pond. A summary of subareas and runoff coefficients is provided in **Appendix B.1**, and **Drawing SD-1** indicates the stormwater management subcatchments. A clear stone base is proposed below the dry pond to provide additional storage and encourage infiltration.

5.3.1 Allowable Release Rate

The predevelopment release rate for the area has been determined using the rational method. Existing buildings, paved access areas and gravel access areas were considered as hard surfaces (C=0.9 paved, C=0.75 gravel), while the remainder of the site is grassed (C=0.2). A time of concentration for the predevelopment area (30 minutes) was assigned based on the Airport Method calculations for the relatively pervious nature of the proposed site. Runoff coefficient values have been increased by 25% for the 100-year storm event based on the City of Ottawa Sewer Design Guidelines. Peak flow rates have been calculated using the rational method as follows:

Q = 2.78 CIA
Where: Q = peak flow rate, L/s
A = drainage area, ha
I = rainfall intensity, mm/hr (per Ottawa IDF curves)
C = site runoff coefficient

The allowable release rate for surface discharge for the site is summarized in **Table 1** below:

Table 1: Allowable Surface Release Rates

Design Storm	Target Flow Rate (L/s)
5- Year	50.7
100- Year	86.3

5.3.2 In-situ Infiltration Testing

Field testing was completed by Paterson Group to establish in-situ saturated hydraulic conductivity rates using a Pask Permeameter. The methodology outlined in the Credit Valley Conservation LID Design Guidelines – Appendix C (CVC, 2012) was then used to calculate the infiltration rate and safety factor for each test location. Test results and calculations results are attached for reference and a summary is included in **Table 2** below.

Table 2: Summary of Infiltration Rates

Auger hole ID	K_{fs} (cm/min)	Testing Depth below surface (m)	Infiltration Rate (i) (mm/hr)	Safety factor	Corrected Infiltration (mm/hr)
TP 1	3.20E-07	0.90	9.94	2.50	3.98
TP 4	9.40E-07	0.60	13.27		5.31
TP 5	9.40E-08	0.70	7.16		2.87
TP 11	5.30E-06	0.90	21.08		8.43
TP 12	1.20E-05	1.10	26.23		10.49
TP 13	5.30E-06	1.00	21.08		8.43

5.3.3 Groundwater and Bedrock Elevations

Groundwater level measurements were obtained from the on-site piezometers on June 2016 by Paterson Group. **Table 3** below summarizes the groundwater elevations (a reference plan with borehole locations is included in the attached Paterson letter). Test-pits excavated during the infiltration testing indicated shallow depths to highly fractured bedrock (previously identified as glacial till from the soil cores examined during borehole drilling). In most locations the groundwater elevation is identified to be lower than the fractured bedrock interface. As such, the bedrock elevation was considered to be controlling in establishing the dry pond elevation and footprint.

Table 3: Summary of Groundwater and Bedrock Elevations

Stand-pipe well ID	Top of Riser Elevation (m)	Groundwater Elevations			Bedrock Elevation
		Date measured (d/m/y)	Groundwater Depth (m) below top of riser	Groundwater Elevation (m)	
BH1	118.24	01/06/16	4.20	114.04	117.48
BH2	118.42	01/06/16			116.97
BH3	118.29	01/06/16			117.38
BH3A	118.29	01/06/16	4.30	113.99	116.49
BH4	118.03	01/06/16			117.37
BH5	117.74	01/06/16			116.34
BH6	117.71	01/06/16	3.93	113.78	116.80
BH7	117.53	01/06/16	3.70	113.83	116.46
BH8	117.54	01/06/16	4.19	113.35	116.78
BH9	117.66	01/06/16			116.29
BH10	117.46	01/06/16	3.62	113.84	116.09
BH11	117.45	01/06/16			116.18

5.3.4 Storage Requirements

The site requires quantity control measures to meet the restrictive stormwater release criteria. It is proposed that surface grading (for a dry pond) be used to store site runoff to be infiltrated and limit surface release rates to the allowable existing condition rates.

5.3.4.1 Post-development Uncontrolled Catchments

Due to grading constraints, two catchments have been designed without a storage component (EXT-1 & EXT-2). These areas flow offsite uncontrolled. Areas that discharge offsite without entering the proposed stormwater management system must be compensated for in areas with controls. **Table 4** summarizes the peak 5 and 100-year catchment release rates for catchments that are released uncontrolled.

