



# GEMTEC

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**Hydrogeological Investigation and  
Terrain Analysis  
Proposed Warehouse Building  
2885 Carp Road  
Carp, Ontario**



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Submitted to:

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Terrain Analysis  
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2885 Carp Road  
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## 1 INTRODUCTION

GEMTEC Consulting Engineers and Scientists Limited (GEMTEC) was retained by Bell & Associates Architecture (Bell) to carry out a hydrogeological investigation and terrain analysis in support of the construction of a proposed warehouse building to be located at 2885 Carp Road in Carp, Ontario. Based on the City of Ottawa's applicant's study and plan identification list, a groundwater impact study is not required. The site location is provided on Figure 1, which is located following the text of this report.

The objectives of the investigation are the following:

- Confirm that the construction of any new well is in accordance with the Ministry of Environment, Conservation and Parks (MECP) requirements;
- Confirm that the quality of the supply well water meets the Ontario Drinking Water Standards and maximum treatable limits prescribed in MECP Procedure D-5-5 (1996);
- Confirm that the quantity of water meets the MECP requirements; and
- Confirm that the septic impact assessment meets the MECP Procedure D-5-4 (1996) requirements.

## 2 SITE BACKGROUND

### 2.1 Project Description

Plans are being prepared for a new commercial warehouse building, which will have a footprint of approximately 700 square metres. The warehouse will primarily be used to store concrete trucks. A copy of the preliminary construction drawings for the proposed development is provided in the Appendix A. The site is currently being used as a commercial property, and the total site area is approximately 1.21 hectares.

### 2.2 Site Geology

Surficial geology maps (OGS, 2010) indicate that the site is underlain by near-shore sediments consisting of gravel, sand, and boulders. Bedrock geology maps (OGS, 2011) and local well records (MECP, 2019) indicate that bedrock is likely comprised of limestone, dolostone, arkose, and shale of the Ottawa Group, Simcoe Group, and/or Shadow Lake Formation. Overburden thickness mapping indicates that drift thickness ranges from 3 and 17 metres in the surrounding area (Gao et al. 2006). Available karst mapping (Brunton and Dodge, 2008) indicates the presence of inferred or potential karstic features, which is in agreement with the bedrock mapping.

### 2.3 Additional Studies Completed by GEMTEC

Other studies completed by GEMTEC for the subject site that are relevant to the current investigation include:

- “Geotechnical Investigation: Proposed Commercial Development, 2885 Carp Road, Ottawa, Ontario” dated August 2, 2022 (herein referred to as GEMTEC geotechnical investigation).
- “Phase Two Environmental Site Assessment: 2885 Carp Road, Ottawa, Ontario” dated September 20, 2022 (herein referred to as GEMTEC Phase II ESA).

Relevant subsurface information from the geotechnical investigation and phase two environmental site assessment are included in the terrain analysis and groundwater supply investigation sections where appropriate.

### **3 TERRAIN ANALYSIS**

#### **3.1 Subsurface Conditions**

The fieldwork for the geotechnical investigation was carried out on May 18, 2022. On that day, two boreholes (numbered 22-01 and 22-02) were advanced at the approximate locations shown on the Site Plan (Figure 1). A monitoring well was sealed into the overburden within borehole 22-02 to measure groundwater levels. Descriptions of the subsurface conditions logged in the boreholes and the well construction are provided on the Borehole Logs (Appendix B). Two soil samples were taken from borehole 22-01 and analyzed for grain size by GEMTEC (Appendix C).

The borehole logs indicate the subsurface conditions encountered at the specific test locations only, conditions at locations other than where the test was performed may vary. Boundaries between zones on the logs are often not distinct, but rather are transitional and have been interpreted based on observations by GEMTEC field personnel. The following sections present a summary of the subsurface conditions observed in the boreholes advanced during this investigation.

##### **3.1.1 Topsoil**

Topsoil was encountered at the ground surface in borehole 22-02. The topsoil had a thickness of about 100 millimetres.

##### **3.1.2 Fill Material**

A layer of loose to compact fill material was encountered at ground surface in borehole 22-01 and below the topsoil in borehole 22-02. The fill material consists of silty sand with varying amount of gravel and clay and extends to depths of about 2.3 metres below the existing ground surface (mbgs).

##### **3.1.3 Glacial Till**

Native deposits of glacial till were encountered below the fill material in boreholes 22-01 and 22-02. The glacial till was not fully penetrated in the boreholes but was proven to depths of about

6.0 mbgs. The glacial till can be described as a heterogeneous mix of all grain sizes, which at this site is described as sand and gravel, some silt, and trace clay. The glacial till also contains cobbles and boulders. Grain size distributions of two samples taken from borehole 22-01 indicated that the glacial till is composed mainly of gravel and sand, with some silt and trace clay (Appendix C).

### 3.2 Groundwater Level

A well screen was sealed into the overburden within borehole 22-02 for the measurement of groundwater level. The groundwater level in the monitoring well was measured on May 25, 2022. In addition, a static water level was measured within the onsite supply well (Tag#: A295355) on September 28, 2022. The groundwater level depths and elevations are summarized in Table 3.1.

**Table 3.1 – Summary of Groundwater Levels**

Borehole Number or Well Tag Number	Groundwater Depth (mbgs)	Groundwater Elevation (metres)	Date
22-02	2.5	114.8	May 25, 2022
22-02	3.0	114.2	Sep 28, 2022
A295355	3.6	114.2	Sep 28, 2022

The groundwater levels may be higher during wet periods of the year such as the early spring or following periods of precipitation.

## 4 GROUNDWATER SUPPLY INVESTIGATION

### 4.1 Regional Water Well Records

A search of the Ministry of Environment, Conservation and Parks (MECP) water well records (MECP, 2019) returned 70 water well records within 500 metres of the subject site. A summary of the well record search is provided in Appendix D, and the well locations are shown in Figure 1. The well depths, excluding monitoring wells or test holes, range from 12.1 to 123.4 mbgs, with a median well depth of approximately 56.4 mbgs (n = 58). Well casing depths for water supply wells range from 6.7 to 29.6 mbgs, with a median length of 13 mbgs (n = 58).

A review of the well construction details indicates that 58 of the 61 confirmed water supply wells are completed into predominantly limestone bedrock. The remaining 3 wells were either completed in overburden or their screened interval was not specified. Incomplete or suspected overburden well records (n = 7) were reviewed individually to assess potential risk to well water users, and one overburden well (Well ID 7124076) was identified greater than 415 metres away

from the site and another incomplete well record (Well ID 7357888) dated 2019 was located more than 400 metres away. The remaining five well records reviewed reflected that the wells were either completed in bedrock or abandoned. Water bearing zones are identified between 8.8 and 121 mbgs (n = 93) and are likely associated with secondary porosity in the bedrock. The median static water level observed in the area is 4.1 mbgs (n = 57).

#### 4.2 On-Site Test Well Construction

An on-site water supply well (Tag#: A295355) was available for testing, which was constructed by Air Rock Drilling Ltd. (License No. C76811) in August 2020 using an air percussion drill. The approximate location of the water well was confirmed in the field and is shown in the preliminary construction drawings (Appendix A) and site plan (Figure 1). A copy of the MECP Water Well Record for the onsite well is provided in Appendix E. The recommended pumping rate and depth of the well were 20 imperial gallons per minute (iGPM) and 100 ft (30.5 metres), respectively. The construction details from the MECP Water Well Record are summarized in Table 4.1:

**Table 4.1 – On-Site Water Well Construction Details**

Well Construction Details – Tag#: A295355	
Depth to Bedrock	5.2 metres
Length of Well Casing	9.0 metres
Length of Well Casing Below Ground Surface	7.0 metres
Length of Well Casing Set into Bedrock	1.8 metres
Depth Water Found	54.0 metres
Total Well Depth	61.6 metres
Overburden Description	Sand, gravel and boulders
Bedrock Description	Grey limestone with white quartz

The well casing has a stick-up of approximately 2 feet and is sealed with a combination of neat cement slurry and bentonite slurry, in compliance with O.Reg. 903. Ground surface should be graded away from the well, which is not currently explicitly depicted in the preliminary construction drawings (Appendix A). The well will be in a landscaped area surrounded by bollards for protection from vehicular impacts (as shown in Appendix A).

### **4.3 Stormwater Management and Site Plan**

Stormwater runoff will be directed through vegetated swales (reported to be designed for a 70% reduction in suspended solids in the servicing and stormwater management report; Stantec, 2022) along the west and south boundaries of the site, which will be designed to conduct overland flow towards the roadside ditches to the east of the site. It is understood that an overburden dry well and the swales (Appendix A) will be designed to infiltrate runoff to meet or exceed pre-development conditions for recharge (Stantec, 2022). The swales and dry well (Appendix A) will be installed within the overburden more than 45 metres away from the onsite supply well and an estimated 55 metres from the nearest offsite domestic well to the north (Figure 1).

The proposed site use entrains a risk of fuel and oil spills associated with vehicle traffic and parking. It is recommended that an oil-grit separator be installed to treat any water coming from the warehouse, site grading should ensure that potential spills are directed away from the well or dry well, and a spill response plan should be established for the site to identify any traces of spills within the warehouse, outdoor parking or along the gravel driveway.

Road salting for the management of winter conditions may pose a risk to the supply well over time. The location of snow storage and the septic bed should be strategically located with consideration of the stormwater management structures to mitigate risk of potential contamination to the supply well.

These design provisions, as well as the greater than five-metre-thick overburden layer at the site, should reduce the potential risk associated with bedrock aquifer contamination in the future. So long as these precautions are taken, no significant risk is anticipated to well water users in the area resulting from the stormwater management features proposed.

### **4.4 Groundwater Quantity**

A pumping test was carried out on the water well by a GEMTEC technologist on September 28, 2022. The well was pumped at a constant rate of 56.8 litres per minute for a period of eight hours. The water from the pumping test was discharged to the ground surface approximately 10 metres away from the test well such that the discharge flow was away from the well head.

Water level and flow rate measurements were taken at regular intervals throughout the pumping test. Water levels were also taken during the recovery phase of the pumping test (after the pump was turned off).

During the pumping test, the water level decreased approximately 0.7 metres from a static water level of 3.6 metres below ground surface, following approximately 480 minutes (eight hours) of pumping. Almost all of this drawdown occurred within the first 5 minutes of the test and remained relatively stable over the remaining 475 minutes of pumping. Regular flow rate measurements suggest that the pumping was maintained at a constant rate of 56.8 litres per minute. Thus, the

pumping test withdrew approximately 27,260 litres over eight hours. Following cessation of pumping, the well fully recovered within 2 minutes.

Proposed water demands and septic design flows were not available during the preparation of this report for relative comparison with measured values. However, the calculated maximum septic flow for the site was 7,020 litres per day using advanced septic treatment technologies (see Section 5.2.1). Conservatively assuming that the daily water demand will be 150% of the maximum allowable septic flow for the site results in an estimated demand of 10,530 L/day. As demonstrated by the pumping test, the onsite well is more than capable of supplying this quantity of water.

The transmissivity of the water supply aquifer is typically estimated from the pumping test drawdown data using Aqtesolv (Version 4.5), a commercially available software program from HydroSOLVE Inc. In this case, the pumping rate used in the test produced inadequate drawdown in the well to assess aquifer properties.

The test results indicate that the well yield is significantly greater than the pumping rate tested (i.e., 56.8 litres per minute). Based on a static water level of 3.6 metres below ground surface, the recommended pump intake depth of 30.5 metres and the water level after eight hours of pumping, the remaining available drawdown in the well is approximately 26.2 metres.

#### **4.5 Groundwater Quality**

Water samples were collected by a GEMTEC technologist after four and eight hours of pumping and were submitted to a CALA-accredited laboratory for analysis of 'subdivision package' parameters ("Subdivision Package" includes: total coliform, E. coli, fecal coliform, heterotrophic plate count, electrical conductivity, pH, hardness, total dissolved solids, alkalinity, fluoride, chloride, nitrate, nitrite, sulphate, ammonia, total kjeldahl nitrogen, dissolved organic carbon, phenols, hydrogen sulphide, true colour, turbidity, calcium, manganese, magnesium, potassium and sodium). In addition, metals, VOCs, PCBs, and PAHs were analyzed in the eight-hour sample. Field measurements were taken at regular intervals throughout the pumping test and are summarized in Appendix F.

Copies of the laboratory certificates of analysis for the water samples are provided in Appendix F. The results of the laboratory analysis on the water samples are also summarized therein with the applicable standards, guidelines, and objectives provided in the Ontario Drinking Water Quality Standards (ODWQS; Government of Ontario, 2006).

The following comments are provided regarding the drinking water quality and exceedances of the ODWQS:

#### 4.5.1 Bacteriological Results

Total chlorine measurements at the time of bacteriological sampling confirmed that total chlorine concentrations in the groundwater were non-detectable.

Based on water samples collected from the onsite test well (A295355) on September 28, 2022, the four- and eight-hour samples reported total coliform concentrations of <1 and 2 CFU/100mL, respectively. Likewise, fecal coliforms were reported at <1 and 4 CFU/100mL. Both of these reported values exceed the Ontario Drinking Water Quality Standards (ODWQS).

Due to total and fecal coliform exceedances, additional water quality sampling was completed on October 24, 2022, following well chlorination by Air Rock Drilling Company (License No. C76811) on October 21, 2022. Additional bacterial sampling was completed on October 31, 2022. No bacterial exceedances were noted in either of the follow-up samples. The current commercial property utilizes the well for a single onsite washroom. Thus, the well has not undergone any regular bacteria testing and, based on the information provided, has not been previously chlorinated. Fecal coliform exceedances noted in the eight-hour sample were not accompanied with any increase in other parameters indicative of surficial impacts (e.g., organics, nitrate, nitrite, ammonia, turbidity, etc.) so the detectable level may be anomalous. Following well chlorination and re-sampling, all bacteriological parameters were non-detectable.

The water is suitable for consumption based on the bacteriological testing, although regular sampling is recommended as part of well ownership.

#### 4.5.2 Chemical Results

The results of the chemical testing on the water samples indicate the aesthetic objectives for manganese was exceeded in the water samples. Furthermore, the warning level for sodium was also exceeded.

The above noted exceedances are discussed in the follow sections:

##### 4.5.2.1 Hardness

The hardness of the water samples was reported to be 317 and 333 mg/L as CaCO<sub>3</sub>, which exceeds the ODWQS operational guideline for hardness (80 to 100 mg/L as Ca CO<sub>3</sub>). Water having a hardness above 100 milligrams per litre as CaCO<sub>3</sub> is often softened for domestic use. Water softeners are widely used throughout rural areas to treat hardness and there is no upper treatable limit. The ODQWS indicates that hardness levels exceeding 200 mg/L as CaCO<sub>3</sub> is considered poor but tolerable and hardness levels exceeding 500 mg/L as CaCO<sub>3</sub> is considered to be unacceptable for most domestic purposes.

Water softening by conventional sodium ion exchange water softeners that use sodium chloride may introduce relatively high concentrations of sodium into the drinking water, which may be of concern to persons on a sodium restricted diet. The use of potassium chloride in the water



softener (which adds potassium to the water instead of sodium) could be considered as a means of keeping sodium concentrations in softened water at the background level. Alternatively, consideration could be given to providing a cold-water bypass water line for drinking water purposes that is not treated by a water softener.

#### **4.5.2.2 Manganese**

The manganese concentrations were reported to be 0.48 and 0.50 mg/L after four and eight hours of pumping, respectively, which exceeds the ODWQS aesthetic objective of 0.05 mg/L. Manganese may cause staining of plumbing fixtures and laundry. Typical treatments include water softeners or manganese greensand filters. The MECP Procedure D-5-5 maximum concentration of manganese considered reasonably treatable is 1 mg/L.

#### **4.5.2.3 Sodium**

Sodium concentrations ranged from 32.3 to 34.0 mg/L over the course of the pumping test, which falls well below the aesthetic objective of 200 mg/L. However, the ODWQS warning level for sodium of 20 mg/L was exceeded in all samples taken during the pumping test. The local Medical Officer of Health should be notified so that this information may be distributed to local physicians for their use with patients on sodium restricted diets.

## **5 IMPACT ASSESSMENT**

The impact on groundwater and surface water resources due to wastewater treatment and disposal by the onsite sewage disposal system on the subject site is assessed in the following sections.

It should be noted that the following information is provided for general guidance purposes only and that the septic system installed on the subject site should be designed using specific subsurface conditions at the location of the proposed septic system. In all cases, the septic system design must conform to the Ontario Building Code (OBC) requirements.

### **5.1 Hydrogeological Sensitivity**

Areas of thin soils cover, highly permeable soils, fractured bedrock exposed at ground surface and karst environments contribute to hydrogeological sensitivity of the site, which may not allow for sufficient attenuative processes for on-site septic systems and negatively impact the receiving aquifer. Areas of thin soil cover, generally taken to be less than two metres, were not encountered at the subject site. The overburden thickness across the site estimated from the on-site test holes and the supply well record ranges from 5.2 to 6.8 metres. Although the hydraulic conductivity of the fill, glacial till, and limestone bedrock observed at the site is unknown, the thickness of the overburden and the lack of bedrock outcropping supports the conclusion that the site is not hydrogeologically sensitive. Further, the primary water bearing zones for the onsite well were identified at 51.8 metres. Isolation of the bedrock supply well is further supported by the absence



of indicators of rapid surficial connection to the bedrock well, although some minor nitrate accumulation may be present, suggesting that the bedrock aquifer has an acceptable degree of isolation from contaminant sources.

Karst mapping (Brunton and Dodge, 2008) does not indicate the presence of inferred or potential karstic features and no evidence of shallow bedrock was identified surrounding the site.

## **5.2 Background Nitrate Conditions**

Water samples were collected on September 28, 2022, from the proposed supply well (Well ID A295355) and the overburden well (MW22-02) to evaluate background nitrate concentrations in the overburden and bedrock aquifers. Reported nitrate concentrations in the overburden were non-detect (<0.1 mg/L) and were 0.4 mg/L in the bedrock supply well after eight hours of pumping. Nitrate from the septic is most likely to be received by the overburden aquifer; however, based on the highly variable fill and overburden materials encountered at the subject site that may have areas of increased hydraulic conductivity, the upper bedrock water supply aquifer may also be a receiver. For the septic calculations, the background nitrate concentrations in the overburden and bedrock aquifer were measured ranging from <0.1 to 0.4 mg/L and were considered negligible.

## **5.3 Groundwater Impacts**

### **5.3.1 On-Site Septic**

The potential risk to groundwater resources on and off the subject site was assessed in accordance with Ministry of Environment Procedure D-5-4: Technical Guideline for Individual On-Site Sewage Systems: Water Quality Impact Risk Assessment. To evaluate the groundwater impacts, lot size considerations as well as nitrate dilution calculations for commercial properties outlined in MECP D-5-4 were followed.

The proposed development area is 1.21 hectares. The risks of individual on-site septic systems will be assessed using nitrate-nitrogen contaminant loading for commercial/industrial properties. The maximum allowable concentration of nitrate in the groundwater at the boundaries of the subject property is 10 milligrams per litre as per the Ministry of the Environment, Conservation and Parks' guideline D-5-4, dated August 1996.

The nitrate concentration at the site boundaries was calculated using the following information:

- Subject site area of 1.21 hectares (refer to construction drawings, Appendix A);
- Water holding capacity of soils (WHC) based on information obtained from Table 3.1 of the Ministry of Environment Stormwater Management Planning and Design Manual, dated March 2003;
- Post-Development water holding capacity;
  - 75 mm: Urban lawns, fine sandy loam.