Table 4: 5 and 100 Year Discharge from Uncontrolled Catchments

Catchment ID	5-Year Peak Discharge (L/s)	100-Year Peak Discharge (L/s)
EXT-1	16.8	36.0
EXT-2	3.5	7.5

Peak 5 and 100 year discharge values in the above table are based on minimum time of concentration values (10 minutes).

5.3.4.2 Surface Storage/Subsurface Storage

It is proposed to detain all stormwater in the pond to reduce peak surface discharge from the proposed site. The modified rational method (MRM) was employed to determine the peak volume required to be stored in surface ponding areas and subsurface clear stone storage basin and trenches.

The stormwater management dry pond and clear stone storage areas were sized using an iterative approach between pond grading, infiltration calculations and the MRM calculations to provide enough storage to restrict runoff from the 100 year event and meet the target release rates from the overall site and external areas. The release rate from the pond storage was calculated based on infiltration rates and pond footprint and was then input into the MRM calculations as the "controlled release rate" from drainage area STM-1. Note that the average flow rate over the pond storage depth was used. The entirety of the required storage volume is provided within the dry pond. Drawdown calculations indicate that a minimum infiltration rate of 8.3mm/hr would be needed to achieve a pond drawdown time of 48hr. In-situ infiltration testing included testing at two test pits (TP 11 and TP 12) in the footprint of the infiltration area and based on the values in Table 2 would have an average measured infiltration rate of approximately 9.46mm/hr. Therefore, it is estimated that the facility would drawdown in less than 48hrs following a 100-yr event.

Table 5 summarizes the estimated pond discharge rate resulting from infiltration and corresponding storage volume during the 100-year event.

Table 5: 100 Year Peak Surface Volume and Controlled Discharge Summary

ID	100-Year Event		
	Discharge Rate (L/s)	Vrequired (m^3)	Vavailable (m^3)
Pond	9.8	385.3	389.6

100-year volume available based on surface storage and a maximum spill depth not to exceed 0.40m, where required.

Table 6 demonstrates the proposed stormwater management plan and confirms that the estimated release rates from the site are less than the allowable rate.

Table 6: Summary of Total 5 and 100 Year Event Surface Release Rates

	5-Year Peak Discharge (L/s)	100-Year Peak Discharge (L/s)
Uncontrolled (EXT-1 & EXT-2)	20.3	43.5
Allowable	50.7	86.3

5.3.5 Groundwater Mounding Check

Geotechnical investigations indicated shallow depths to highly fractured bedrock but did not encounter groundwater before the fractured bedrock interface. Therefore, the clearance from bedrock was the control in setting the base elevation of the infiltration basin area. The clearance from the bottom of the infiltration area and the referenced bedrock elevation is less than 1m, therefore mounding calculations were completed as a final check for the longer-term function of the infiltration area. Groundwater mounding calculations were completed using spreadsheet analysis tool developed by the USGS that applies the Hantush (1967) equation for groundwater mounding beneath an infiltration basin. Standard values for site soils and measured hydraulic conductivity rates were used. The maximum mounding depth was calculated to be approximately 0.002m resulting in a clearance from infiltration bottom to mounded groundwater of 0.11m. Spreadsheet calculations are included in **Appendix B.2.**

5.4 WATER QUALITY CONTROL

Water quality treatment to a 'Normal' level of protection (70% TSS removal) is required for the site per the MVCA. In order to achieve this level of treatment several a treatment train approach is proposed for the site. The proposed site drainage allows for most of the site to sheet drain across the grassed area around the dry pond rather than concentrated flow into the pond. This will allow for an initial filtering and settling of solids. Secondly, a 33m long (measured perpendicular to flow direction) vegetated buffer is proposed around the dry pond. Based on **Figure 5-4** from the US EPA design manual for Low Impact Development (LID) (see **Appendix B.3**), it is estimated that this configuration would provide an initial treatment rate of 60% to 90% TSS reduction before the runoff enters the dry pond. However, lower removal rates are anticipated in areas of steeper slopes. Additionally, these values assume that the design buffer width (in direction of flow) can be achieved in all areas. Equation 5-2 of the EPA LID manual defines the minimum buffer width as

$$W_G = 0.2L_I \text{ or } 8ft \text{ (whichever is greater)}$$

Where, W_G = Design width (m)

L_I = length of flow path of upstream sheet flow (m)

Using an average flow path length of 55m would require a minimum vegetated buffer of 11.0m. Due to area and constraints the proposed vegetated buffer length will vary between 3.5m and 10m along the north and east sides of the pond. Therefore, it is estimated that some areas may provide lower or higher filtration of solids, but an average of near 70% removal could be achieved.