- An annual water surplus of 0.380 metres/year (post-development) for soils with a water holding capacity of 75 mm (average of Ottawa Airport, Environment Canada Water Surplus Datasets, attached in Appendix G);
  - Ottawa International Airport (1939-2020), 75 mm WHC - surplus of 0.380 metres/yr.
- Post-Development hard surface area of approximately 20% that includes the driveway, parking lot, building, and septic bed area (Appendix A);
- Negligible background nitrate concentration in the overburden and bedrock aquifers; and
- The use of advanced treatment systems in the construction of the septic systems at the commercial lot, capable of reducing the concentration of nitrate in the effluent exiting the treatment unit to a maximum of 20 mg/L (this concentration value was utilized when re-simplifying the formula provided in D-5-4 for the purpose of determining the factor used to determine the maximum allowable flow for each lot from the determined available infiltration volume. The factor becomes 1 versus 3 (as is the case without advanced treatment).

The septic flow for the commercial lot is based on information provided in Section 5.6.3 of Guideline D-5-4, the Carp Road Corridor Nitrate Impact Assessment Recommendations memo dated September 27, 2016, and the MOE SWM Planning and Design Manual, dated March 2003. Based on the nitrate impact assessment for commercial properties, the maximum allowable daily design sanitary sewage flow (DDSSF) for the proposed commercial lot is 7,020 litres per day using advanced treatment technologies and 2,340 litres per day using conventional treatment. The calculations and assumptions of this are provided in Appendix H.

The average DDSSF to support the proposed development was not available during the preparation of this report.

### **5.3.2 Septic Impacts to Neighbouring Properties**

The proposed on-site septic system is located in the southwest portion of the subject site, adjacent to residential lands (Figure 1). The subject site is not considered to be hydrogeologically sensitive and, based on the nitrate impact assessment, an advanced septic system with a maximum allowable flow of 7,020 litres per day or conventional unit with up to 2,340 litres per day are not anticipated to result in negative impacts at the property boundary.

The septic system is recessed approximately fifteen metres from the property boundary. A fifteen-metre buffer must be maintained to adjacent drilled wells; however, a thirty-metre buffer is required for any dug well. The well records and satellite imagery do not indicate the presence of a drilled or dug well within thirty metres of the proposed septic location. Thus, nitrate impacts to neighbouring water well users are not anticipated, although the absence of neighbouring wells within the prescribed buffer distances should be confirmed before the septic bed is installed.

## 5.4 Aquifer Vulnerability

The proposed development involves the construction of a single-storey warehouse for the storage of concrete trucks accompanied by a gravel driveway, gravel parking lot, septic bed, and stormwater management system (Appendix A). A dry well and swale system has been proposed (Stantec, 2022) with features that are more than 30 metres from any known or suspected water supply well. The site is covered by more than five metres of glacial till and the primary water bearing zone of the supply well is within the bedrock at 51.8 mbgs. No karstic features are anticipated on the project site. The presence of fecal coliform in one water sample is interpreted as anomalous, as evidenced by follow-up bacterial sampling. Isolation of the bedrock supply well is evidenced by the absence of indicators of rapid surficial connection to the bedrock well, although some minor nitrate accumulation may be present, suggesting that the bedrock aquifer has an acceptable degree of isolation from contaminant sources.

Records for an off-site overburden well and a well of unknown construction were identified more than 400 metres away from the site. Although it is acknowledged that not all well records are registered in the MECP Well Record Database, a review of well records and satellite imagery have not identified any well users at risk from the proposed site use within 30 metres of the site boundaries. As such, the proposed Site plan adheres with the Ontario Regulation 903 for well construction.

This site use entrains a risk of fuel and oil spills associated with vehicle traffic and storage as well as potential chloride contamination over time associated with road salt. It is recommended that an oil-grit separator be installed to treat any water coming from the warehouse, site grading should ensure that potential spills are directed away from the well or dry well, and a spill response plan should be established for the site to identify any traces of spills within the warehouse or along the gravel driveway and parking lot. The location of snow storage and the septic bed should be strategically located with consideration of the stormwater management structures to mitigate risk of potential contamination to the supply well. So long as these precautions are taken, no significant risk is anticipated to well water users in the area resulting from the proposed development.

## 6 CONCLUSIONS AND RECOMMENDATIONS

### 6.1 Conclusions

Based on the results of this investigation, the following conclusions are provided:

- The surficial soils encountered at the subject site consist of silty sand fill material underlain by native sand and gravel glacial till, ranging in thickness from 5.2 to 6.8 mbgs.
- The maximum drawdown in the water level of the well was approximately 0.7 metres following eight hours of pumping at a flow rate of 56.8 litres per minute. Thus, the pumping

test withdrew approximately 27,260 litres in eight hours, which far exceeds 1.5 times the maximum permissible septic flow for the site (7,020 L/day assuming advanced septic treatment technologies). Based on a static water level of 3.6 metres below ground surface, the proposed pump intake depth of 30.5 metres, and the water level after eight hours of pumping, the remaining available drawdown in the well is approximately 26.2 metres. Interference effects on neighbouring properties are not anticipated given the high well yields and negligible drawdown during pumping.

- The groundwater quality exceeds the ODWQS for the aesthetic objective of manganese, warning level for sodium, and operational guideline for hardness. Initial well water samples reported exceedances for both fecal and total coliform; however, two follow-up samples taken after chlorination of the well were clear of bacterial exceedances. Chlorine concentrations were confirmed to be negligible in the well at the time of sampling. Fecal coliform exceedances initially noted in the eight-hour sample (Appendix F) were not accompanied with any increase in other parameters indicative of surficial impacts (e.g., organics, nitrate, nitrite, ammonia, turbidity, etc.) so the detectable level may be anomalous, as would suggest the results of follow-up sampling. The water is suitable for consumption based on the bacteriological testing, although periodic sampling is recommended to confirm the continued suitability of the water supply.
- The site is not considered to be hydrogeologically sensitive as thin soils, highly permeable soils, or outcropped bedrock were not encountered. The on-site supply well casing extends 7 mbgs and 3.05 metres into bedrock. Based on a review of MECP water well logs and satellite imagery in the area, neighbouring dug wells are not expected to be impacted; however, one dug well may be in operation more than 415 metres southeast and upgradient of the project site (Well ID 7124076). Furthermore, an incomplete well record (Well ID 7357888) dated 2019 was located more than 400 metres away. Based on MECP water well records and aerial photos, neighbouring bedrock water supply wells are likely more than 15 metres away from the project site.
- Nearby borehole logs and design drawings for the swales and dry well suggest that there will be greater than two metres of overburden separating these features from the bedrock aquifer; however, this should be confirmed during installation. Water exiting the stormwater management system must be of adequate quality to not impact the downgradient groundwater system. Likewise, water infiltrated via the dry well and swales must be of adequate quality to not negatively impact the bedrock system. A review of well records and satellite imagery suggest that no drilled or dug supply wells are within 30 metres of the proposed septic system or stormwater management features, which complies with Ontario Regulation 903.

- Background nitrates are considered to be negligible, measured to be <0.1 mg/L in the receiving overburden aquifer and 0.4 mg/L in the bedrock water supply aquifer.
- The maximum allowable septic flow, as per MECP Procedure D-5-4 commercial predicative assessment, is calculated to be 7,020 litres per day, assuming the use of an advanced treatment septic system capable of reducing nitrates by 50%, or 2,340 litres per day using a conventional septic system. The average DDSSF for the proposed development must remain below the maximum allowable septic flow as per MECP Procedure D-5-4.
  - The proposed system must be certified for nitrate reduction through a third body, such as BNQ or NSF. The OSSO septic permit must be submitted to confirm that the system has been approved as designed. In addition, an agreement will be required with the OSSO to conduct regular sampling of the tertiary septic system with nitrate reduction, as required in the OBC to ensure the system is functioning as designed in the long-term.

## 6.2 Recommendations

Based on the results of this investigation, the following water supply, septic system, and groundwater impact mitigation measures recommendations are provided:

### 6.2.1 Water Supply Recommendations

- It is recommended that the property owners construct, maintain and test their drinking water well in accordance with the Ministry of the Environment and Climate Change document “Water Supply Wells - Requirements and Best Management Practices, Revised April 2015”.
- Groundwater quality treatment may be utilized to treat the following ODWQS exceedances:
  - Hardness – the water supply is considered as “very hard”, as defined by concentrations exceeding 300 mg/L as CaCO<sub>3</sub>. Water softeners (e.g., sodium chloride or potassium chloride ion exchange) may be used to reduce hardness below the operational guideline.
  - Sodium – the warning level for sodium of 20 mg/L was exceeded which concerns individuals on sodium-restricted diets. Sodium levels should be reported to local Medical Officer of Health so that local medical practitioners may be informed.
  - Manganese – manganese concentrations exceeded the ODWQS limit of 0.05 mg/L. Typical treatments include water softeners or manganese greensand filters.

- Ground surface surrounding the supply well should be graded radially away from the well to avoid pooling and overland flow in the vicinity of the supply well.
- The use of earth energy systems was not evaluated as part of this investigation. If considered, additional hydrogeological investigations will be required to assess site suitability.
- Potential contaminant sources include winter maintenance (road salting), snow storage, and fuel spills and contaminants from vehicles.
  - It is recommended that an oil-grit separator be installed to treat any outflows from the warehouse.
  - Best management practices for the application of road salts within the parking lot and internal driveway should follow the City of Ottawa’s “Material Application Policy, Revision 3.2, October 31, 2011” Salt Management Plan.
  - Best management practices for fuel storage should follow the Liquid Fuels Handling Code and the Ontario Water Resources Act.
  - Best management practices should be implemented for waste treatment.
  - A spills prevention and management plan be prepared to protect the bedrock aquifer which is used as a drinking water source for adjacent developments. Flows from the warehouse, driveway and/or parking lot should be directed away from the supply well and dry well to reduce risk in the event of a containment breach.
  - Only clean stormwater should be infiltrated through the grass swales or SWMP, which can be achieved through adherence with best management practices and effective and properly maintained treatment systems (in this case swales, an oil-grit separator, and a septic bed).
- The post-development water balance indicates an increase in runoff (Stantec, 2022), which is offset by the proposed grass swales and the dry well. The stormwater management report indicates that the grass swales and retention pond will remove 70% TSS. It must be confirmed during construction that greater than two metres of relatively low-conductivity overburden separate the base of the stormwater management features from the bedrock aquifer.

### 6.2.2 Septic System Recommendations

- The maximum daily design sewage flow for the development based on the MECP Procedure D-5-4 nitrate impact assessment is calculated to be 7,020 litres per day assuming the use of advanced septic sewage disposal system that achieves a minimum of a 50% reduction (to 10 mg/L) in nitrogen prior to the effluent being disposed to a Class IV leaching bed (Type A or Type B) and 20% hard surface area post-development.

Alternatively, the maximum daily design flow for a conventional septic system was calculated as 2,340 litres per day. The system must be approved by the Ontario Building Code and is recommended to be BNQ or NSF certified. A site-specific investigation should be conducted on the lot for the design of the septic system (proposed septic location shown in the construction drawings of Appendix A).

- It is required that the property owners enter a maintenance agreement with authorized agents of an advanced treatment septic system manufacturer for the service life of the system.
- It is recommended that the property owners construct, maintain and check their onsite septic system in accordance with the Ontario Building Code.



## 7 LIMITATIONS OF REPORT

This report was prepared for Bell & Associates Architecture (Bell) and is intended for the exclusive use of Bell & Associates Architecture. This report may not be relied upon by any other person or entity without the express written consent of GEMTEC and Bell & Associates Architecture. Nothing in this report is intended to provide a legal opinion.

The investigation undertaken by GEMTEC with respect to this report and any conclusions or recommendations made in this report reflect the best judgments of GEMTEC based on the site conditions observed during the investigations undertaken at the date(s) identified in the report and on the information available at the time the report was prepared. This report has been prepared for the application noted and it is based, in part, on visual observations made at the site, subsurface investigations at discrete locations and depths and laboratory analyses of specific chemical parameters and material during a specific time interval, all as described in the report. Unless otherwise stated, the findings contained in this report cannot be extrapolated or extended to previous or future site conditions, portions of the site that were unavailable for direct investigation, subsurface locations on the site that were not investigated directly, or chemical parameters, materials or analysis which were not addressed.

Should new information become available during future work, including excavations, borings or other studies, GEMTEC should be requested to review the information and, if necessary, re-assess the conclusions presented herein.

## 8 CLOSURE

We trust that this report is sufficient for your purposes. If you have any questions or require additional information, please call.



Jason KarisAllen, M.A.Sc., E.I.T. (NS)  
Environmental Scientist



Andrius Paznekas, M.Sc., P.Geo.  
Hydrogeologist



JKA / AP



## 9 REFERENCES

Brunton, F.R. and Dodge, J.E.P. 2008. Karst of southern Ontario and Manitoulin Island; Ontario Geological Survey, Groundwater Resources Study 5.

Gao, C., Shirota, J., Kelly, R. I., Brunton, F.R., van Haften, S. 2006. Bedrock topography and overburden thickness mapping, southern Ontario; Ontario Geological Survey, Miscellaneous Release--Data 207. ISBN 1-4249-2550-9

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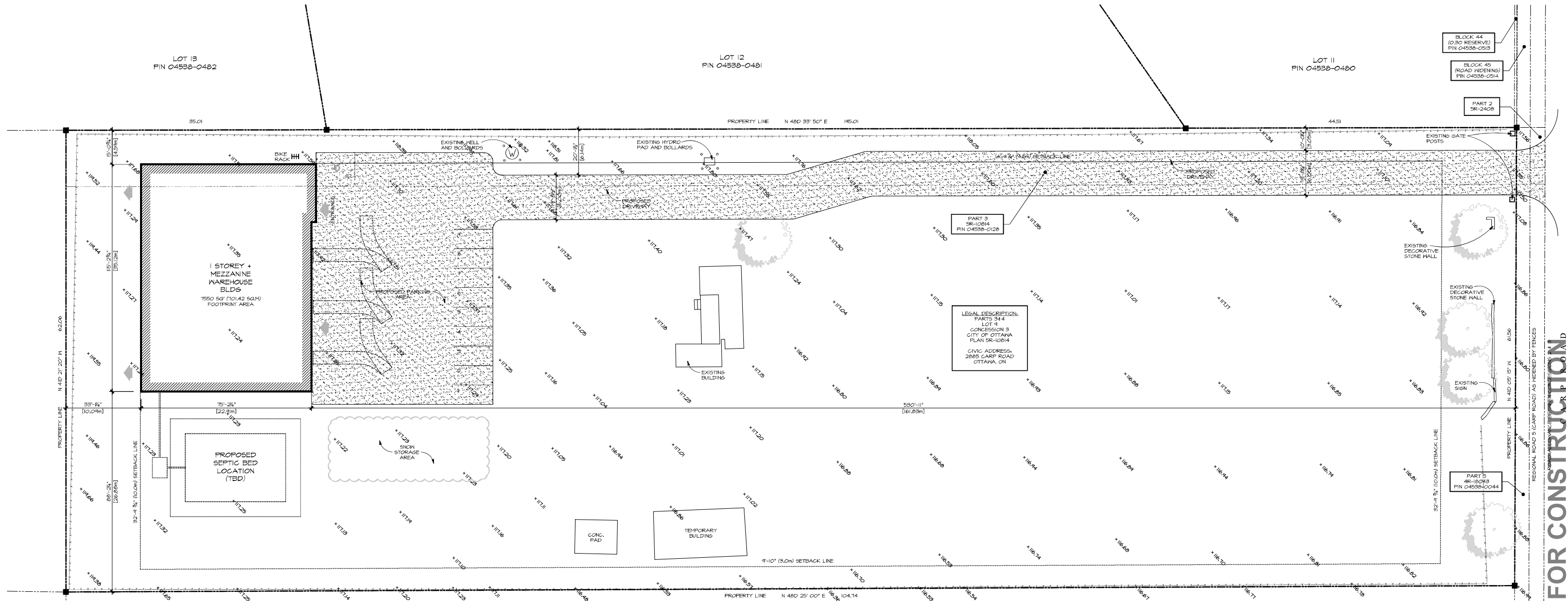
Ontario Ministry of the Environment, Conservation and Parks (MECP). 1996. Procedure D-5-4, Technical Guideline for Individual On-Site Sewage Systems: Water Quality Impact Risk Assessment. August 1996.

Stantec Consulting Limited. 2022. *Servicing and stormwater management report – 2885 Carp Road* [draft report prepared for HQ Management Group]. Ottawa, Ontario, Canada.

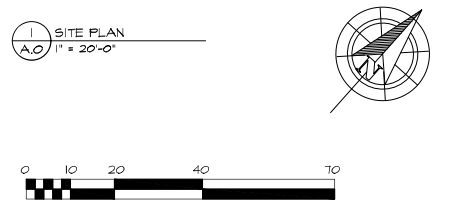


## **APPENDIX A**

### Preliminary Construction Drawings



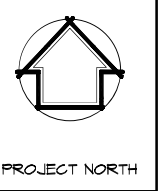
**SITE PLAN GENERAL NOTES:**  
 - THIS SITE PLAN AND ALL EXISTING SITE INFO AND PROPERTY INFORMATION IS BASED ON A SURVEY COMPLETED BY FAIRHALL MOFFATT AND WOODLAND LIMITED, ONTARIO LAND SURVEYORS



RCM ZONING		
ZONING MECHANISMS PROPOSED WAREHOUSE USE	PROVISIONS	
	REQUIRED	PROVIDED
MINIMUM LOT AREA	4,000 m <sup>2</sup>	12,041 m <sup>2</sup>
MINIMUM LOT WIDTH	30 m	61 m
MINIMUM FRONT YARD AND CORNER SIDE YARD SETBACKS		
	10 m	161 m
MINIMUM INTERIOR		
ABUTTING RESIDENTIAL ZONE	4.5 m	4.5 M
SIDE YARD SETBACKS ALL OTHER ZONES		
	3.0 m	
MINIMUM REAR		
FROM ANY PORTION OF A REAR LOT LINE	10 m	10 m
YARD SETBACKS ABUTTING A RESIDENTIAL ZONE		
	11 m	7.5 m
MAXIMUM BUILDING HEIGHT		
	25 %	6 %
MAXIMUM LOT COVERAGE		
	35,000 m <sup>2</sup>	101 m <sup>2</sup>
MAXIMUM PERMITTED GROSS FLOOR AREA (SUBZONE 14)		
	REQUIRED	PROVIDED
LANDSCAPING OF YARDS		
	FRONT AND CORNER SIDE YARDS MUST BE LANDSCAPED EXCEPT FOR DRIVEWAYS CROSSING THOSE YARDS LEADING TO PARKING	
OUTDOOR STORAGE		
	PERMITTED IN INTERIOR SIDE AND REAR YARD ONLY MUST BE SCREENED AND CONCEALED AND CONCEALED FROM VIEW ABUTTING STREETS AND FROM ABUTTING NON-COMMERCIAL OR NON INDUSTRIAL ZONES	
PARKING (WAREHOUSE USE)		
	REQUIRED	PROVIDED
MINIMUM PARKING SPACES - 0.25/100 M <sup>2</sup> GROSS FLOOR AREA	5 SPACES	10 SPACES
MINIMUM DRIVEWAY WIDTH PROVIDING ACCESS TO A PARKING LOT		
	6.0 m	6.0 m
MINIMUM WIDTH OF LANDSCAPED AREA AROUND A PARKING LOT FOR A PARKING LOT CONTAINING MORE THAN 10 BUT FEWER THAN 100 SPACES		
	ABUTTING A STREET	3 m
	NOT ABUTTING A STREET	1.5 m
	REQUIRED	PROVIDED
LANDSCAPING FOR PARKING LOTS		
	5% OF THE PARKING LOT AREA MUST BE PERIMETER OR INTERIOR BETWEEN THE LOT LINE AND THE PERIMETER OF THE PARKING LOT, AND CAN INCLUDE LANDSCAPE ISLANDS, MEDIANS, PATHWAYS, PLAZAS	
BICYCLE PARKING		
	REQUIRED	PROVIDED
MINIMUM BICYCLE PARKING SPACES - 1/250 M <sup>2</sup> GROSS FLOOR AREA	3 SPACES	3 SPACES

**NOTES:**  
 REFER TO GENERAL NOTES FOR ALL TYPICAL CONSTRUCTION NOTES & DETAILS WHEN DRAWINGS OR NOTES REFER TO O.B.G. WALL, CAREFULLY REFER TO THE LATEST VERSION OF THE ONTARIO BUILDING CODE 2022.

LEGEND:	
(1) EXTERIOR DOOR & WINDOW TAG	(1520) DOOR NUMBER
(2) DOOR TAG	(1520) EXISTING DOOR
(3) EXTERIOR HALL TYPE	(1520) NEW DOOR
(4) INTERIOR PARTITION WALL TYPE	(1520) EXISTING HALL
(5) FLOOR TYPE	(1520) NEW HALL CONSTRUCTION
(6) ROOF TYPE	(1520) DEMOLITION
(7) POST TYPE	(1520) ENTRANCE (POINTS INTO BUILDING) EXIT (POINTS OUT OF BUILDING)
(8) PAD FOOTING TYPE	
(9) HALL FOOTING TYPE	
(10) SMOKE/CO CARBON MONOXIDE DETECTOR PER OBC 4.0.1.4 & 4.20.4	



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 Ottawa, ON K1A 1L3  
 613-831-9688  
 info@jimbella.com  
 www.jimbella.com

VERSION NO.	1
DATE	OCTOBER 2022
SCALE	

**NOTES:**  
 ALL CONTRACTORS MUST COMPLY WITH ALL CODES & BY-LAWS IN JURISDICTION.  
 IT IS THE RESPONSIBILITY OF THE APPROVED CONTRACTOR TO OBTAIN ALL NECESSARY PERMITS FROM THE LOCAL GOVERNMENT.  
 CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS FROM THE LOCAL GOVERNMENT.  
 CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS FROM THE LOCAL GOVERNMENT.  
 CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS FROM THE LOCAL GOVERNMENT.

NO.	ITEM	DATE
1	FOR REVIEW	07.12.22

**PROJECT:**  
 WAREHOUSE BUILDING  
 2885 CARP ROAD  
 OTTAWA, ON  
 K2H 1P4

**CLIENT:**  
 HQ MANAGEMENT GROUP  
 218 HUNTSVILLE DRIVE  
 KANATA, ON  
 K2T 0G6

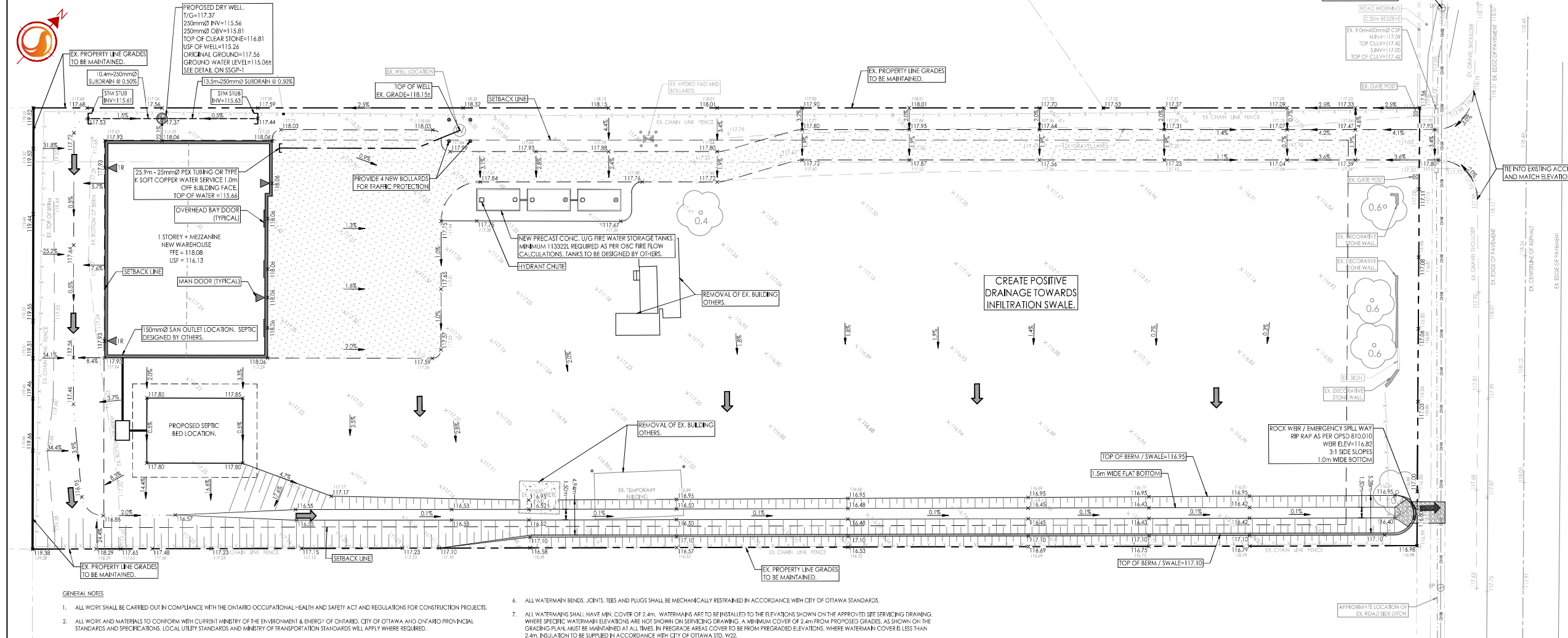
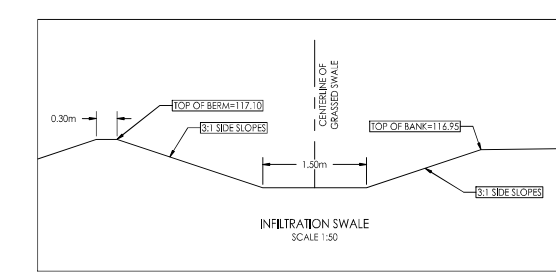
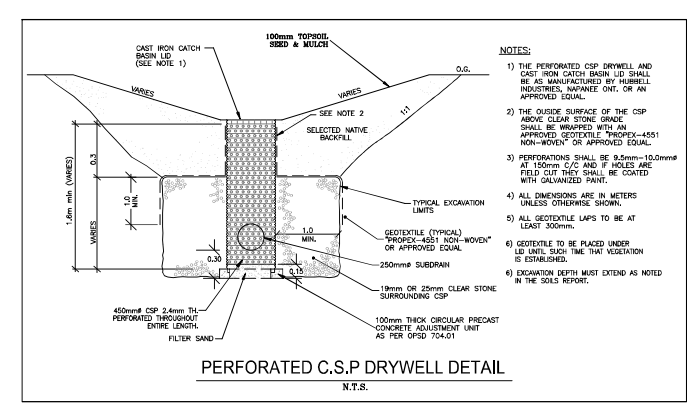
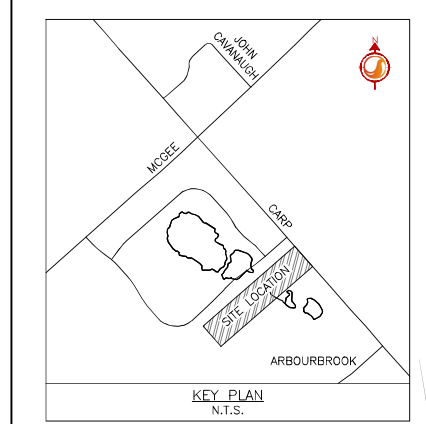
**DRAWING:**  
 SITE PLAN

**SCALE:** AS SHOWN  
**DRAWN BY:** TJS  
**DATE:** OCT. 2022  
**CHECKED BY:** JCS  
**APPROVED BY:** JCS  
**PROJECT NO.:** 218-04  
**SHEET NO.:** A.0

PRELIMINARY - NOT FOR CONSTRUCTION

Legend

	PROPERTY LINE
	EXISTING GROUND ELEVATION
	EXISTING ROAD SIDE DITCH
	EXISTING OVERHEAD WIRES
	EXISTING UTILITY POLE
	EXISTING CHAIN LINK FENCE
	EXISTING CONCRETE GATE POST
	EXISTING ROAD CENTERLINE
	EXISTING TREE
	EXISTING WELL LOCATION
	EXISTING TRANSFORMER AND BOLLARDS
	EXISTING CULVERT
	PROPOSED WATER SERVICE
	PROPOSED ELEVATION
	PROPOSED LOT CORNER ELEVATION
	EXISTING ELEVATION AT LOT CORNER
	FLOW DIRECTION AND GRADE
	FINISHED FIRST FLOOR ELEVATION
	UNDERSIDE OF FOOTING ELEVATION
	ENGINEERED FILL REQUIRED
	TERRACING 3:1 SLOPE MAXIMUM (UNLESS OTHERWISE SHOWN)
	DIRECTION OF OVERLAND FLOW
	PROPOSED GRAVEL ACCESS



- GENERAL NOTES**
1. ALL WORK SHALL BE CARRIED OUT IN COMPLIANCE WITH THE ONTARIO OCCUPATIONAL HEALTH AND SAFETY ACT AND REGULATIONS FOR CONSTRUCTION PROJECTS.
  2. ALL WORK AND MATERIALS TO CONFORM WITH CURRENT MINISTRY OF THE ENVIRONMENT & ENERGY OF ONTARIO, CITY OF OTTAWA AND ONTARIO PROVINCIAL STANDARDS AND SPECIFICATIONS. LOCAL UTILITY STANDARDS AND MINISTRY OF TRANSPORTATION STANDARDS WILL APPLY WHERE REQUIRED.
  3. THE CONTRACTOR IS ADVISED THAT WORKS BY OTHERS MAY BE ONGOING DURING THE PERIOD OF THIS CONTRACT. THE CONTRACTOR SHALL COORDINATE CONSTRUCTION ACTIVITIES AND COOPERATION WITH ALL OTHER CONTRACTORS AND PRESENT CONSTRUCTION PROJECTS.
  4. THE INFORMATION SHOWN FOR EXISTING UTILITIES WAS PROVIDED BY OTHERS. THE CONTRACTOR IS RESPONSIBLE FOR LOCATING AND PROTECTING ALL UTILITIES DURING CONSTRUCTION. ALL EXISTING UTILITIES MUST BE LOCATED AND VERIFIED BY EACH UTILITY PRIOR TO COMMENCEMENT OF WORK. ANY VARIANCE TO BE IMMEDIATELY REPORTED TO THE ENGINEER. LOST TIME DUE TO FAILURE OF THE CONTRACTOR TO CONFIRM UTILITY LOCATIONS AND NOTIFY THE ENGINEER OF POSSIBLE CONFLICTS PRIOR TO CONSTRUCTION WILL BE AT THE CONTRACTOR'S EXPENSE.
  5. ALL CONSTRUCTION SHALL BE CARRIED OUT IN ACCORDANCE WITH THE RECOMMENDATIONS MADE BY THE GEOTECHNICAL CONSULTANT, OBC, MUNICIPAL AND PROVINCIAL STANDARDS.
  6. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL PERMITS REQUIRED AND TO BEAR THE COST OF SAME INCLUDING WATER PERMIT AND ASSOCIATED COSTS.
  7. ALL DISTURBED AREAS SHALL BE RESTORED TO EQUAL OR BETTER CONDITION TO THE SATISFACTION OF THE ENGINEER AND THE TOWNSHIP. PAVEMENT REINSTATEMENT FOR SERVICE AND UTILITY CUTS SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STANDARD R10, OPSD 509.010 AND OPSD 310.
  8. BENCHMARKS: IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THAT THE SITE BENCHMARK(S) HAS NOT BEEN ALTERED OR DISTURBED AND THAT ITS RELATIVE ELEVATION AND DESCRIPTION AGREES WITH THE INFORMATION SHOWN ON DRAWING SSG-1.
  9. THE CONTRACTOR SHALL PROVIDE TO THE ENGINEER 1 (ONE) SET OF AS CONSTRUCTED SITE SERVICING, GRADING, AND SITE ELECTRICAL DWGS.
  10. CONTRACTOR TO LOCATE EXISTING SERVICE LATERALS PRIOR TO CONSTRUCTION. EXISTING STORM AND SANITARY SERVICE LATERALS TO BE ABANDONED PER S11.4. EXISTING WATER SERVICE TO BE BLANKED AT THE MAIN (TYP).
  11. TOPOGRAPHIC SURVEY SUPPLIED BY FAIRHALL MOFFATT AND WOODLAND LTD. JOB NO. Z17300. TOPOGRAPHIC SURVEY OF PART OF LOT 9, CONCESSION 3 GEOGRAPHIC TOWNSHIP OF HUNTELEY, CITY OF OTTAWA.
  12. SITE PLAN PREPARED BY JVA BELL ARCHITECTURAL DESIGN INC. DATED OCTOBER 14, 2021. DRAWING A.0.
  13. GEOTECHNICAL REPORT PREPARED BY GEMTEC, TITLED PROPOSED COMMERCIAL DEVELOPMENT, 2885 CARP ROAD, OTTAWA, ONTARIO.
- WATER SUPPLY SERVICING**
1. THE CONTRACTOR SHALL CONSTRUCT WATERMAIN, WATER SERVICES, CONNECTIONS & APPURTENANCES AS PER CITY OF OTTAWA SPECIFICATIONS & SHALL CO-ORDINATE AND PAY ALL RELATED COSTS INCLUDING THE COST OF CONNECTION, INSPECTION & DISSECTION.
  2. WATER SERVICE TO BE INSTALLED 1.0m OFF BUILDING FACE.
  3. DRILLED POTABLE WATER WELL IS TO BE DESIGNED AND INSTALLED BY LICENSED WELL CONTRACTOR THAT USES LICENSED TECHNICIANS. INSTALLATION OF ON-SITE WELL SHALL BE AS PER ONTARIO BUILDING CODE AND ONTARIO REGULATION 903 UNDER THE WATER RESOURCES ACT.
  4. WATERMAIN TRENCH AND BEDDING SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STD. W17 UNLESS OTHERWISE SPECIFIED. BEDDING AND COVER MATERIAL TO BE SPECIFIED BY PROJECT GEOTECHNICAL CONSULTANT.
  5. CATHODIC PROTECTION TO BE SUPPLIED ON METALLIC FITTINGS AS PER CITY OF OTTAWA STD. W40 AND W42.

6. ALL WATERMAIN BENDS, JOINTS, TEES AND PLUGS SHALL BE MECHANICALLY RESTRAINED IN ACCORDANCE WITH CITY OF OTTAWA STANDARDS.
  7. ALL WATERMANS SHALL HAVE MIN. COVER OF 2.4m. WATERMANS ARE TO BE INSTALLED TO THE ELEVATIONS SHOWN ON THE APPROVED SITE SERVICING DRAWING. WHERE SPECIFIC WATERMAIN ELEVATIONS ARE NOT SHOWN ON SERVICING DRAWING, A MINIMUM COVER OF 2.4m FROM PROPOSED GRADES, AS SHOWN ON THE GRADING PLAN, MUST BE MAINTAINED AT ALL TIMES. IN PREGRADE AREAS COVER TO BE FROM PREGRADE ELEVATIONS, WHERE WATERMAIN COVER IS LESS THAN 2.4m. INSULATION TO BE SUPPLIED IN ACCORDANCE WITH CITY OF OTTAWA STD. W22.
- SITE GRADING**
1. ALL GRANULAR BASE & SUB BASE COURSE MATERIALS SHALL BE COMPACTED AS PER GEOTECHNICAL CONSULTANT RECOMMENDATIONS.
  2. ALL DISTURBED GRASSED AREAS SHALL BE RESTORED TO ORIGINAL CONDITION OR BETTER, WITH SOIL ON MIN.
  3. REFER TO ARCHITECTURAL SITE PLAN FOR DIMENSIONS AND SITE DETAILS.
  4. CONTRACTOR TO OBTAIN A ROAD OCCUPANCY PERMIT 48 HOURS PRIOR TO COMMENCING ANY WORK WITHIN THE MUNICIPAL ROAD ALLOWANCE IF REQUIRED BY THE MUNICIPALITY.
  5. EMBANKMENTS TO BE SLOPED AT MAX. 3:1, UNLESS OTHERWISE SPECIFIED.
  6. ALL NECESSARY CLEARING AND GRUBBING SHALL BE COMPLETED BY THE CONTRACTOR. REVIEW WITH ARCHITECT AND THE ICENSHIP PRIOR TO TREE CUTTING.
  7. SUB-EXCAVATE SOFT AREAS & FILL WITH GRANULAR "B" COMPACTED IN 0.15m LAYERS.
  8. NO ALTERATION TO EXISTING GRADES OR DRAINAGE PATTERN ON PROPERTY LINE MAY BE MADE WHERE NO PERMISSION TO ENTER ADJACENT PROPERTY EXISTS.
  9. NO EXCESS DRAINAGE, DURING AND AFTER CONSTRUCTION, IS TO BE DIRECTED TOWARDS NEIGHBOURING PROPERTIES.
  10. UNDERSIDE OF FOOTING TO HAVE MINIMUM COVER OF 1.5m. WHERE SUFFICIENT COVER IS NOT PROVIDED, FOOTINGS ARE TO BE INSULATED TO PROVIDED EQUIVALENT INSULATION.
  11. PAVEMENT CONSTRUCTION SHALL BE AS PER GEOTECHNICAL CONSULTANT RECOMMENDATIONS.

0	ISSUED FOR SPA	MJS	NC	22.10.22
Revision		By	Appd.	YF.AMM.DD
File Name:	160401724-DB	MJS	NC	MJS
		Dwn.	Chkd.	Dsgn.
Permit-Seal		MJS	NC	22.11.09
		Dwn.	Chkd.	Dsgn.