While the vegetated buffer will provide significant pre-treatment of runoff, additional settling and filtration will occur in the dry pond. The MOECC SWM Design Manual (2003) recognizes dry ponds as providing approximately 60% TSS removal. This removal rate is identified for a typical dry pond with a gravity outlet to a sewer or watercourse and does not include the filtration benefits achieved from the infiltration outlet of the proposed dry pond.

Therefore, with the various proposed measures it is estimated that at least 70% TSS removal will be achieved through the system.

6.0 GRADING AND DRAINAGE

The proposed development site measures approximately 1.30ha (3.22 acre) in area and is currently partly developed. The topography across the site is relatively flat, and the entirety of the site currently drains from west to east. A detailed grading plan (see **Drawing GP-1**) has been provided to satisfy the stormwater management requirements for the site. Site grading has been established to provide emergency overland flow routes required for stormwater management in accordance with City of Ottawa requirements.

The subject site maintains emergency overland flow routes for runoff from events exceeding the 100-year design event to the eastern portion of the development where major system flows are presently draining as depicted in **Drawing GP-1.**

7.0 UTILITIES

Hydro overhead lines exist along Carp Road. It is anticipated that existing infrastructure will be sufficient to provide a means of distribution for the proposed site under interim and ultimate conditions. Consultation with Hydro Ottawa will continue throughout the Composite Utility Planning process. Exact size, location, and routing of hydro utilities, as well as required transformer locations, will be finalized after design circulation.

Bell lines are expected to be able to service the proposed site via infrastructure within Carp Road. Bell may require easements for their respective cabinets and vaults. Easement requirements and location of telecommunication infrastructure will be determined as part of the Composite Utility Planning process, following design circulation.

8.0 APPROVALS

Consultation with the Ministry of the Environment and Climate Change (MOECC) will be completed to confirm whether an Environmental Compliance Approval (ECA, formerly Certificates of Approval (CofA) will be necessary for stormwater management (Correspondence included in **Appendix D**).

Will require approval for septic tank, line and bed from the Ottawa Septic System Office by way of OSSO permit. The Mississippi Valley Conservation authority permit approval is required for the septic tank and bed.

9.0 EROSION CONTROL DURING CONSTRUCTION

Erosion and sediment controls must be in place during construction. The following recommendations to the contractor will be included in contract documents.

It is noted that the site stormwater management is dependent on infiltration for release of stored runoff. As such, all infiltration trenches and basins shall be constructed after all other site grading and construction is complete. The SWM dry pond depression may be excavated during construction if they are required for stormwater management during construction. However, they should not be excavated to the depth of the infiltration areas until all other site works are complete. All accumulated sediment will need to be excavated from the pond and infiltration testing shall be completed before placing clear stone and geotextiles etc.

1. Implement best management practices to provide appropriate protection of the existing and proposed drainage system and the receiving water course(s).
2. Limit extent of exposed soils at any given time.
3. Re-vegetate exposed areas as soon as possible.
4. Minimize the area to be cleared and grubbed.
5. Protect exposed slopes with plastic or synthetic mulches.
6. Provide sediment traps and basins during dewatering.
7. Plan construction at proper time to avoid flooding.
8. Installation of a mud matt to prevent mud and debris from being transported off site.
9. Installation of silt fence to prevent sediment runoff.

The contractor will, at every rainfall, complete inspections and guarantee proper performance. The inspection is to include:

10. Verification that water is not flowing under silt barriers.

Refer to **Drawing EC-1** for the proposed location of silt fences, straw bales and other erosion control structures.

10.0 GEOTECHNICAL INVESTIGATION AND ENVIRONMENTAL ASSESSMENT

A geotechnical Investigation Report was prepared by Patersongroup on November 11, 2016. The report summarizes the existing soil conditions within the subject area and construction recommendations. For details which are not summarized below, please see the original Paterson report.

Subsurface soil conditions within the subject area were determined from 11 boreholes and 14 test pits across the proposed site. The investigation concluded that the site is underlain by dense silty sand with gravel layer of 1.1 to 6.0m below ground surface overlaid by a thin layer of topsoil. Bedrock is anticipated to lie within subjected area and is in the form of limestone and Verulam. In addition, six constant head pask permeameter tests were completed to verify existing hydraulic conductivity of the soils below the proposed area for infiltration.