Client/Project  
**HQ MANAGEMENT GROUP**

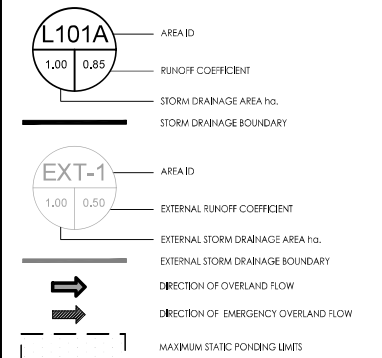
2885 CARP ROAD  
NEW WAREHOUSE BUILDING  
OTTAWA, ON, CANADA

Title  
**SITE SERVICING AND GRADING PLAN**

Project No.	Scale	0	3	9	15m
160401724	1:300				
Drawing No.	Sheet			Revision	

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Legend



Notes

Revision	By	Appd.	Date
0	MJS	NC	22.12.02
ISSUED FOR SPA			

File Name:	MJS	NC	MJS	22.11.09
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

Client/Project

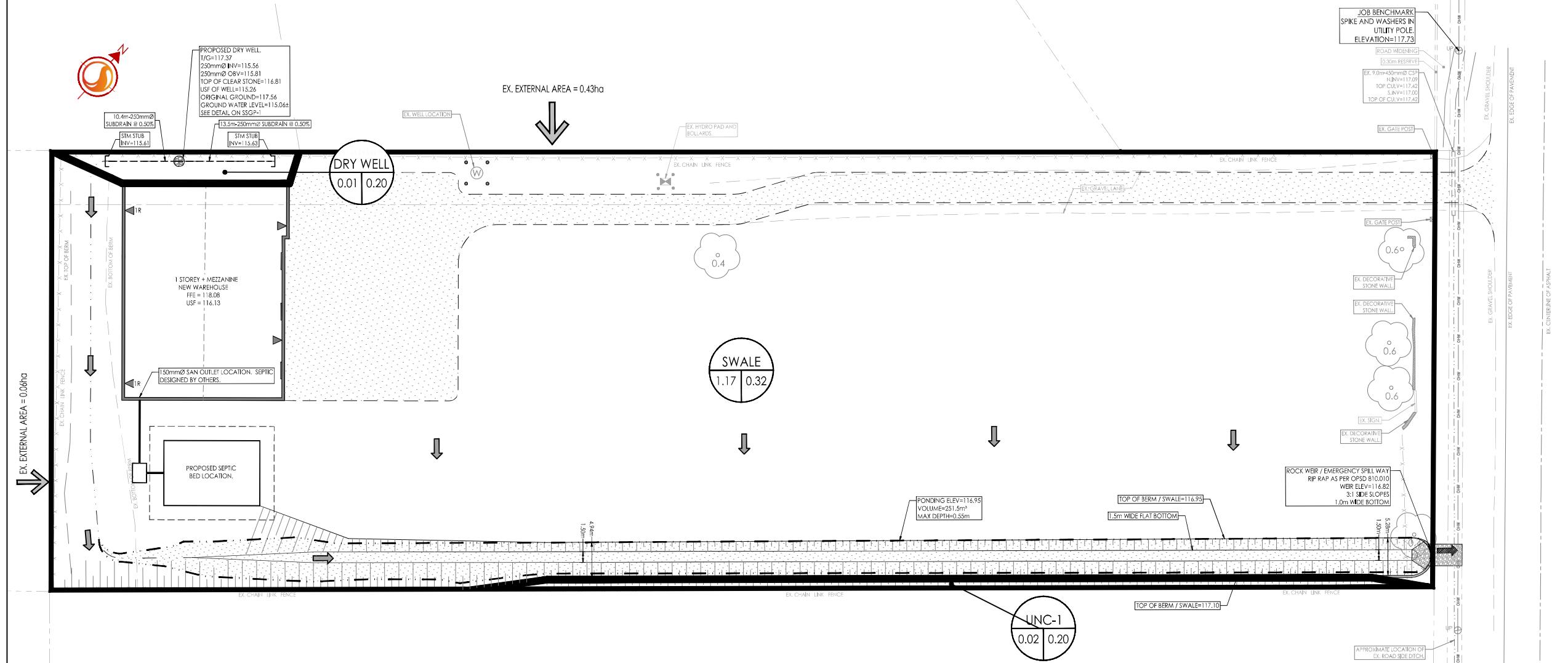
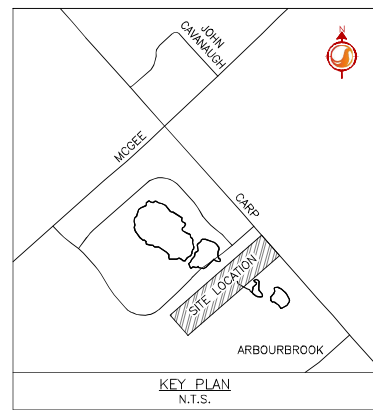
HQ MANAGEMENT GROUP

2885 CARP ROAD  
NEW WAREHOUSE BUILDING  
OTTAWA, ON, CANADA

Title

STORM DRAINAGE PLAN

Project No. 160401724	Scale 1:300	0 3 9 15m
Drawing No. SD-1	Sheet 2 of 3	Revision 0



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2022/12/02 2:10 PM by: jsp, MKC



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Legend

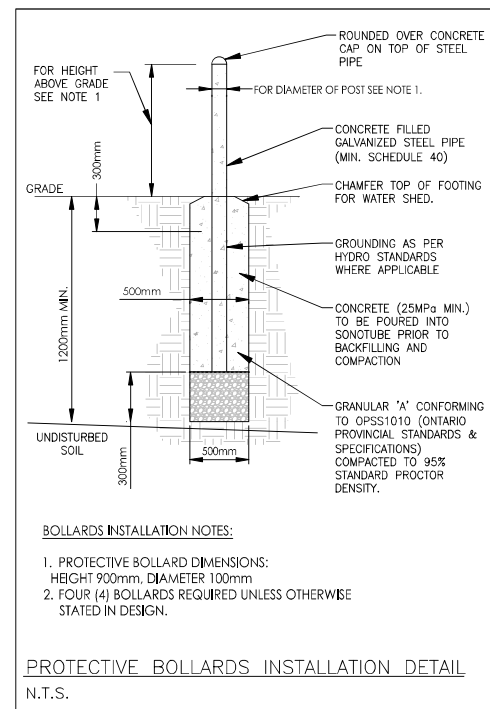
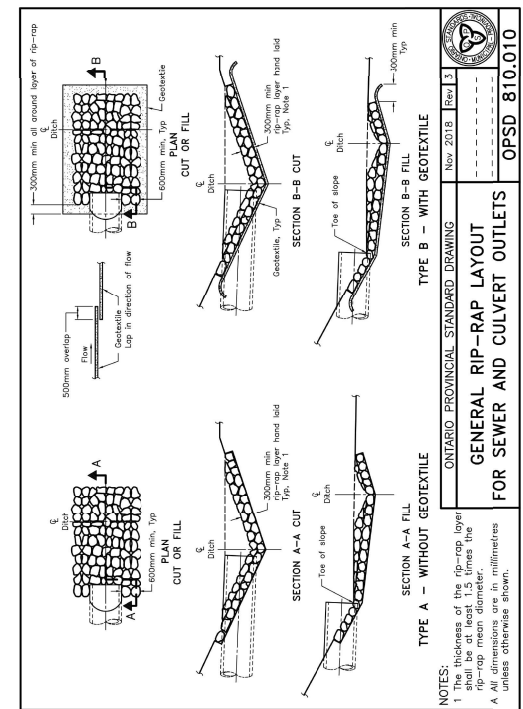
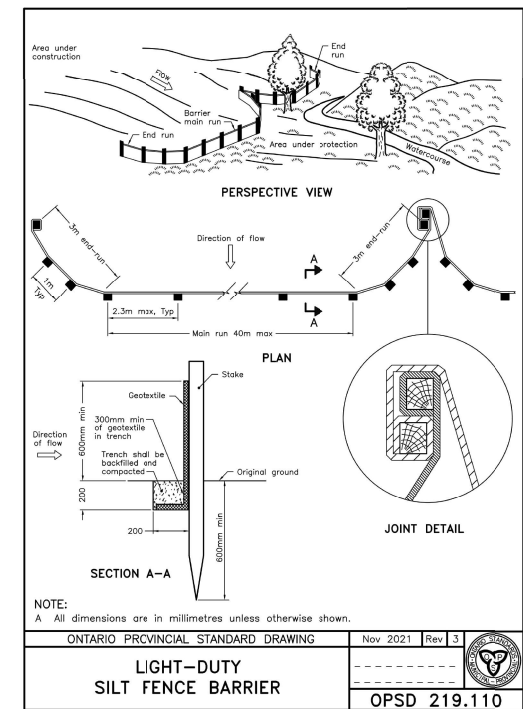
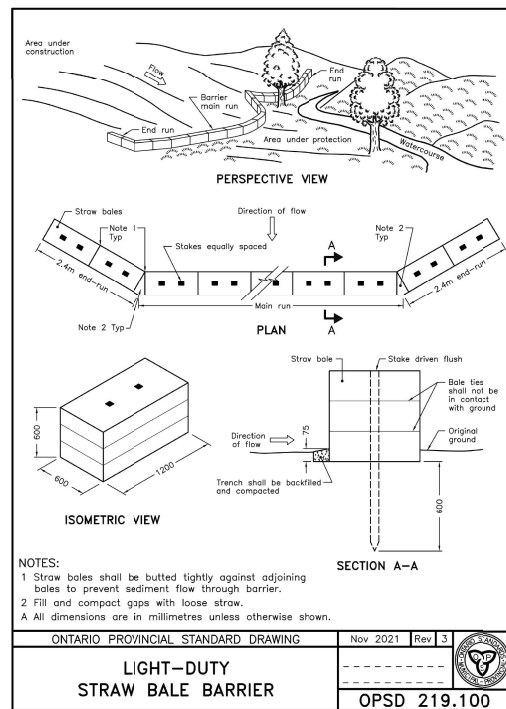
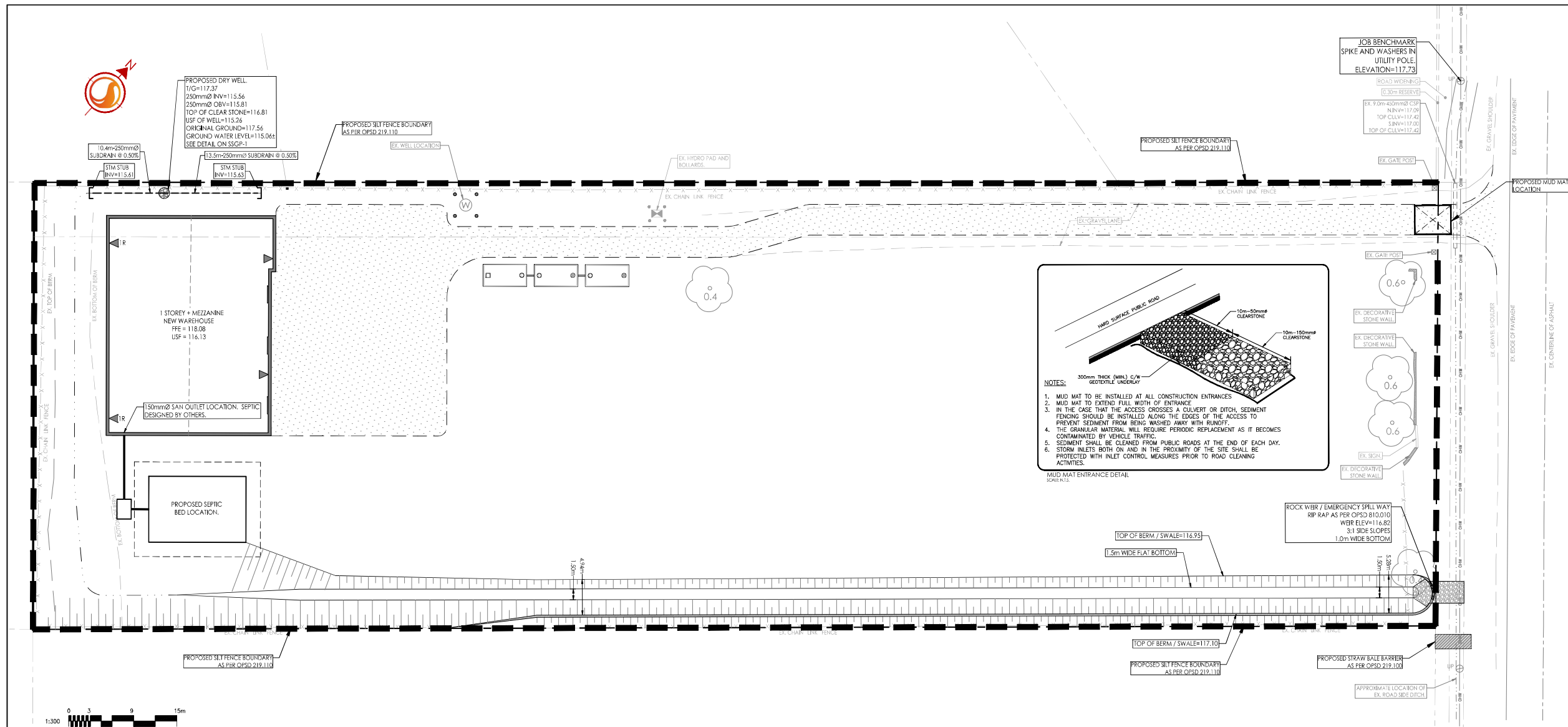
- PROPOSED SILT FENCE BOUNDARY AS PER OPSD 219.110
- PROPOSED MUD MAT LOCATION
- PROPOSED STRAW BALE LOCATIONS

Best Management Practices

CONTRACTOR TO PROVIDE EROSION AND SEDIMENT CONTROLS (BEST MANAGEMENT PRACTICES) DURING CONSTRUCTION OF THIS PROJECT.

EROSION MUST BE MINIMIZED AND SEDIMENTS MUST BE REMOVED FROM CONSTRUCTION SITE RUN-OFF IN ORDER TO PROTECT DOWNSTREAM AREAS. DURING ALL CONSTRUCTION, EROSION AND SEDIMENTATION SHOULD BE CONTROLLED BY THE FOLLOWING TECHNIQUES:

1. LIMIT THE EXTENT OF EXPOSED SOILS AT ANY GIVEN TIME.
2. REVEGETATE EXPOSED AREAS AND SLOPES AS SOON AS POSSIBLE.
3. MINIMIZE AREA TO BE CLEARED AND GRUBBED.
4. PROTECT EXPOSED SLOPES WITH PLASTIC OR SYNTHETIC MULCHES.
5. INSTALL CATCH BASIN INSERTS OR EQUIVALENT IN ALL PROPOSED CATCH BASINS AND CATCH BASIN MANHOLES AND IN ALL EXISTING CATCH BASINS THAT WILL RECEIVE RUN-OFF FROM THE SITE.
6. A SILT FENCE SHALL BE INSTALLED AROUND THE PERIMETER OF ALL AND ANY STOCKPILES OF MATERIAL TO BE USED OR REMOVED FROM SITE (LOCATION TO BE DETERMINED).
7. A VISUAL INSPECTION SHALL BE DONE DAILY ON SEDIMENT CONTROL MEASURES AND CLEANED OF ANY ACCUMULATED SILT AS REQUIRED, THE DEPOSITS WILL BE DISPOSED OFF SITE AS PER THE REQUIREMENTS OF THE CONTRACT.
8. SEDIMENT CONTROL BARRIERS MAY ONLY BE REMOVED TEMPORARILY WITH APPROVAL OF CONTRACT ADMINISTRATOR TO ACCOMMODATE CONSTRUCTION OPERATIONS. ALL AFFECTED BARRIERS MUST BE REINSTATED AT NIGHT WHEN CONSTRUCTION IS COMPLETED, NO REMOVAL WILL OCCUR IF THERE IS A SIGNIFICANT RAINFALL EVENT ANTICIPATED (>10mm) UNLESS A NEW DEVICE HAS BEEN INSTALLED TO PROTECT EXISTING STORM AND SANITARY SEWER SYSTEMS, OR DOWNSTREAM WATERCOURSES.
9. NO REFUELING OR CLEANING OF EQUIPMENT IS PERMITTED NEAR ANY EXISTING WATERWAY.
10. CONTRACTOR SHALL REMOVE SEDIMENT CONTROL MEASURES WHEN, IN THE OPINION OF THE CONTRACT ADMINISTRATOR, THE MEASURES IS NO LONGER REQUIRED. NO CONTROL MEASURES SHALL BE PERMANENTLY REMOVED WITHOUT PRIOR WRITTEN AUTHORIZATION FROM THE CONTRACT ADMINISTRATOR.
11. THE CONTRACTOR SHALL PERIODICALLY, OR WHEN REQUESTED BY THE CONTRACT ADMINISTRATOR, CLEAN OUT ACCUMULATED SEDIMENTS AS REQUIRED.
12. THE CONTRACTOR SHALL IMMEDIATELY REPORT TO THE ENGINEER ANY ACCIDENTAL DISCHARGES OF SEDIMENT MATERIAL INTO THE WATERCOURSE. APPROPRIATE RESPONSE MEASURES, INCLUDING ANY REPAIRS TO EXISTING CONTROL MEASURES OR THE IMPLEMENTATION OF ADDITIONAL CONTROL MEASURES, SHALL BE CARRIED OUT BY THE CONTRACTOR WITHOUT DELAY.
13. CONTRACTOR SHALL INSTALL MUD MATS AT BOTH ENTRANCES TO THE SITE.
14. STORMWATER SWALES TO BE COVERED WITH HYDRO-SEED AND MULCH.



Revision	By	Appd.	Yr.	MM	DD	
0	ISSUED FOR SPA	MJS	NC	22	12	02

File Name: 160401724-DB MJS NC MJS 22.11.09  
Dwn. Chkd. Dsgn. Yr. MM. DD

Permit-Seal

Client/Project  
**HQ MANAGEMENT GROUP**

2885 CARP ROAD  
NEW WAREHOUSE BUILDING  
OTTAWA, ON, CANADA

Title  
**EROSION CONTROL PLAN AND DETAILS SHEET**

Project No. Scale  
160401724

Drawing No. Sheet Revision





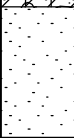
## **APPENDIX B**

Borehole Logs (GEMTEC)

# RECORD OF BOREHOLE 22-01

CLIENT: Bell & Associates Architecture  
 PROJECT: Geotechnical Investigation, Proposed Development, 2885 Carp Road, Ottawa  
 JOB#: 101688.002  
 LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1  
 DATUM: CGVD28  
 BORING DATE: May 18 2022

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES				PENETRATION RESISTANCE (N), BLOWS/0.3m		SHEAR STRENGTH (Cu), kPA		ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	▲ DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m	● PENETRATION RESISTANCE (N), BLOWS/0.3m	⊕ NATURAL ⊕ REMOULDED			WATER CONTENT, % W <sub>p</sub>   W   W <sub>L</sub>
0	Power Auger Hollow Stem Auger (108mm OD)	Ground Surface		117.36										
0.5		Loose to compact, brown silty sand, some gravel, trace clay (FILL MATERIAL)			1	SS	205	14	15	18				
1.0					2	SS	355	9	20	25				
1.5					3	SS	510	9	25	30				
2.0					4	SS	455	31	35	45				
2.5			Dense to very dense, grey sand and gravel, some silt, trace clay (GLACIAL TILL)		115.07 2.29	5	SS	355	34	40	50			
3.0					6	SS	405	84	50	60				
3.5					7	SS	560	58	60	70				
4.0					8	SS	205	57	70	80				
4.5				9	SS	560	29	80	90					
5.0		Dense, grey brown, SAND, some silt and gravel		111.42 5.94										
5.5														
6.0														
6.5														
6.8		End of Borehole Auger Refusal		110.56 6.80										
7.0														
8.0														
9.0														
10.0														

GEO - BOREHOLE LOG, 101785.001, BH LOGS, 2022-05-20.GPJ, GEMTEC 2018.GDT, 7/29/22

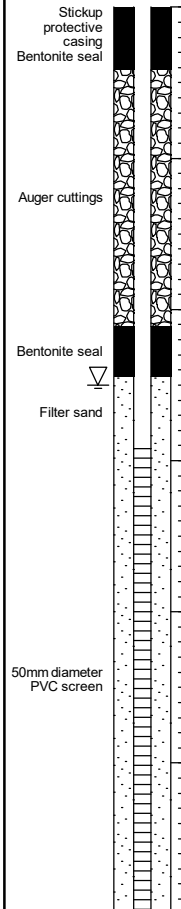


# RECORD OF BOREHOLE 22-02

CLIENT: Bell & Associates Architecture  
 PROJECT: Geotechnical Investigation, Proposed Development, 2885 Carp Road, Ottawa  
 JOB#: 101688.002  
 LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1  
 DATUM: CGVD28  
 BORING DATE: May 18 2022