Expected long-term groundwater levels were measured on June 6, 2016 and vary in elevation from 2.5m to 3.5m in depth.

The required pavement structure for proposed hard surfaced areas are outlined in **Table 7 and Table 8** below:

Table 7: Pavement Structure – Car Only Parking Areas

Thickness (mm)	Material Description
50	Wear Course – HL-3 or Superpave 12.5 Asphaltic Concrete
150	Base – OPSS Granular A Crushed Stone
300	Subbase - OPSS Granular B Type II
-	Subgrade – Either fill, in situ soil, or OPSS Granular B Type I or II material placed over in situ soil or fill.

Table 8: Pavement Structure – Access Lanes

Thickness (mm)	Material Description
40	Wear Course – HL-3 or Superpave 12.5 Asphaltic Concrete
50	Binder Course – HL-8 or Superpave 19.0 Asphaltic Concrete
150	Base – OPSS Granular A Crushed Stone
400	Subbase - OPSS Granular B Type II
-	Subgrade – Either fill, in situ soil, or OPSS Granular B Type II material placed over in situ soil or fill.

11.0 CONCLUSIONS

11.1 WATER SERVICING

The proposed new well is considered to be capable of supplying sufficient water supply for fire flows. Based on the OBC calculations the maximum required fire flow for the site is 45 L/s (2,700 L/min). Fire suppression will be provided through two onsite 53,000L water storage tanks.

11.2 STORMWATER SERVICING

The proposed stormwater management plan is in compliance with the goals specified through consultation with the City of Ottawa. Onsite storage will be provided for all runoff in excess of existing surface release rates. All stored stormwater up to the 100-year event will be infiltrated as existing site grading is such that no feasible surface outlet exists for the captured stormwater on the site.

11.3 GRADING

Grading for the site has been designed to provide an emergency overland flow route as per City requirements and reflects any restrictions recommended in the Geotechnical Investigation Report prepared by Patersongroup on November 11, 2016. Erosion and sediment control measures will be implemented during construction to reduce the impact on existing facilities.

11.4 UTILITIES

Utility infrastructure exists within overhead lines within the Carp Road ROW at the south western boundary of the proposed site. It is anticipated that existing infrastructure will be sufficient to provide a means of distribution for the proposed site. Exact size, location and routing of utilities will be finalized after design circulation.

11.5 APPROVALS/PERMITS

An MOECC ECA is not expected to be required for the subject site as site will remain private, under single ownership, however due to the infiltration component of the proposed stormwater management consultation with the MOECC will be required to confirm whether an ECA is required for stormwater management. A Permit to Take Water is not anticipated to be required for pumping requirements for service lateral/building footing installation. The Mississippi Valley Conservation Authority will need to be consulted in order to obtain municipal approval for site Water Supply Servicing.

Appendix D DRAWINGS

C.3 Environmental Compliance Approval (ECA)

Content Copy Of Original

Ontario

Ministry of the Environment and Climate Change
Ministère de l'Environnement et de l'Action en matière de changement climatique

ENVIRONMENTAL COMPLIANCE APPROVAL
NUMBER 9196-AQBQZV
Issue Date: October 6, 2017

York-Hop Corp.
2962 Carp Road
Ottawa, Ontario
K0A 1T0

Site Location: 2978 and 2966 Carp Road
City of Ottawa

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act, R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

the establishment of stormwater management works to service the 1.30 hectare warehouse storage site at 2978 and 2966 Carp Road, in the City of Ottawa, for the collection, treatment and disposal of stormwater run-off, to provide Normal Level quality control and erosion protection, and to infiltrate and attenuate the post-development peak flows for all storm events up to and including the 100-year storm to allowable release rates, consisting of the following:

infiltration basin (catchment area 1.14 ha) located at the southeast corner of the site, with vegetated buffer area providing pre-treatment, comprising of 200 millimetre thick layer of 50 millimetre diameter clear stone covered by filter fabric, to store and infiltrate stormwater run-off from the site, having a total storage volume of approximately 389.6 m 3 , with an emergency overland flow in excess of the 100-year storm to the neighbouring property to the south;

including erosion/sedimentation control measures during construction and all other controls and appurtenances essential for the proper operation of the aforementioned Works;

all in accordance with the submitted supporting documents listed in Schedule "A" forming part of this Approval.