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES				PENETRATION RESISTANCE (N), BLOWS/0.3m		SHEAR STRENGTH (Cu), kPA		ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	▲ DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m	● PENETRATION RESISTANCE (N), BLOWS/0.3m	⊕ NATURAL ⊕ REMOULDED		
0	Power Auger Hollow Stem Auger (108mm OD)	Ground Surface		117.27									
		TOPSOIL		0.10									
		Loose, brown silty sand (FILL MATERIAL)			1	SS	305	7					
1		Loose to compact, dark brown, silty sand, some gravel (FILL MATERIAL)		116.36 0.91									
					2	SS	405	11					
					3	SS	255	8					
2		Compact to very dense, grey sand and gravel, some silt, trace clay (GLACIAL TILL)		114.98 2.29									
					4	SS	100	>50 for 75mm Ø					
3				5	SS	205	14						
4				6	SS	150	>50 for 100mm Ø						
5				7	SS	355	29						
6				8	SS	205	>50 for 100mm Ø						
6		End of Borehole Auger Refusal		111.30 5.97									



GROUNDWATER OBSERVATIONS		
DATE	DEPTH (m)	ELEV. (m)
22/05/25	2.5	114.8

GEO - BOREHOLE LOG 101785.001\_BH LOGS\_2022-05-20.GPJ\_GEMTEC 2018.GDT\_7/29/22



LOGGED: PS  
 CHECKED: WAM

## LITHOLOGICAL AND GEOTECHNICAL ROCK DESCRIPTION TERMINOLOGY

WEATHERING STATE	
Fresh	No visible sign of rock material weathering
Faintly weathered	Weathering limited to the surface of major discontinuities
Slightly weathered	Penetrative weathering developed on open discontinuity surfaces but only slight weathering of rock material
Moderately weathered	Weathering extends throughout the rock mass but the rock material is not friable
Completely weathered	Rock is wholly decomposed and in a friable condition but the rock and structure are preserved

CORE CONDITION
<p><b>Total Core Recovery (TCR)</b> The percentage of solid drill core recovered regardless of quality or length, measured relative to the length of the total core run</p>
<p><b>Solid Core Recovery (SCR)</b> The percentage of solid drill core, regardless of length, recovered at full diameter, measured relative to the length of the total core run.</p>
<p><b>Rock Quality Designation (RQD)</b> The percentage of solid drill core, greater than 100 mm length, as measured along the centerline axis of the core, relative to the length of the total core run. RQD varies from 0% for completed broken core to 100% for core in solid segments.</p>

BEDDING THICKNESS	
Description	Thickness
Thinly laminated	< 6 mm
Laminated	6 - 20 mm
Very thinly bedded	20 - 60 mm
Thinly bedded	60 - 200 mm
Medium bedded	200 - 600 mm
Thickly bedded	600 - 2000 mm
Very thickly bedded	2000 - 6000 mm

DISCONTINUITY SPACING	
Description	Spacing
Very close	20 - 60 mm
Close	60 - 200 mm
Moderate	200 - 600 mm
Wide	600 - 2000 mm
Very wide	2000 - 6000 mm

ROCK QUALITY	
RQD	Overall Quality
0 - 25	Very poor
25 - 50	Poor
50 - 75	Fair
75 - 90	Good
90 - 100	Excellent

ROCK COMPRESSIVE STRENGTH	
Comp. Strength, MPa	Description
1 - 5	Very weak
5 - 25	Weak
25 - 50	Moderate
50 - 100	Strong
100 - 250	Very strong

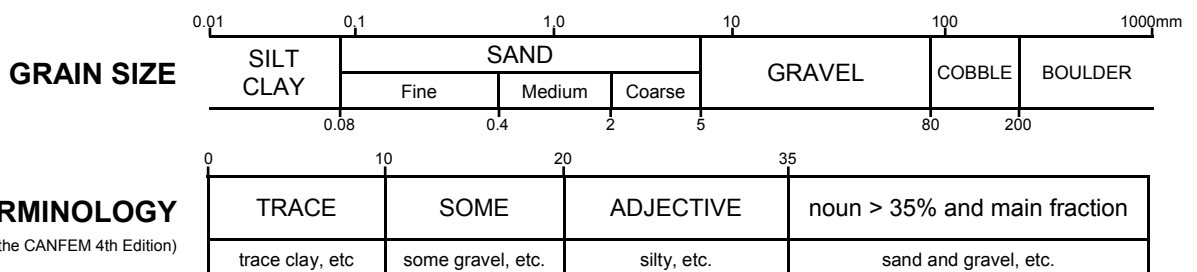
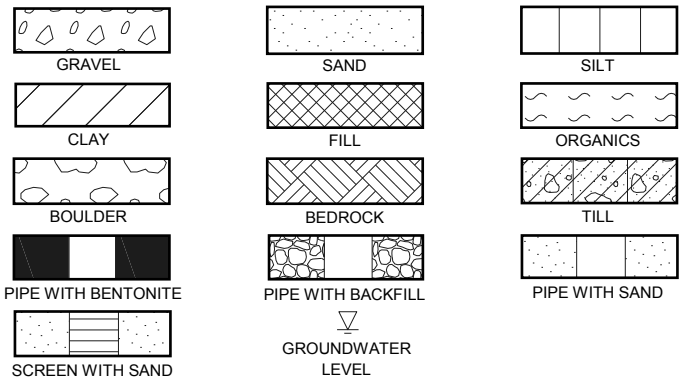
# ABBREVIATIONS AND TERMINOLOGY USED ON RECORDS OF BOREHOLES AND TEST PITS

SAMPLE TYPES	
AS	Auger sample
CA	Casing sample
CS	Chunk sample
BS	Borros piston sample
GS	Grab sample
MS	Manual sample
RC	Rock core
SS	Split spoon sampler
ST	Slotted tube
TO	Thin-walled open shelby tube
TP	Thin-walled piston shelby tube
WS	Wash sample

SOIL TESTS	
w	Water content
PL, $w_p$	Plastic limit
LL, $w_L$	Liquid limit
C	Consolidation (oedometer) test
$D_R$	Relative density
DS	Direct shear test
$G_s$	Specific gravity
M	Sieve analysis for particle size
MH	Combined sieve and hydrometer (H) analysis
MPC	Modified Proctor compaction test
SPC	Standard Proctor compaction test
OC	Organic content test
UC	Unconfined compression test
$\gamma$	Unit weight

PENETRATION RESISTANCE	
<p><b>Standard Penetration Resistance, N</b> The number of blows by a 63.5 kg (140 lb) hammer dropped 760 millimetres (30 in.) required to drive a 50 mm split spoon sampler for a distance of 300 mm (12 in.). For split spoon samples where less than 300 mm of penetration was achieved, the number of blows is reported over the sampler penetration in mm.</p>	
<p><b>Dynamic Penetration Resistance</b> The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) to drive a 50 mm (2 in.) diameter 60° cone attached to 'A' size drill rods for a distance of 300 mm (12 in.).</p>	
WH	Sampler advanced by static weight of hammer and drill rods
WR	Sampler advanced by static weight of drill rods
PH	Sampler advanced by hydraulic pressure from drill rig
PM	Sampler advanced by manual pressure

COHESIONLESS SOIL Compactness		COHESIVE SOIL Consistency	
SPT N-Values	Description	$C_u$ , kPa	Description
0-4	Very Loose	0-12	Very Soft
4-10	Loose	12-25	Soft
10-30	Compact	25-50	Firm
30-50	Dense	50-100	Stiff
>50	Very Dense	100-200	Very Stiff
		>200	Hard



## DESCRIPTIVE TERMINOLOGY

(Based on the CANFEM 4th Edition)



## **APPENDIX C**

Soil Grading Charts (GEMTEC)







## **APPENDIX D**

### MECP Well Records Summary Table 500-m Search Radius

## MECP Online Well Database Summary (500-m Radius) (1 of 6)

ID	Township	Completion Date (yyyy-mm-dd)	Water Use	Well Depth (m)	Bedrock Depth (m)	Casing Depth (m)	Static Water Levels (m)	Water Types and Bearing Zone Depths (ft)	Stratigraphic Layers (ft)
1503063	HUNTLEY TOWNSHIP CON 02 009	1952-02-12	DO	54.6	15.8	15.8	7.0	FR 0065 FR 0158 FR 0176	PRDR 0052 LMSN 0179
1503064	HUNTLEY TOWNSHIP CON 02 010	1960-03-18	DO	54.9	1.2	7.3	6.1	FR 0178	CLAY LOAM 0004 GREY LMSN 0180
1503066	HUNTLEY TOWNSHIP CON 02 010	1965-11-04	DO	30.5	1.5	9.1	7.6	SU 0070 SU 0095	GRVL BLDR 0005 LMSN 0100
1503121	HUNTLEY TOWNSHIP CON 03 009	1960-07-21	DO	24.4	10.4	11.0	1.2	FR 0080	MSND GRVL 0034 GREY LMSN 0080
1503122	HUNTLEY TOWNSHIP CON 03 009	1961-03-25	DO	25.0	11.6	11.6	4.6	FR 0082	RED MSND 0038 GREY LMSN 0082
1510546	HUNTLEY TOWNSHIP CON 02 009	1970-01-21	DO	23.2	9.1	9.4	3.0	FR 0075	GREY GRVL HPAN 0030 BLCK SHLE 0065 GREY LMSN 0076
1514027	HUNTLEY TOWNSHIP CON 03 009	1974-02-07	DO	23.8	8.5	9.1	1.8	FR 0076	BRWN SAND LOOS 0008 GREY GRVL BLDR PCKD 0028 GREY LMSN HARD 0078
1516528	HUNTLEY TOWNSHIP CON 02 010	1978-06-20	DO	72.2	4.3	6.7	7.6	FR 0235	BRWN SAND GRVL BLDR 0014 GREY LMSN SOFT 0179 BLCK LMSN 0237
1518822	HUNTLEY TOWNSHIP CON 02 009	1983-12-08	DO	65.5	29.3	29.6	22.9	FR 0185 FR 0209	BRWN CLAY PCKD 0012 GREY CLAY PCKD 0023 GREY SAND PCKD 0060 BRWN SAND PCKD 0071 BRWN SAND
1535747	HUNTLEY TOWNSHIP CON 03 008	2005-07-05	DO	35.0	12.5	13.1	4.3	0111	BRWN LOAM 0005 BRWN CLAY 0012 GREY CLAY STNS 0041 GREY LMSN 0115
1536342	HUNTLEY TOWNSHIP CON 03 010	2006-03-10	NU	24.4	12.8	16.5	3.1	0073	SAND CLAY GRVL 0042 GREY QTZ LMSN 0080
1536605	HUNTLEY TOWNSHIP	2006-07-06	DO	53.3	12.2	13.1	54.7	0168	BRWN LOAM STNS 0004 BRWN CLAY 0015 GREY CLAY STNS 0040 BRWN LMSN LYRD 0175
7040818	HUNTLEY TOWNSHIP CON 03 010	2006-12-11	NU	24.4	15.8	19.2	4.6	0066 0073	SAND GRVL 0052 GREY LMSN 0080

AC = Cooling and A/C  
IR = Irrigation  
OT = Other

CO = Commercial  
MN = Municipal  
PS = Public

DE = Dewatering  
MO = Monitoring  
ST = Livestock

DO = Domestic  
MT = Monitoring and Test Hole  
TH = Test Hole

IN = Industrial  
NU = Not Used



## MECP Online Well Database Summary (500-m Radius) (2 of 6)

ID	Township	Completion Date (yyyy-mm-dd)	Water Use	Well Depth (m)	Bedrock Depth (m)	Casing Depth (m)	Static Water Levels (m)	Water Types and Bearing Zone Depths (ft)	Stratigraphic Layers (ft)
7147771	HUNTLEY TOWNSHIP CON 02 009	2010-05-20	DO CO	42.7	1.8	6.1	0.9	UT 0131	BRWN SAND CLAY STNS 0003 BRWN SAND CLAY STNS 0006 BRWN SHLE 0008 BRWN LMSN 0140
7149236	HUNTLEY TOWNSHIP CON 03 010	2010-06-02	DO	52.7	8.8	11.9	2.9	UT 0110 UT 0168	BRWN CLAY STNS FILL 0005 BRWN CLAY PCKD 0022 GREY SAND CLAY STNS 0029 GREY LMSN MGRD 0173
7149244	HUNTLEY TOWNSHIP CON 03 010	2010-05-28							
7149249	HUNTLEY TOWNSHIP CON 03 009	2010-05-04	DO	45.1	15.2	16.1	4.4	UT 0070 UT 0142	BRWN SAND LOAM STNS 0016 GREY GRVL BLDR 0050 GREY LMSN 0148
7151411	HUNTLEY TOWNSHIP CON 03 010	2010-08-26	DO	36.6	4.6	8.5	4.9	UT 0112	SAND CLAY GRVL 0015 GREY LMSN 0120
7151491	HUNTLEY TOWNSHIP CON 03 010	2010-07-19							
7156079	HUNTLEY TOWNSHIP	2010-11-10	DO	83.2	7.3	10.4	4.1	UT 0110 UT 0260	BRWN LOAM BLDR 0024 GREY LMSN DKCL 0273
7156112	HUNTLEY TOWNSHIP CON 03 009	2010-10-29	DO	83.2	16.4	17.4	4.0	UT 0170 UT 0260	BRWN SAND CLAY STNS 0013 BRWN SAND 0030 GREY SAND STNS 0054 GREY LMSN LYRD MGRD 0273
7156126	HUNTLEY TOWNSHIP CON 03 010	2010-09-23	DO	68.0	12.5	15.5	5.4	UT 0066 UT 0219	BRWN SAND LOAM STNS 0012 BRWN SAND CLAY BLDR 0027 BRWN SAND STNS PCKD 0041 GREY LMSN 0223
7156127	HUNTLEY TOWNSHIP CON 03 010	2010-09-29	DO	74.7	10.1	13.1	5.0	UT 0237	BRWN GRVL BLDR PCKD 0033 GREY LMSN 0245
7162100	HUNTLEY TOWNSHIP CON 03 009	2011-03-31	DO	83.2	10.1	13.1	3.1	UT 0110 UT 0269	BRWN LOAM STNS FILL 0005 BRWN CLAY PCKD 0016 GREY CLAY BLDR 0033 GREY LMSN HARD 0273
7162186	HUNTLEY TOWNSHIP CON 03 010	2011-03-17	DO	54.9	17.1	20.1	4.1	UT 0138 UT 0173	SAND GRVL BLDR 0056 GREY LMSN 0138 GREY LMSN 0173 GREY LMSN 0180
7166860	HUNTLEY TOWNSHIP CON 03 010	2010-11-22							

AC = Cooling and A/C  
IR = Irrigation  
OT = Other

CO = Commercial  
MN = Municipal  
PS = Public

DE = Dewatering  
MO = Monitoring  
ST = Livestock

DO = Domestic  
MT = Monitoring and Test Hole  
TH = Test Hole

IN = Industrial  
NU = Not Used

## MECP Online Well Database Summary (500-m Radius) (3 of 6)

ID	Township	Completion Date (yyyy-mm-dd)	Water Use	Well Depth (m)	Bedrock Depth (m)	Casing Depth (m)	Static Water Levels (m)	Water Types and Bearing Zone Depths (ft)	Stratigraphic Layers (ft)
7042385	HUNTLEY TOWNSHIP CON 02 010	2007-01-28	DO	12.1	0.9	7.0	5.1	FR 0032 FR 0038	BRWN SAND 0003 GREY SHLE CLAY LYRD 0010 GREY HPAN BLDR 0016 0040
7104179	03 010	2008-01-10	DO	85.3	12.2	15.9	2.5	0256 0270	SAND GRVL 0040 GREN LMSN 0280
7105841	HUNTLEY TOWNSHIP CON 03 008	2008-03-26	DO	12.2	9.1	10.4	2.9	UK 0039	BRWN LOAM SNDY LOOS 0006 BRWN CLAY 0014 GREY HPAN 0030 GREY LMSN 0040
7123248	HUNTLEY TOWNSHIP CON 03 010	2009-03-25	DO	42.7	9.8	12.8	4.6	UT 0140	BRWN LOAM ROCK FCRD 0004 BRWN CLAY PCKD 0014 BRWN SAND WBRG 0022 GREY TILL PCKD 0032 GREY
7124076	HUNTLEY TOWNSHIP CON 03 009	2009-04-20	DO	13.6		13.6	1.7	0045	BRWN SAND 0031 BRWN GRVL 0045
7124492	HUNTLEY TOWNSHIP CON 03 006	2009-05-19	DO	83.2	6.1	9.1	1.8	UK 0150 UK 0251 UK 0269	BRWN LOAM SNDY 0012 GREY SAND BLDR 0020 GREY LMSN LYRD 0273
7126669	HUNTLEY TOWNSHIP CON 03 008	2009-06-04	DO	42.7	17.1	18.9	4.0	UT 0068 UT 0118 UT 0132	SAND GRVL BLDR 0056 GREY LMSN 0140
7131310	HUNTLEY TOWNSHIP CON 03 010	2009-08-25	DO	27.4	8.5	12.2	4.0	UT 0076 UT 0080	SAND GRVL BLDR 0028 GREY LMSN 0090
7139812	HUNTLEY TOWNSHIP CON 03 009	2009-12-11	DO	84.1	13.4	14.6	4.2	UT 0195 UT 0271	BRWN LOAM STNS 0014 GREY CLAY 0044 GREY LMSN 0273 GREY LMSN 0276
7139851	HUNTLEY TOWNSHIP CON 03 010	2009-10-02	DO	49.4	2.4	7.3	4.9	UT 0110 UT 0161	BRWN HPAN BLDR 0008 GREY LMSN LYRD SOFT 0020 GREY LMSN MGRD 0162
7140431	HUNTLEY TOWNSHIP CON 03 010	2010-02-22	DO	59.4	9.7	11.3	3.4		GREY FILL LOOS 0004 GREY CLAY HARD 0026 GREY SILT WBRG 0032 GREY LMSN HARD 0195
7141758	HUNTLEY TOWNSHIP CON 03 010	2010-02-04	DO	61.0	5.2	8.5	3.5	UT 0152 UT 0186	SAND GRVL BLDR 0017 GREY LMSN 0135 GREY LMSN SNDS 0160 GREY LMSN 0200
7145670	HUNTLEY TOWNSHIP CON 03 010	2010-02-22	DO	52.7	12.2	15.2	4.0	UT 0169	BRWN SAND LOAM STNS 0012 GREY SAND GRVL STNS 0040 GREY LMSN MGRD 0173

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PS = Public

DE = Dewatering  
MO = Monitoring  
ST = Livestock

DO = Domestic  
MT = Monitoring and Test Hole  
TH = Test Hole

IN = Industrial  
NU = Not Used

## MECP Online Well Database Summary (500-m Radius) (4 of 6)

ID	Township	Completion Date (yyyy-mm-dd)	Water Use	Well Depth (m)	Bedrock Depth (m)	Casing Depth (m)	Static Water Levels (m)	Water Types and Bearing Zone Depths (ft)	Stratigraphic Layers (ft)
7170957	HUNTLEY TOWNSHIP	2011-08-02	DO	83.2	5.5	9.1	6.8	UT 0123 UT 0269	BRWN SAND GRVL 0018 GREY LMSN 0273
7171005	HUNTLEY TOWNSHIP	2011-06-17	DO	83.2	5.5	8.5	3.6	UT 0190 UT 0270	BRWN LOAM BLDR 0018 GREY LMSN ---- 0273
7173858	HUNTLEY TOWNSHIP CON 03 010	2011-10-24	DO	61.0	7.9	12.2	6.6	UT 0113	SAND GRVL BLDR 0026 GREY LMSN 0113 GREY LMSN 0200
7181766	HUNTLEY TOWNSHIP CON 03 010	2012-05-07	DO	63.1	4.9	8.2	5.5	UT 0052 UT 0085 UT 0178	BRWN SAND GRVL FILL 0016 GREY LMSN SHLE 0207
7190611	HUNTLEY TOWNSHIP	2012-10-03	DO	42.1	6.1	11.4	3.3	UT 0068 UT 0126	BRWN CLAY SAND STNS 0004 BRWN SAND 0005 BRWN CLAY DNSE 0016 GREY CLAY SILT 0018 BRWN SAND BRWN LOAM STNS FILL 0005 BRWN SAND 0014 GREY CLAY 0033 GREY LMSN LYRD 0050
7199589	HUNTLEY TOWNSHIP	2012-12-13	DO	15.2	10.1	13.1	5.3	UT 0046	
7204977	HUNTLEY TOWNSHIP	2013-01-08	TH			0.8		0004	
7218704	HUNTLEY TOWNSHIP	2013-09-19	DO	21.9	11.6	14.6	4.8	UT 0068	BRWN SAND 0018 GREY SAND PCKD 0038 GREY LMSN 0072
7218712	HUNTLEY TOWNSHIP	2013-09-25	DO	83.2	14.6	17.7	3.5	UT	GREY GRVL ROCK FILL 0005 BRWN LOAM 0010 BRWN CLAY PCKD 0019 GREY TILL PCKD 0048 GREY LMSN LYRD
7222489	HUNTLEY TOWNSHIP CON 03 009	2014-03-31	DO	83.2	10.7	13.7	3.4	UT 0176	BRWN CLAY PCKD 0006 BRWN LOAM LOOS 0014 GREY CLAY BLDR LOOS 0035 GREY LMSN LYRD 0273
7228811	HUNTLEY TOWNSHIP CON 02 010	2014-07-16	CO	58.0	1.5	9.1	3.5	UT 0178	BRWN SAND 0005 GREY LMSN SHLE 0190
7231976	HUNTLEY TOWNSHIP CON 03 010	2014-08-18	DO	83.7	10.9	12.7	3.2	UT 0029 UT 0035	GREY CLAY 0031 BRWN GRVL 0036 GREY LMSN 0275
7244461	HUNTLEY TOWNSHIP CON 02 009	2015-06-04	DO	61.0	6.7	13.4		UT 0050 UT 0165 UT 0185	HPAN CLAY GRVL 0022 GREY SNDS 0200

AC = Cooling and A/C  
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MO = Monitoring  
ST = Livestock

DO = Domestic  
MT = Monitoring and Test Hole  
TH = Test Hole

IN = Industrial  
NU = Not Used

## MECP Online Well Database Summary (500-m Radius) (5 of 6)

ID	Township	Completion Date (yyyy-mm-dd)	Water Use	Well Depth (m)	Bedrock Depth (m)	Casing Depth (m)	Static Water Levels (m)	Water Types and Bearing Zone Depths (ft)	Stratigraphic Layers (ft)
7254250	HUNTLEY TOWNSHIP	2015-10-08	DO	29.6	9.1	13.1	4.5	UT 0060 UT 0090	GREY LMSN LOAM FILL 0005 BRWN LOAM SNDY PCKD 0016 GREY TILL 0030 GREY LMSN FCRD LYRD 0097
7264607	HUNTLEY TOWNSHIP	2016-05-12	CO	54.3	5.2	9.1	1.7	UT 0078 UT 0116 UT 0172	BRWN SAND GRVL 0008 GREY GRVL CGVL 0017 GREY LMSN SNDS LYRD 0178
7268387	HUNTLEY TOWNSHIP CON 03 009	2016-07-14	DO	36.9	11.6	14.6	2.0	UT 0070 UT 0115	SAND GRVL BLDR 0038 GREY LMSN 0070 GREY LMSN 0115 GREY LMSN 0121
7287114	HUNTLEY TOWNSHIP	2016-11-15	DO	123.4	11.0	14.0	4.4	UT 0397	BRWN LOAM STNS FILL 0006 BRWN CLAY PCKD 0018 GREY CLAY STNS 0030 GREY GRVL PCKD 0036 GREY
7287122	HUNTLEY TOWNSHIP	2017-02-02	DO	108.2	9.8	13.1	3.7	UT 0266 UT 0349	BRWN CLAY FILL 0007 BRWN CLAY PCKD 0022 GREY TILL PCKD 0032 GREY LMSN 0355
7287146	HUNTLEY TOWNSHIP	2016-08-03	DO	83.2	11.6	17.4	4.9	UT 0105 UT 0135	BRWN LOAM STNS PCKD 0016 GREY CLAY STNS LOOS 0038 GREY LMSN LYRD FCRD 0057 GREY LMSN LYRD
7287149	HUNTLEY TOWNSHIP	2016-08-05							
7287760	HUNTLEY TOWNSHIP CON 03 010	2017-05-10	DO	58.9	4.3	6.8	2.2	UT 0076 UT 0193	BRWN SAND GRVL 0014 GREY LMSN 0193
7287761	HUNTLEY TOWNSHIP CON 02 010	2017-02-28	OT						
7299401	HUNTLEY TOWNSHIP CON 03 009	2017-09-11	DO	106.7	11.9	14.9	4.1		BRWN CLAY STNS 0006 BRWN SAND CLAY 0015 GREY TILL 0039 GREY LMSN 0350
7316748	HUNTLEY TOWNSHIP CON 03 010	2018-07-04	DO	54.9	3.0	6.7	6.2	UT 0110	CLAY STNS 0010 GREY LMSN 0180
7317919	HUNTLEY TOWNSHIP CON 03 009	2018-07-07	DO	57.9	18.1	21.2	3.7	UT 0178	BRWN SAND FSND 0006 BRWN SAND MSND 0014 BRWN MSND FGVL 0028 GREY SAND GRVL STNS 0060 GREY
7317920	HUNTLEY TOWNSHIP CON 03 009	2018-07-07	NU			19.8			

AC = Cooling and A/C  
IR = Irrigation  
OT = Other

CO = Commercial  
MN = Municipal  
PS = Public

DE = Dewatering  
MO = Monitoring  
ST = Livestock

DO = Domestic  
MT = Monitoring and Test Hole  
TH = Test Hole

IN = Industrial  
NU = Not Used

## MECP Online Well Database Summary (500-m Radius) (6 of 6)

ID	Township	Completion Date (yyyy-mm-dd)	Water Use	Well Depth (m)	Bedrock Depth (m)	Casing Depth (m)	Static Water Levels (m)	Water Types and Bearing Zone Depths (ft)	Stratigraphic Layers (ft)
7344515	HUNTLEY TOWNSHIP CON 03 009	2019-05-15	DO	83.8	12.2	15.2	2.6	UT 0210 UT 0269	BRWN LOAM 0008 BRWN CLAY PCKD 0023 GREY CLAY STNS 0040 GREY LMSN LYRD 0275
7357270	HUNTLEY TOWNSHIP CON 03 010	2020-02-04	DO	52.4	10.4	13.4	4.1	UT 0163 UT 0168	CLAY SNDY 0030 GRVL 0034 GREY LMSN 0168 GREY SNDS LMSN 0172
7357888	HUNTLEY TOWNSHIP	2019-12-02							
7364123	HUNTLEY TOWNSHIP CON 03 009	2020-06-25	DO	61.6	5.2	7.0	3.9	UT 0177	SAND GRVL BLDR 0017 GREY LMSN QTZ 0202
7371202	HUNTLEY TOWNSHIP CON 02 009	2020-09-29							

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## **APPENDIX E**

MECP Well Record A295355  
2885 Carp Road



Measurements recorded in:  Metric  Imperial

Page \_\_\_ of \_\_\_

A295355

Well Owner's Information

First Name: **BEKIM** Last Name / Organization: **HOLDINGS INC.** E-mail Address: \_\_\_\_\_  Well Constructed by Well Owner

Mailing Address (Street Number/Name): **23 Huntsville Drive** Municipality: **Kanata** Province: **Ont** Postal Code: **K2H 0C6** Telephone No. (inc. area code): \_\_\_\_\_

Well Location

Address of Well Location (Street Number/Name): **# 2885 CARP ROAD** Township: **WEST CARLETON** Lot: **P/L9** Concession: **3**

County/District/Municipality: **OTTAWA CARLETON** City/Town/Village: **CARP** Province: **Ontario** Postal Code: \_\_\_\_\_

UTM Coordinates Zone: **18** Easting: **422101** Northing: **5017719** Municipal Plan and Sublot Number: **16nRP-5R-10814** Other: **Part 34**

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

General Colour	Most Common Material	Other Materials	General Description	Depth From (m/ft)	To (m/ft)
	Sand, Gravel & Boulders			0'	17'
	Grey limestone w/ white Quartz			17'	202'

**Annular Space**

Depth Set at (m/ft) From	To (m/ft)	Type of Sealant Used (Material and Type)	Volume Placed (m <sup>3</sup> /ft <sup>3</sup> )
23'	13'	Neat Cement Slurry	9.36
13'	0'	Bentonite Slurry	37.80

**Results of Well Yield Testing**

After test of well yield, water was:  
 Clear and sand free  
 Other, specify \_\_\_\_\_

If pumping discontinued, give reason: **X**

Pump intake set at (m/ft): **180'**

Pumping rate (l/min / GPM): **20**

Duration of pumping: **1 hr 0 min**

Final water level end of pumping (m/ft): **15'6"**

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

Recommended pump depth (m/ft): **100'**

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

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

Disturbed?  Yes  No

Time (min)	Draw Down (m/ft)		Recovery (m/ft)	
	Water Level	Time	Water Level	Time
Static Level	12'8"		15'6"	
1	15.3	1	13'9"	
2	15.4	2	12'8"	
3	15.5	3	12'8"	
4	↓	4		
5	↓	5		
10	15.6	10		
15	↓	15		
20	↓	20		
25	↓	25		
30	↓	30		
40	↓	40		
50	↓	50		
60	↓	60		

**Method of Construction**

Cable Tool  Diamond  Public  Commercial  Not used  
 Rotary (Conventional)  Jetting  Domestic  Municipal  Dewatering  
 Rotary (Reverse)  Driving  Livestock  Test Hole  Monitoring  
 Boring  Digging  Irrigation  Cooling & Air Conditioning  
 Air percussion  Industrial  Other, specify \_\_\_\_\_  
 Other, specify **SURGED**

**Construction Record - Casing**

Inside Diameter (cm/ft)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft)		Status of Well
			From	To	
6 1/4"	Steel	.188"	2'	23'	<input checked="" type="checkbox"/> Water Supply
6"	Open hole		23'	202'	<input type="checkbox"/> Replacement Well

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

**Construction Record - Screen**

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

**Water Details**

Water found at Depth (m/ft)	Kind of Water: <input type="checkbox"/> Fresh <input checked="" type="checkbox"/> Untested	Depth (m/ft) From	To	Diameter (cm/ft)
177 (m/ft)	<input type="checkbox"/> Gas <input checked="" type="checkbox"/> Other, specify <b>SURGED</b>	0'	23'	9 3/4"
	<input type="checkbox"/> Gas <input type="checkbox"/> Other, specify _____	23'	202'	6"

**Well Contractor and Well Technician Information**

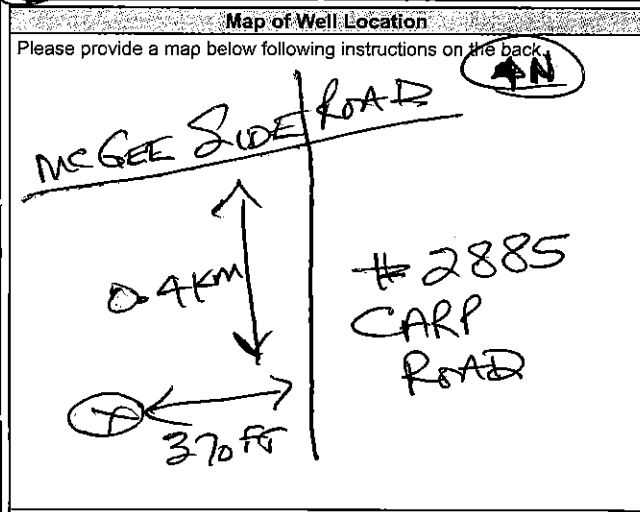
Business Name of Well Contractor: **AIRROCK DRIVING CO. LTD** Well Contractor's Licence No.: **C76811**

Business Address (Street Number/Name): **6659 Front Street East** Municipality: **Richmond Hill**

Province: **Ont** Postal Code: **K4A2Z0** Business E-mail Address: \_\_\_\_\_

Bus. Telephone No. (inc. area code): **6138382170** Name of Well Technician (Last Name, First Name): **HOGAN DAN**

Well Technician's Licence No.: **TB058** Signature of Technician and/or Contractor: \_\_\_\_\_ Date Submitted: **20200630**



Comments: **LHP-20GPM Set @ 100 FT**

Well owner's information package delivered: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Date Package Delivered: <b>20200630</b>	Ministry Use Only Audit No. <b>7316883</b> AUG 06 2020 Received
Date Work Completed: <b>20200625</b>		



## **APPENDIX F**

### Laboratory Certificates of Analysis & Supply Well Summary Tables



### Summary of Measured Field Parameters

Test Well A295355	Time Elapsed Pumping (Hours)	Pumping Rate (L/min)	Temp	pH	Electrical Conductivity ( $\mu$ S/cm)	Total Dissolved Solids (ppm)	Colour (ACU <sup>1</sup> )	Colour (TCU <sup>2,3</sup> )	Turbidity (NTU)	Chlorine (mg/L)	Comments
Pumping Test Sep 28, 2022	1	56.8	10.9	7.93	902	576	-	-	5.06	-	Sulphur odour
	2	56.8	10.7	7.46	901	577	-	-	2.41	-	Slight sulphur odour
	3	56.8	10.9	7.52	904	582	-	-	1.44	-	Slight sulphur odour
	4	56.8	10.9	7.37	899	575	0	0	0.87	0	Slight sulphur odour
	5	56.8	10.93	7.27	898	575	-	-	0.85	-	Slight sulphur odour
	6	56.8	10.97	7.22	897	574	-	-	0.65	-	Slight sulphur odour
	7	56.8	10.93	7.30	901	576	-	-	0.47	-	Slight sulphur odour
	8	56.8	10.96	7.39	900	575	0	0	0.52	0	Slight sulphur odour

**NOTES:**

1. ACU = Actual Colour Units
2. Field filtered using 0.45 micron filter
3. TCU = True Colour Units

## Summary of Laboratory Parameters Analyzed (1/7)

Parameter		Units	A295355 4hr Sept 29, 2022	A295355 8hr Sept 29, 2022	A295355 Oct 24, 2022	A295355 Oct 31, 2022	ODWQS	Standard
Microbiological Parameters	Escherichia coli	CFU/100mL	ND (1)	ND (1)	ND (1)	ND (1)	0	MAC
	Fecal Coliform	CFU/100mL	ND (1)	4	ND (1)	ND (1)	0	MAC
	Total coliforms	CFU/100mL	ND (1)	2	ND(1)	ND(1)	0	MAC
	Heterotrophic Plate Count	CFU/1mL	30	20	<10	130	-	-
General Inorganics	Alkalinity (as CaCO <sub>3</sub> )	mg/L	305	305	-	-	30-500	OG
	Ammonia as N (NH <sub>3</sub> )	mg/L	0.04	0.01	-	-	-	-
	Dissolved Organic Carbon (DOC)	mg/L	2.9	2.1	-	-	5 / 10	AO / MCT
	Colour	ACU	7	6	-	-	-	-
	Colour, apparent	TCU	2	2	-	-	5 / 7	AO / MCT
	Electrical Conductivity	uS/cm	864	850	-	-	-	-
	Total Hardness (as CaCO <sub>3</sub> )	mg/L	317	333	-	-	80-100 / 500	OG / AO
	pH	pH units	7.8	7.8	-	-	6.5-8.5	OG
	Phenols	mg/L	ND (0.001)	ND (0.001)	-	-	-	-
	Total Dissolved Solids (TDS)	mg/L	490	492	-	-	500	AO
	Sulphide (S <sub>2</sub> )	mg/L	ND (0.02)	ND (0.02)	-	-	0.05	AO
	Tannin and Lignin	mg/L	ND (0.1)	ND (0.1)	-	-	-	-
	Total Kjeldahl Nitrogen (TKN)	mg/L	0.2	0.2	-	-	-	-
Turbidity	NTU	0.7	0.8	-	-	5 / 5	AO / MCT	

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6. WL = Warning Level for Persons on Sodium Restricted Diets
7. MCT = Maximum Concentration Considered Reasonably Treatable

## Summary of Laboratory Parameters Analyzed (2/7)

	Parameter	Units	A295355 4hr Sept 29, 2022	A295355 8hr Sept 29, 2022	A295355 Oct 24, 2022	A295355 Oct 31, 2022	ODWQS	Standard
Anions	Chloride (Cl)	mg/L	67	68	-	-	250 / 250	AO / MCT
	Fluoride (F)	mg/L	0.1	0.1	-	-	1.5	MAC
	Nitrate as N (NO <sub>3</sub> )	mg/L	0.4	0.4	0.2	ND (0.1)	10	MAC
	Nitrite as N (NO <sub>2</sub> )	mg/L	ND (0.10)	ND (0.10)	ND (0.10)	ND (0.10)	0.1	MAC
	Sulphate (SO <sub>4</sub> )	mg/L	44	43	-	-	500 / 500	AO / MCT
Metal (1/2)	Mercury	mg/L	N/A	ND (0.0001)	-	-	0.001	MAC
	Aluminum	mg/L	N/A	0.002	-	-	0.1	AO
	Antimony	mg/L	N/A	ND (0.0005)	-	-	0.006	MAC
	Arsenic	mg/L	N/A	ND (0.001)	-	-	0.01	MAC
	Barium	mg/L	N/A	0.296	-	-	1	MAC
	Beryllium	mg/L	N/A	ND (0.0005)	-	-	-	-
	Boron	mg/L	N/A	0.02	-	-	5	MAC
	Cadmium	mg/L	N/A	ND (0.0001)	-	-	0.005	MAC
	Calcium	mg/L	95.2	99.6	-	-	-	-
	Chromium	mg/L	N/A	ND (0.001)	-	-	0.05	MAC
	Cobalt	mg/L	N/A	0.0010	-	-	-	-
	Copper	mg/L	N/A	0.0015	-	-	1	AO
	Iron	mg/L	ND (0.1)	ND (0.1)	-	-	0.3 / 5.0	AO / MCT

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### Summary of Laboratory Parameters Analyzed (3/7)

Parameter		Units	A295355 4hr Sept 29, 2022	A295355 8hr Sept 29, 2022	A295355 Oct 24, 2022	A295355 Oct 31, 2022	ODWQS	Standard
Metals (2/2)	Lead	mg/L	N/A	ND (0.0001)	-	-	0.01	MAC
	Magnesium	mg/L	19.4	20.5	-	-	-	-
	Manganese	mg/L	0.482	0.496	-	-	0.05 / 1	AO / MCT
	Molybdenum	mg/L	N/A	ND (0.0005)	-	-	-	-
	Nickel	mg/L	N/A	0.002	-	-	-	-
	Potassium	mg/L	2.9	3.0	-	-	-	-
	Selenium	mg/L	N/A	ND (0.001)	-	-	0.05	MAC
	Silver	mg/L	N/A	ND (0.0001)	-	-	-	-
	Sodium	mg/L	32.6	34.0	-	-	20 / 200 / 200	WL / AO / MCT
	Strontium	mg/L	N/A	0.79	-	-	7	MAC
	Thallium	mg/L	N/A	ND (0.001)	-	-	-	-
	Uranium	mg/L	N/A	0.0007	-	-	0.02	MAC
	Vanadium	mg/L	N/A	ND (0.0005)	-	-	-	-
Zinc	mg/L	N/A	ND (0.005)	-	-	5	AO	