For the purpose of this environmental compliance approval, the following definitions apply:

1. "Approval" means this entire document and any schedules attached to it, and the application;
2. "Director" means a person appointed by the Minister pursuant to section 5 of the EPA for the purposes of Part II.1 of the EPA;
3. "District Manager" means the District Manager of the appropriate local District Office of the Ministry, where the Works are geographically located;
4. "EPA" means the *Environmental Protection Act,* R.S.O. 1990, c.E.19, as amended;
5. "Ministry" means the ministry of the government of Ontario responsible for the EPA and OWRA and includes all officials, employees or other persons acting on its behalf;
6. "Owner" means York-Hop Corp., and includes its successors and assignees;
7. "OWRA" means the *Ontario Water Resources Act*, R.S.O. 1990, c. O.40, as amended;
8. "Works" means the sewage works described in the Owner's application, and this Approval.

You are hereby notified that this environmental compliance approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. **GENERAL CONDITIONS**
    1. The Owner shall ensure that any person authorized to carry out work on or operate any aspect of the Works is notified of this Approval and the conditions herein and shall take all reasonable measures to ensure any such person complies with the same.
    2. Except as otherwise provided by these Conditions, the Owner shall design, build, install, operate and maintain the Works in accordance with the description given in this Approval, and the application for approval of the Works.
    3. Where there is a conflict between a provision of any document in the schedule referred to in this Approval and the conditions of this Approval, the conditions in this Approval shall take precedence, and where there is a conflict between the documents in the schedule, the document bearing the most recent date shall prevail.
    4. Where there is a conflict between the documents listed in Schedule "A" and the application, the application shall take precedence unless it is clear that the purpose of the document was to amend the application.
    5. The conditions of this Approval are severable. If any condition of this Approval, or the application of any requirement of this Approval to any circumstance, is held invalid or unenforceable, the application of such condition to other circumstances and the remainder of this Approval shall not be affected thereby.
    6. The issuance of, and compliance with the conditions of, this Approval does not:
        a. relieve any person of any obligation to comply with any provision of any applicable statute, regulation or other legal requirement, including, but not limited to, the obligation to obtain approval from the local conservation authority/MNR necessary to construct or operate the sewage works; or
        b. limit in any way the authority of the Ministry to require certain steps be taken to require the Owner to furnish any further information related to compliance with this Approval.
2. **EXPIRY OF APPROVAL**
    1. This Approval will cease to apply to those parts of the Work which have not been constructed within five (5) years of the date of this Approval.
    2. In the event that completion and commissioning of any portion of the Works is anticipated to be delayed beyond the specified expiry period, the Owner shall submit an application of extension to the expiry period, at least twelve (12) months prior to the end of the period. The application for extension shall include the reason(s) for the delay, whether there is any design change(s) and a review of whether the standards applicable at the time of Approval of the Works are still applicable at the time of request for extension, to ensure the ongoing protection of the environment.
3. **CHANGE OF OWNER**
    1. The Owner shall notify the District Manager and the Director, in writing, of any of the following changes within thirty (30) days of the change occurring:
        a. change of Owner;
        b. change of address of the Owner;

c. change of partners where the Owner is or at any time becomes a partnership, and a copy of the most recent declaration filed under the *Business Names Act*, R.S.O. 1990, c.B17 shall be included in the notification to the District Manager; or
d. change of name of the corporation where the Owner is or at any time becomes a corporation, and a copy of the most current information filed under the *Corporations Information Act*, R.S.O. 1990, c. C39 shall be included in the notification to the District Manager.

2. In the event of any change in ownership of the Works, other than a change to a successor municipality, the Owner shall notify in writing the succeeding owner of the existence of this Approval, and a copy of such notice shall be forwarded to the District Manager and the Director.
3. The Owner shall ensure that all communications made pursuant to this condition refer to the number at the top of this Approval.

4. **OPERATION AND MAINTENANCE**
   1. If applicable, any proposed storm sewers or other stormwater conveyance in this Approval can be constructed but not operated until the proposed stormwater management facilities in this Approval or any other Approval that are designed to service the storm sewers or other stormwater conveyance are in operation.
   2. The Owner shall make all necessary investigations, take all necessary steps and obtain all necessary approvals so as to ensure that the physical structure, siting and operations of the Works do not constitute a safety or health hazard to the general public.
   3. The Owner shall inspect and ensure that the design minimum liquid retention volume is maintained in the Works at all times, except when maintenance is required.
   4. The Owner shall undertake an inspection of the condition of the Works, at least once a year, and undertake any necessary cleaning and maintenance to ensure that sediment, debris and excessive decaying vegetation are removed from the Works to prevent the excessive build-up of sediment, oil/grit, debris and/or decaying vegetation, to avoid reduction of the capacity and/or permeability of the Works, as applicable. The Owner shall also regularly inspect and clean out the inlet to and outlet from the Works to ensure that these are not obstructed.
   5. The Owner shall design, construct and operate the Works with the objective that the effluent from the Works is essentially free of floating and settleable solids and does not contain oil or any other substance in amounts sufficient to create a visible film, sheen, foam or discoloration on the receiving waters.
   6. The Owner shall ensure the immediate clean-out of the Works after a fuel or oil spill capture.
   7. The Owner shall ensure that equipment and material for the containment, clean-up and disposal of fuel and oil and materials contaminated with such, is on hand and in good repair for immediate use in the event of:
      a. loss of fuel or oil to the Works; or
      b. a spill within the meaning of Part X of the EPA.
   8. The Owner shall maintain a logbook to record the results of these inspections and any cleaning and maintenance operations undertaken, and shall keep the logbook at the Owner's administration office for inspection by the Ministry. The logbook shall include the following:
      a. the name of the Works;
      b. the date and results of each inspection, maintenance and cleaning, including an estimate of the quantity of any materials removed and method of clean-out of the Works; and
      c. the date of each spill within the catchment area, including follow-up actions and remedial measures undertaken.
   9. The Owner shall prepare an operations manual prior to the commencement of operation of the

Works that includes, but is not necessarily limited to, the following information:

a. operating and maintenance procedures for routine operation of the Works;
b. inspection programs, including frequency of inspection, for the Works and the methods or tests employed to detect when maintenance is necessary;
c. repair and maintenance programs, including the frequency of repair and maintenance for the Works;
d. contingency plans and procedures for dealing with potential spills and any other abnormal situations and for notifying the District Manager; and
e. procedures for receiving, responding and recording public complaints, including recording any follow-up actions taken.

10. The Owner shall maintain the operations manual current and retain a copy at the location of the Works for the operational life of the Works. Upon request, the Owner shall make the manual available to Ministry staff.

5. **TEMPORARY EROSION AND SEDIMENT CONTROL**

1. The Owner shall install and maintain temporary sediment and erosion control measures during construction and conduct inspections once every two (2) weeks and after each significant storm event (a significant storm event is defined as a minimum of 25 mm of rain in any 24 hours period). The inspections and maintenance of the temporary sediment and erosion control measures shall continue until they are no longer required and at which time they shall be removed and all disturbed areas reinstated properly.
2. The Owner shall maintain records of inspections and maintenance which shall be made available for inspection by the Ministry, upon request. The record shall include the name of the inspector, date of inspection, and the remedial measures. if any, undertaken to maintain the temporary sediment and erosion control measures.

6. **REPORTING**

1. One (1) week prior to the start-up of the operation of the Works, the Owner shall notify the District Manager (in writing) of the pending start-up date.
2. The Owner shall, upon request, make all manuals, plans, records, data, procedures and supporting documentation available to Ministry staff.
3. The Owner shall prepare and submit a performance report to the District Manager on an annual basis, within ninety (90) days following the end of the period being reported upon. The first such report shall cover the first annual period following the commencement of operation of the Works and subsequent reports shall be submitted to cover successive annual periods following thereafter. The reports shall contain, but shall not be limited to, the following information:
   a. a description of any operating problems encountered and corrective actions taken;
   b. a summary of all maintenance carried out on any major structure, equipment, apparatus, mechanism or thing forming part of the Works, including an estimate of the quantity of any materials removed from the Works;
   c. a summary of any complaints received during the reporting period and any steps taken to address the complaints;
   d. a summary of all spill or abnormal discharge events; and
   e. any other information the District Manager requires from time to time.

7. **SPILL CONTINGENCY PLAN**

1. Within six (6) months from the issuance of this Approval, the Owner shall implement a spill contingency plan - that is a set of procedures describing how to mitigate the impacts of a spill within the area serviced by the Works. The Owner shall, upon request, make this plan available to Ministry staff. This plan shall include as a minimum:

With every community, we redefine what's possible.

Stantec is a global leader in sustainable engineering, architecture, and environmental consulting. The diverse perspectives of our partners and interested parties drive us to think beyond what's previously been done on critical issues like climate change, digital transformation, and future-proofing our cities and infrastructure. We innovate at the intersection of community, creativity, and client relationships to advance communities everywhere, so that together we can redefine what's possible.