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### Summary of Laboratory Parameters Analyzed (4/7)

Parameter		Units	A295355 4hr Sept 29, 2022	A295355 8hr Sept 29, 2022	ODWQS	Standard
Volatiles (1/3)	Acetone	mg/L	N/A	ND (0.0050)	-	-
	Benzene	mg/L	N/A	ND (0.0005)	-	0.001 mg/L MAC
	Bromodichloromethane	mg/L	N/A	ND (0.0005)	-	-
	Bromoform	mg/L	N/A	ND (0.0005)	-	-
	Bromomethane	mg/L	N/A	ND (0.0005)	-	-
	Carbon Tetrachloride	mg/L	N/A	ND (0.0002)	-	0.002 mg/L MAC
	Chlorobenzene	mg/L	N/A	ND (0.0005)	-	0.08 mg/L MAC
	Chloroethane	mg/L	N/A	ND (0.0010)	-	-
	Chloroform	mg/L	N/A	ND (0.0005)	-	-
	Dibromochloromethane	mg/L	N/A	ND (0.0005)	-	-
	Dichlorodifluoromethane	mg/L	N/A	ND (0.0010)	-	-
	Ethylene dibromide (dibromoethane, 1,2-)	mg/L	N/A	ND (0.0002)	-	-
	1,2-Dichlorobenzene	mg/L	N/A	ND (0.0005)	-	0.2 mg/L MAC
	1,3-Dichlorobenzene	mg/L	N/A	ND (0.0005)	-	-
	1,4-Dichlorobenzene	mg/L	N/A	ND (0.0005)	-	0.005 mg/L MAC
1,1-Dichloroethane	mg/L	N/A	ND (0.0005)	-	-	
1,2-Dichloroethane	mg/L	N/A	ND (0.0005)	-	0.005 mg/L MAC	

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### Summary of Laboratory Parameters Analyzed (5/7)

Parameter		Units	A295355 4hr Sept 29, 2022	A295355 8hr Sept 29, 2022		ODWQS	Standard
Volatiles (2/3)	1,1-Dichloroethylene	mg/L	N/A	ND (0.0005)	-	0.014 mg/L	MAC
	cis-1,2-Dichloroethylene	mg/L	N/A	ND (0.0005)	-	-	-
	trans-1,2-Dichloroethylene	mg/L	N/A	ND (0.0005)	-	-	-
	1,2-Dichloroethylene, total	mg/L	N/A	ND (0.0005)	-	-	-
	1,2-Dichloropropane	mg/L	N/A	ND (0.0005)	-	-	-
	cis-1,3-Dichloropropylene	mg/L	N/A	ND (0.0005)	-	-	-
	trans-1,3-Dichloropropylene	mg/L	N/A	ND (0.0005)	-	-	-
	1,3-Dichloropropene, total	mg/L	N/A	ND (0.0005)	-	-	-
	Ethylbenzene	mg/L	N/A	ND (0.0005)	-	0.14 mg/L	MAC
	Hexane	mg/L	N/A	ND (0.0010)	-	-	-
	Methyl Ethyl Ketone (2-Butanone)	mg/L	N/A	ND (0.0050)	-	-	-
	Methyl Isobutyl Ketone	mg/L	N/A	ND (0.0050)	-	-	-
	Methyl tert-butyl ether	mg/L	N/A	ND (0.0020)	-	-	-
	Methylene Chloride	mg/L	N/A	ND (0.0050)	-	0.05 mg/L	MAC
	Styrene	mg/L	N/A	ND (0.0005)	-	-	-
	1,1,1,2-Tetrachloroethane	mg/L	N/A	ND (0.0005)	-	-	-
1,1,2,2-Tetrachloroethane	mg/L	N/A	ND (0.0005)	-	-	-	

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## Summary of Laboratory Parameters Analyzed (6/7)

Parameter		Units	A295355 4hr Sept 29, 2022	A295355 8hr Sept 29, 2022		ODWQS	Standard
Volatiles (3/3)	Tetrachloroethylene	mg/L	N/A	ND (0.0005)	-	0.01 mg/L	MAC
	Toluene	mg/L	N/A	ND (0.0005)	-	0.06 mg/L	MAC
	1,1,1-Trichloroethane	mg/L	N/A	ND (0.0005)	-	-	-
	1,1,2-Trichloroethane	mg/L	N/A	ND (0.0005)	-	-	-
	Trichloroethylene	mg/L	N/A	ND (0.0005)	-	0.005 mg/L	MAC
	Trichlorofluoromethane	mg/L	N/A	ND (0.0010)	-	-	-
	Vinyl Chloride	mg/L	N/A	ND (0.0002)	-	0.001 mg/L	MAC
	m/p-Xylene	mg/L	N/A	ND (0.0005)	-	-	-
	o-Xylene	mg/L	N/A	ND (0.0005)	-	-	-
	Xylenes, total	mg/L	N/A	ND (0.0005)	-	0.09 mg/L	MAC
Semi-Volatiles (1/2)	Acenaphthene	µg/L	N/A	ND (0.05)	-	-	-
	Acenaphthylene	µg/L	N/A	ND (0.05)	-	-	-
	Anthracene	µg/L	N/A	ND (0.01)	-	-	-
	Benzo[a]anthracene	µg/L	N/A	ND (0.01)	-	-	-
	Benzo[a]pyrene	µg/L	N/A	ND (0.01)	-	0.01	MAC
	Benzo[b]fluoranthene	µg/L	N/A	ND (0.05)	-	-	-
	Benzo[g,h,i]perylene	µg/L	N/A	ND (0.05)	-	-	-

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## Summary of Laboratory Parameters Analyzed (7/7)

Parameter		Units	A295355 4hr Sept 29, 2022	A295355 8hr Sept 29, 2022		ODWQS	Standard
Semi-Volatiles (2/2)	Benzo[k]fluoranthene	µg/L	N/A	ND (0.05)	-	-	-
	1,1-Biphenyl	µg/L	N/A	ND (0.05)	-	-	-
	Chrysene	µg/L	N/A	ND (0.05)	-	-	-
	Dibenzo[a,h]anthracene	µg/L	N/A	ND (0.05)	-	-	-
	Fluoranthene	µg/L	N/A	ND (0.01)	-	-	-
	Fluorene	µg/L	N/A	ND (0.05)	-	-	-
	Indeno [1,2,3-cd] pyrene	µg/L	N/A	ND (0.05)	-	-	-
	1-Methylnaphthalene	µg/L	N/A	ND (0.05)	-	-	-
	2-Methylnaphthalene	µg/L	N/A	ND (0.05)	-	-	-
	Methylnaphthalene (1&2)	µg/L	N/A	ND (0.10)	-	-	-
	Naphthalene	µg/L	N/A	ND (0.05)	-	-	-
	Phenanthrene	µg/L	N/A	ND (0.05)	-	-	-
	Pyrene	µg/L	N/A	ND (0.01)	-	-	-
PCBs	PCBs, total	µg/L	N/A	ND (0.05)	-	3	MAC

1. ODWQS = Ontario Drinking Water Quality Standards
2. MAC = Maximum Acceptable Concentration
3. OG = Operational Guideline
4. AO = Aesthetic Objective
5. ND = Not Detectable
6. WL = Warning Level for Persons on Sodium Restricted Diets
7. MCT = Maximum Concentration Considered Reasonably Treatable



## Certificate of Analysis

### GEMTEC Consulting Engineers and Scientists Limited

32 Steacie Drive  
Kanata, ON K2K 2A9  
Attn: Brent Redmond

Client PO:  
Project: 101688.002  
Custody: 17046

Report Date: 7-Oct-2022  
Order Date: 29-Sep-2022

**Order #: 2240403**

This Certificate of Analysis contains analytical data applicable to the following samples as submitted :

Paracel ID	Client ID
2240403-01	TW22-1 4hr
2240403-02	TW22-1 8hr
2240403-03	TW22-1 8hr (Filtered)
2240403-04	MW22-1

Approved By:



Dale Robertson, BSc  
Laboratory Director

Certificate of Analysis

Report Date: 07-Oct-2022

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 29-Sep-2022

Client PO:

Project Description: 101688.002

**Analysis Summary Table**

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Alkalinity, total to pH 4.5	EPA 310.1 - Titration to pH 4.5	29-Sep-22	29-Sep-22
Ammonia, as N	EPA 351.2 - Auto Colour	28-Sep-22	29-Sep-22
Anions	EPA 300.1 - IC	4-Oct-22	4-Oct-22
Colour	SM2120 - Spectrophotometric	29-Sep-22	30-Sep-22
Colour, apparent	SM2120 - Spectrophotometric	29-Sep-22	30-Sep-22
Conductivity	EPA 9050A- probe @25 °C	29-Sep-22	29-Sep-22
Dissolved Organic Carbon	MOE E3247B - Combustion IR, filtration	30-Sep-22	30-Sep-22
E. coli	MOE E3407	30-Sep-22	30-Sep-22
Fecal Coliform	SM 9222D	30-Sep-22	30-Sep-22
Heterotrophic Plate Count	SM 9215C	29-Sep-22	29-Sep-22
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	30-Sep-22	30-Sep-22
Metals, ICP-MS	EPA 200.8 - ICP-MS	29-Sep-22	29-Sep-22
PAHs by GC-MS	EPA 625 - GC-MS, extraction	6-Oct-22	6-Oct-22
PCBs, total	EPA 608 - GC-ECD	30-Sep-22	30-Sep-22
pH	EPA 150.1 - pH probe @25 °C	29-Sep-22	29-Sep-22
Phenolics	EPA 420.2 - Auto Colour, 4AAP	30-Sep-22	30-Sep-22
Hardness	Hardness as CaCO <sub>3</sub>	29-Sep-22	29-Sep-22
Sulphide	SM 4500SE - Colourimetric	4-Oct-22	4-Oct-22
Tannin/Lignin	SM 5550B - Colourimetric	3-Oct-22	3-Oct-22
Total Coliform	MOE E3407	30-Sep-22	30-Sep-22
Total Dissolved Solids	SM 2540C - gravimetric, filtration	30-Sep-22	3-Oct-22
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	30-Sep-22	3-Oct-22
Turbidity	SM 2130B - Turbidity meter	29-Sep-22	29-Sep-22
VOCs by P&T GC-MS	EPA 624 - P&T GC-MS	4-Oct-22	4-Oct-22

Certificate of Analysis

Report Date: 07-Oct-2022

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 29-Sep-2022

Client PO:

Project Description: 101688.002

Client ID:	TW22-1 4hr	TW22-1 8hr	TW22-1 8hr (Filtered)	MW22-1
Sample Date:	28-Sep-22 12:00	28-Sep-22 16:00	28-Sep-22 16:00	28-Sep-22 16:00
Sample ID:	2240403-01	2240403-02	2240403-03	2240403-04
MDL/Units	Drinking Water	Drinking Water	Drinking Water	Water

**Microbiological Parameters**

Parameter	MDL/Units	TW22-1 4hr	TW22-1 8hr	TW22-1 8hr (Filtered)	MW22-1
E. coli	1 CFU/100mL	ND	ND	-	-
Fecal Coliforms	1 CFU/100mL	<1	4	-	-
Total Coliforms	1 CFU/100mL	ND	2	-	-
Heterotrophic Plate Count	10 CFU/mL	30	20	-	-

**General Inorganics**

Parameter	MDL/Units	TW22-1 4hr	TW22-1 8hr	TW22-1 8hr (Filtered)	MW22-1
Alkalinity, total	5 mg/L	305	305	-	-
Ammonia as N	0.01 mg/L	0.04	0.01	-	-
Dissolved Organic Carbon	0.5 mg/L	2.9	2.1	-	-
Colour	2 TCU	2	2	-	-
Colour, apparent	2 ACU	7	6	-	-
Conductivity	5 uS/cm	864	850	-	-
Hardness	mg/L	317	333	-	-
pH	0.1 pH Units	7.8	7.8	-	-
Phenolics	0.001 mg/L	<0.001	<0.001	-	-
Total Dissolved Solids	10 mg/L	490	492	-	-
Sulphide	0.02 mg/L	<0.02	<0.02	-	-
Tannin & Lignin	0.1 mg/L	<0.1	<0.1	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	0.2	0.2	-	-
Turbidity	0.1 NTU	0.7	0.8	-	-

**Anions**

Parameter	MDL/Units	TW22-1 4hr	TW22-1 8hr	TW22-1 8hr (Filtered)	MW22-1
Chloride	1 mg/L	67 [4]	68 [4]	-	-
Fluoride	0.1 mg/L	0.1 [4]	0.1 [4]	-	-
Nitrate as N	0.1 mg/L	0.4 [4]	0.4 [4]	-	<0.1 [4]
Nitrite as N	0.10 mg/L	<0.10 [4]	<0.10 [4]	-	<0.10 [4]
Sulphate	1 mg/L	44 [4]	43 [4]	-	-

**Metals**

Parameter	MDL/Units	TW22-1 4hr	TW22-1 8hr	TW22-1 8hr (Filtered)	MW22-1
Mercury	0.0001 mg/L	-	<0.0001	<0.0001	-
Aluminum	0.001 mg/L	-	0.002	<0.001	-
Antimony	0.0005 mg/L	-	<0.0005	<0.0005	-
Arsenic	0.001 mg/L	-	<0.001	<0.001	-
Barium	0.001 mg/L	-	0.296	0.291	-
Beryllium	0.0005 mg/L	-	<0.0005	<0.0005	-
Boron	0.01 mg/L	-	0.02	0.02	-
Cadmium	0.0001 mg/L	-	<0.0001	<0.0001	-

Certificate of Analysis

Report Date: 07-Oct-2022

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 29-Sep-2022

Client PO:

Project Description: 101688.002

	Client ID:	TW22-1 4hr	TW22-1 8hr	TW22-1 8hr (Filtered)	MW22-1
	Sample Date:	28-Sep-22 12:00	28-Sep-22 16:00	28-Sep-22 16:00	28-Sep-22 16:00
	Sample ID:	2240403-01	2240403-02	2240403-03	2240403-04
	MDL/Units	Drinking Water	Drinking Water	Drinking Water	Water
Calcium	0.1 mg/L	95.2	99.6	96.5	-
Chromium	0.001 mg/L	-	<0.001	<0.001	-
Cobalt	0.0005 mg/L	-	0.0010	0.0010	-
Copper	0.0005 mg/L	-	0.0015	0.0012	-
Iron	0.1 mg/L	<0.1	<0.1	<0.1	-
Lead	0.0001 mg/L	-	<0.0001	<0.0001	-
Magnesium	0.2 mg/L	19.4	20.5	20.1	-
Manganese	0.005 mg/L	0.482	0.496	0.474	-
Molybdenum	0.0005 mg/L	-	<0.0005	<0.0005	-
Nickel	0.001 mg/L	-	0.002	0.002	-
Potassium	0.1 mg/L	2.9	3.0	3.0	-
Selenium	0.001 mg/L	-	<0.001	<0.001	-
Silver	0.0001 mg/L	-	<0.0001	<0.0001	-
Sodium	0.2 mg/L	32.6	34.0	32.3	-
Strontium	0.01 mg/L	-	0.79	0.77	-
Thallium	0.001 mg/L	-	<0.001	<0.001	-
Uranium	0.0001 mg/L	-	0.0007	0.0007	-
Vanadium	0.0005 mg/L	-	<0.0005	<0.0005	-
Zinc	0.005 mg/L	-	<0.005	<0.005	-

<b>Volatiles</b>					
Acetone	0.0050 mg/L	-	<0.0050	-	-
Benzene	0.0005 mg/L	-	<0.0005	-	-
Bromodichloromethane	0.0005 mg/L	-	<0.0005	-	-
Bromoform	0.0005 mg/L	-	<0.0005	-	-
Bromomethane	0.0005 mg/L	-	<0.0005	-	-
Carbon Tetrachloride	0.0002 mg/L	-	<0.0002	-	-
Chlorobenzene	0.0005 mg/L	-	<0.0005	-	-
Chloroethane	0.0010 mg/L	-	<0.0010	-	-
Chloroform	0.0005 mg/L	-	<0.0005	-	-
Dibromochloromethane	0.0005 mg/L	-	<0.0005	-	-
Dichlorodifluoromethane	0.0010 mg/L	-	<0.0010	-	-
1,2-Dibromoethane	0.0002 mg/L	-	<0.0002	-	-
1,2-Dichlorobenzene	0.0005 mg/L	-	<0.0005	-	-
1,3-Dichlorobenzene	0.0005 mg/L	-	<0.0005	-	-
1,4-Dichlorobenzene	0.0005 mg/L	-	<0.0005	-	-

Certificate of Analysis

Report Date: 07-Oct-2022

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 29-Sep-2022

Client PO:

Project Description: 101688.002

	MDL/Units	Client ID:	TW22-1 4hr	TW22-1 8hr	TW22-1 8hr (Filtered)	MW22-1
		Sample Date:	28-Sep-22 12:00	28-Sep-22 16:00	28-Sep-22 16:00	28-Sep-22 16:00
		Sample ID:	2240403-01	2240403-02	2240403-03	2240403-04
		Drinking Water	Drinking Water	Drinking Water	Water	
1,1-Dichloroethane	0.0005 mg/L	-	<0.0005	-	-	
1,2-Dichloroethane	0.0005 mg/L	-	<0.0005	-	-	
1,1-Dichloroethylene	0.0005 mg/L	-	<0.0005	-	-	
cis-1,2-Dichloroethylene	0.0005 mg/L	-	<0.0005	-	-	
trans-1,2-Dichloroethylene	0.0005 mg/L	-	<0.0005	-	-	
1,2-Dichloroethylene, total	0.0005 mg/L	-	<0.0005	-	-	
1,2-Dichloropropane	0.0005 mg/L	-	<0.0005	-	-	
cis-1,3-Dichloropropylene	0.0005 mg/L	-	<0.0005	-	-	
trans-1,3-Dichloropropylene	0.0005 mg/L	-	<0.0005	-	-	
1,3-Dichloropropene, total	0.0005 mg/L	-	<0.0005	-	-	
Ethylbenzene	0.0005 mg/L	-	<0.0005	-	-	
Hexane	0.0010 mg/L	-	<0.0010	-	-	
Methyl Ethyl Ketone (2-Butanone)	0.0050 mg/L	-	<0.0050	-	-	
Methyl Isobutyl Ketone	0.0050 mg/L	-	<0.0050	-	-	
Methyl tert-butyl ether	0.0020 mg/L	-	<0.0020	-	-	
Methylene Chloride	0.0050 mg/L	-	<0.0050	-	-	
Styrene	0.0005 mg/L	-	<0.0005	-	-	
1,1,1,2-Tetrachloroethane	0.0005 mg/L	-	<0.0005	-	-	
1,1,2,2-Tetrachloroethane	0.0005 mg/L	-	<0.0005	-	-	
Tetrachloroethylene	0.0005 mg/L	-	<0.0005	-	-	
Toluene	0.0005 mg/L	-	<0.0005	-	-	
1,1,1-Trichloroethane	0.0005 mg/L	-	<0.0005	-	-	
1,1,2-Trichloroethane	0.0005 mg/L	-	<0.0005	-	-	
Trichloroethylene	0.0005 mg/L	-	<0.0005	-	-	
Trichlorofluoromethane	0.0010 mg/L	-	<0.0010	-	-	
Vinyl chloride	0.0002 mg/L	-	<0.0002	-	-	
m,p-Xylenes	0.0005 mg/L	-	<0.0005	-	-	
o-Xylene	0.0005 mg/L	-	<0.0005	-	-	
Xylenes, total	0.0005 mg/L	-	<0.0005	-	-	
4-Bromofluorobenzene	Surrogate	-	113%	-	-	
Dibromofluoromethane	Surrogate	-	89.4%	-	-	
Toluene-d8	Surrogate	-	109%	-	-	
<b>Semi-Volatiles</b>						
Acenaphthene	0.05 ug/L	-	<0.05	-	-	
Acenaphthylene	0.05 ug/L	-	<0.05	-	-	

Certificate of Analysis

Report Date: 07-Oct-2022

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 29-Sep-2022

Client PO:

Project Description: 101688.002

	MDL/Units	Client ID:	TW22-1 4hr	TW22-1 8hr	TW22-1 8hr (Filtered)	MW22-1
		Sample Date:	28-Sep-22 12:00	28-Sep-22 16:00	28-Sep-22 16:00	28-Sep-22 16:00
		Sample ID:	2240403-01	2240403-02	2240403-03	2240403-04
		Drinking Water	Drinking Water	Drinking Water	Water	
Anthracene	0.01 ug/L	-	<0.01	-	-	
Benzo [a] anthracene	0.01 ug/L	-	<0.01	-	-	
Benzo [a] pyrene	0.01 ug/L	-	<0.01	-	-	
Benzo [b] fluoranthene	0.05 ug/L	-	<0.05	-	-	
Benzo [g,h,i] perylene	0.05 ug/L	-	<0.05	-	-	
Benzo [k] fluoranthene	0.05 ug/L	-	<0.05	-	-	
Biphenyl	0.05 ug/L	-	<0.05	-	-	
Chrysene	0.05 ug/L	-	<0.05	-	-	
Dibenzo [a,h] anthracene	0.05 ug/L	-	<0.05	-	-	
Fluoranthene	0.01 ug/L	-	<0.01	-	-	
Fluorene	0.05 ug/L	-	<0.05	-	-	
Indeno [1,2,3-cd] pyrene	0.05 ug/L	-	<0.05	-	-	
1-Methylnaphthalene	0.05 ug/L	-	<0.05	-	-	
2-Methylnaphthalene	0.05 ug/L	-	<0.05	-	-	
Methylnaphthalene (1&2)	0.10 ug/L	-	<0.10	-	-	
Naphthalene	0.05 ug/L	-	<0.05	-	-	
Phenanthrene	0.05 ug/L	-	<0.05	-	-	
Pyrene	0.01 ug/L	-	<0.01	-	-	
2-Fluorobiphenyl	Surrogate	-	81.2%	-	-	
Terphenyl-d14	Surrogate	-	102%	-	-	
<b>PCBs</b>						
PCBs, total	0.05 ug/L	-	<0.05	-	-	
Decachlorobiphenyl	Surrogate	-	60.0%	-	-	

Certificate of Analysis

Report Date: 07-Oct-2022

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 29-Sep-2022

Client PO:

Project Description: 101688.002

**Method Quality Control: Blank**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>General Inorganics</b>									
Alkalinity, total	ND	5	mg/L						
Ammonia as N	ND	0.01	mg/L						
Dissolved Organic Carbon	ND	0.5	mg/L						
Colour	ND	2	TCU						
Colour, apparent	ND	2	ACU						
Conductivity	ND	5	uS/cm						
Phenolics	ND	0.001	mg/L						
Total Dissolved Solids	ND	10	mg/L						
Sulphide	ND	0.02	mg/L						
Tannin & Lignin	ND	0.1	mg/L						
Total Kjeldahl Nitrogen	ND	0.1	mg/L						
Turbidity	ND	0.1	NTU						
<b>Metals</b>									
Mercury	ND	0.0001	mg/L						
Aluminum	ND	0.001	mg/L						
Antimony	ND	0.0005	mg/L						
Arsenic	ND	0.001	mg/L						
Barium	ND	0.001	mg/L						
Beryllium	ND	0.0005	mg/L						
Boron	ND	0.01	mg/L						
Cadmium	ND	0.0001	mg/L						
Calcium	ND	0.1	mg/L						
Chromium	ND	0.001	mg/L						
Cobalt	ND	0.0005	mg/L						
Copper	ND	0.0005	mg/L						
Iron	ND	0.1	mg/L						
Lead	ND	0.0001	mg/L						
Magnesium	ND	0.2	mg/L						
Manganese	ND	0.005	mg/L						
Molybdenum	ND	0.0005	mg/L						
Nickel	ND	0.001	mg/L						
Potassium	ND	0.1	mg/L						
Selenium	ND	0.001	mg/L						
Silver	ND	0.0001	mg/L						
Sodium	ND	0.2	mg/L						
Strontium	ND	0.01	mg/L						
Thallium	ND	0.001	mg/L						
Uranium	ND	0.0001	mg/L						
Vanadium	ND	0.0005	mg/L						
Zinc	ND	0.005	mg/L						
<b>Microbiological Parameters</b>									
E. coli	ND	1	CFU/100mL						
Fecal Coliforms	ND	1	CFU/100mL						
Total Coliforms	ND	1	CFU/100mL						
Heterotrophic Plate Count	ND	10	CFU/mL						
<b>PCBs</b>									
PCBs, total	ND	0.05	ug/L						
Surrogate: Decachlorobiphenyl	0.391		ug/L		78.2	60-140			
<b>Volatiles</b>									
Acetone	ND	0.0050	mg/L						
Benzene	ND	0.0005	mg/L						
Bromodichloromethane	ND	0.0005	mg/L						
Bromoform	ND	0.0005	mg/L						
Bromomethane	ND	0.0005	mg/L						
Carbon Tetrachloride	ND	0.0002	mg/L						
Chlorobenzene	ND	0.0005	mg/L						
Chloroethane	ND	0.0010	mg/L						

Certificate of Analysis

Report Date: 07-Oct-2022

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 29-Sep-2022

Client PO:

Project Description: 101688.002

**Method Quality Control: Blank**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Chloroform	ND	0.0005	mg/L						
Dibromochloromethane	ND	0.0005	mg/L						
Dichlorodifluoromethane	ND	0.0010	mg/L						
1,2-Dibromoethane	ND	0.0002	mg/L						
1,2-Dichlorobenzene	ND	0.0005	mg/L						
1,3-Dichlorobenzene	ND	0.0005	mg/L						
1,4-Dichlorobenzene	ND	0.0005	mg/L						
1,1-Dichloroethane	ND	0.0005	mg/L						
1,2-Dichloroethane	ND	0.0005	mg/L						
1,1-Dichloroethylene	ND	0.0005	mg/L						
cis-1,2-Dichloroethylene	ND	0.0005	mg/L						
trans-1,2-Dichloroethylene	ND	0.0005	mg/L						
1,2-Dichloroethylene, total	ND	0.0005	mg/L						
1,2-Dichloropropane	ND	0.0005	mg/L						
cis-1,3-Dichloropropylene	ND	0.0005	mg/L						
trans-1,3-Dichloropropylene	ND	0.0005	mg/L						
1,3-Dichloropropene, total	ND	0.0005	mg/L						
Ethylbenzene	ND	0.0005	mg/L						
Hexane	ND	0.0010	mg/L						
Methyl Ethyl Ketone (2-Butanone)	ND	0.0050	mg/L						
Methyl Isobutyl Ketone	ND	0.0050	mg/L						
Methyl tert-butyl ether	ND	0.0020	mg/L						
Methylene Chloride	ND	0.0050	mg/L						
Styrene	ND	0.0005	mg/L						
1,1,1,2-Tetrachloroethane	ND	0.0005	mg/L						
1,1,2,2-Tetrachloroethane	ND	0.0005	mg/L						
Tetrachloroethylene	ND	0.0005	mg/L						
Toluene	ND	0.0005	mg/L						
1,1,1-Trichloroethane	ND	0.0005	mg/L						
1,1,2-Trichloroethane	ND	0.0005	mg/L						
Trichloroethylene	ND	0.0005	mg/L						
Trichlorofluoromethane	ND	0.0010	mg/L						
Vinyl chloride	ND	0.0002	mg/L						
m,p-Xylenes	ND	0.0005	mg/L						
o-Xylene	ND	0.0005	mg/L						
Xylenes, total	ND	0.0005	mg/L						
Surrogate: 4-Bromofluorobenzene	0.0864		mg/L		108	50-140			
Surrogate: Dibromofluoromethane	0.0681		mg/L		85.1	50-140			
Surrogate: Toluene-d8	0.0852		mg/L		107	50-140			



Certificate of Analysis

Report Date: 07-Oct-2022

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 29-Sep-2022

Client PO:

Project Description: 101688.002

**Method Quality Control: Duplicate**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>General Inorganics</b>									
Alkalinity, total	348	5	mg/L	352			1.3	14	
Ammonia as N	0.074	0.01	mg/L	0.073			1.6	17.7	
Dissolved Organic Carbon	1.0	0.5	mg/L	1.1			3.4	37	
Colour	2	2	TCU	2			0.0	12	
Colour, apparent	13	2	ACU	13			0.0	12	
Conductivity	1930	5	uS/cm	1960			1.3	5	
pH	7.4	0.1	pH Units	7.4			0.3	3.3	
Phenolics	ND	0.001	mg/L	ND			NC	10	
Total Dissolved Solids	98.0	10	mg/L	96.0			2.1	10	
Sulphide	0.02	0.02	mg/L	0.03			NC	10	
Tannin & Lignin	ND	0.1	mg/L	ND			NC	11	
Total Kjeldahl Nitrogen	0.14	0.1	mg/L	0.14			3.7	16	
Turbidity	4.5	0.1	NTU	4.4			2.2	10	
<b>Metals</b>									
Mercury	ND	0.0001	mg/L	ND			NC	20	
Aluminum	0.045	0.001	mg/L	0.045			1.5	20	
Antimony	ND	0.0005	mg/L	ND			NC	20	
Arsenic	ND	0.001	mg/L	ND			NC	20	
Barium	0.012	0.001	mg/L	0.012			0.8	20	
Beryllium	ND	0.0005	mg/L	ND			NC	20	
Boron	ND	0.01	mg/L	ND			NC	20	
Cadmium	ND	0.0001	mg/L	ND			NC	20	
Calcium	7.4	0.1	mg/L	7.4			0.4	20	
Chromium	ND	0.001	mg/L	ND			NC	20	
Cobalt	ND	0.0005	mg/L	ND			NC	20	
Copper	0.0017	0.0005	mg/L	0.0017			0.2	20	
Iron	ND	0.1	mg/L	ND			NC	20	
Lead	ND	0.0001	mg/L	ND			NC	20	
Magnesium	1.9	0.2	mg/L	1.9			1.1	20	
Manganese	ND	0.005	mg/L	ND			NC	20	
Molybdenum	ND	0.0005	mg/L	ND			NC	20	
Nickel	ND	0.001	mg/L	ND			NC	20	
Potassium	0.6	0.1	mg/L	0.7			4.1	20	
Selenium	ND	0.001	mg/L	ND			NC	20	
Silver	ND	0.0001	mg/L	ND			NC	20	
Sodium	15.0	0.2	mg/L	15.3			2.0	20	
Thallium	ND	0.001	mg/L	ND			NC	20	
Uranium	ND	0.0001	mg/L	ND			NC	20	
Vanadium	ND	0.0005	mg/L	ND			NC	20	
Zinc	ND	0.005	mg/L	ND			NC	20	
<b>Microbiological Parameters</b>									
E. coli	ND	1	CFU/100mL	ND			NC	30	
Fecal Coliforms	ND	1	CFU/100mL	6			NC	30	
Total Coliforms	ND	1	CFU/100mL	ND			NC	30	
Heterotrophic Plate Count	ND	10	CFU/mL	30			NC	30	
<b>Volatiles</b>									
Acetone	ND	0.0050	mg/L	ND			NC	30	
Benzene	ND	0.0005	mg/L	ND			NC	30	
Bromodichloromethane	ND	0.0005	mg/L	ND			NC	30	
Bromoform	ND	0.0005	mg/L	ND			NC	30	
Bromomethane	ND	0.0005	mg/L	ND			NC	30	
Carbon Tetrachloride	ND	0.0002	mg/L	ND			NC	30	
Chlorobenzene	ND	0.0005	mg/L	ND			NC	30	
Chloroethane	ND	0.0010	mg/L	ND			NC	30	
Chloroform	ND	0.0005	mg/L	ND			NC	30	
Dibromochloromethane	ND	0.0005	mg/L	ND			NC	30	

Certificate of Analysis

Report Date: 07-Oct-2022

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 29-Sep-2022

Client PO:

Project Description: 101688.002

**Method Quality Control: Duplicate**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Dichlorodifluoromethane	ND	0.0010	mg/L	ND			NC	30	
1,2-Dibromoethane	ND	0.0002	mg/L	ND			NC	30	
1,2-Dichlorobenzene	ND	0.0005	mg/L	ND			NC	30	
1,3-Dichlorobenzene	ND	0.0005	mg/L	ND			NC	30	
1,4-Dichlorobenzene	ND	0.0005	mg/L	ND			NC	30	
1,1-Dichloroethane	ND	0.0005	mg/L	ND			NC	30	
1,2-Dichloroethane	ND	0.0005	mg/L	ND			NC	30	
1,1-Dichloroethylene	ND	0.0005	mg/L	ND			NC	30	
cis-1,2-Dichloroethylene	ND	0.0005	mg/L	ND			NC	30	
trans-1,2-Dichloroethylene	ND	0.0005	mg/L	ND			NC	30	
1,2-Dichloropropane	ND	0.0005	mg/L	ND			NC	30	
cis-1,3-Dichloropropylene	ND	0.0005	mg/L	ND			NC	30	
trans-1,3-Dichloropropylene	ND	0.0005	mg/L	ND			NC	30	
Ethylbenzene	ND	0.0005	mg/L	ND			NC	30	
Hexane	ND	0.0010	mg/L	ND			NC	30	
Methyl Ethyl Ketone (2-Butanone)	ND	0.0050	mg/L	ND			NC	30	
Methyl Isobutyl Ketone	ND	0.0050	mg/L	ND			NC	30	
Methyl tert-butyl ether	ND	0.0020	mg/L	ND			NC	30	
Methylene Chloride	ND	0.0050	mg/L	ND			NC	30	
Styrene	ND	0.0005	mg/L	ND			NC	30	
1,1,1,2-Tetrachloroethane	ND	0.0005	mg/L	ND			NC	30	
1,1,2,2-Tetrachloroethane	ND	0.0005	mg/L	ND			NC	30	
Tetrachloroethylene	ND	0.0005	mg/L	ND			NC	30	
Toluene	ND	0.0005	mg/L	ND			NC	30	
1,1,1-Trichloroethane	ND	0.0005	mg/L	ND			NC	30	
1,1,2-Trichloroethane	ND	0.0005	mg/L	ND			NC	30	
Trichloroethylene	ND	0.0005	mg/L	ND			NC	30	
Trichlorofluoromethane	ND	0.0010	mg/L	ND			NC	30	
Vinyl chloride	ND	0.0002	mg/L	ND			NC	30	
m,p-Xylenes	ND	0.0005	mg/L	ND			NC	30	
o-Xylene	ND	0.0005	mg/L	ND			NC	30	
Surrogate: 4-Bromofluorobenzene	0.0912		mg/L		114	50-140			
Surrogate: Dibromofluoromethane	0.0700		mg/L		87.4	50-140			
Surrogate: Toluene-d8	0.0863		mg/L		108	50-140			

Certificate of Analysis

Report Date: 07-Oct-2022

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 29-Sep-2022

Client PO:

Project Description: 101688.002

**Method Quality Control: Spike**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>General Inorganics</b>									
Ammonia as N	0.300	0.01	mg/L	0.073	91.0	81-124			
Dissolved Organic Carbon	11.4	0.5	mg/L	1.1	104	60-133			
Phenolics	0.028	0.001	mg/L	ND	110	67-133			
Total Dissolved Solids	98.0	10	mg/L	ND	98.0	75-125			
Sulphide	0.54	0.02	mg/L	0.03	102	79-115			
Tannin & Lignin	0.9	0.1	mg/L	ND	94.1	71-113			
Total Kjeldahl Nitrogen	1.95	0.1	mg/L	0.14	90.6	81-126			
<b>Metals</b>									
Mercury	0.0023	0.0001	mg/L	ND	76.1	70-130			
Aluminum	92.3	0.001	mg/L	44.8	95.1	80-120			
Antimony	43.5	0.0005	mg/L	0.302	86.4	80-120			
Arsenic	47.1	0.001	mg/L	0.417	93.5	80-120			
Barium	55.3	0.001	mg/L	11.7	87.1	80-120			
Beryllium	50.5	0.0005	mg/L	0.0163	101	80-120			
Boron	51.9	0.01	mg/L	5.30	93.3	80-120			
Cadmium	43.6	0.0001	mg/L	0.0153	87.1	80-120			
Calcium	15400	0.1	mg/L	7400	80.2	80-120			
Chromium	48.0	0.001	mg/L	0.113	95.7	80-120			
Cobalt	46.4	0.0005	mg/L	0.0236	92.8	80-120			
Copper	45.9	0.0005	mg/L	1.66	88.5	80-120			
Iron	2190	0.1	mg/L	4.0	87.6	80-120			
Lead	44.0	0.0001	mg/L	0.0699	87.9	80-120			
Magnesium	10500	0.2	mg/L	1940	86.1	80-120			
Manganese	50.7	0.005	mg/L	4.95	91.6	80-120			
Molybdenum	44.9	0.0005	mg/L	0.264	89.2	80-120			
Nickel	46.9	0.001	mg/L	0.438	92.9	80-120			
Potassium	9810	0.1	mg/L	664	91.5	80-120			
Selenium	45.1	0.001	mg/L	0.086	90.1	80-120			
Silver	46.6	0.0001	mg/L	0.0313	93.2	80-120			
Sodium	11600	0.2	mg/L	1930	96.6	80-120			
Thallium	46.0	0.001	mg/L	0.014	91.9	80-120			
Uranium	46.7	0.0001	mg/L	0.0120	93.4	80-120			
Vanadium	47.7	0.0005	mg/L	0.189	95.0	80-120			
Zinc	45.2	0.005	mg/L	0.574	89.3	80-120			
<b>PCBs</b>									
PCBs, total	0.822	0.05	ug/L	ND	82.2	35-135			
Surrogate: Decachlorobiphenyl	0.428		ug/L		85.7	60-140			
<b>Volatiles</b>									
Acetone	0.0936	0.0050	mg/L	ND	93.6	50-140			
Benzene	0.0383	0.0005	mg/L	ND	95.8	60-130			
Bromodichloromethane	0.0378	0.0005	mg/L	ND	94.6	60-130			
Bromoform	0.0398	0.0005	mg/L	ND	99.5	60-130			
Bromomethane	0.0444	0.0005	mg/L	ND	111	50-140			
Carbon Tetrachloride	0.0410	0.0002	mg/L	ND	103	60-130			
Chlorobenzene	0.0444	0.0005	mg/L	ND	111	60-130			
Chloroethane	0.0334	0.0010	mg/L	ND	83.4	50-140			
Chloroform	0.0436	0.0005	mg/L	ND	109	60-130			
Dibromochloromethane	0.0413	0.0005	mg/L	ND	103	60-130			

Certificate of Analysis

Report Date: 07-Oct-2022

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 29-Sep-2022

Client PO:

Project Description: 101688.002

**Method Quality Control: Spike**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Dichlorodifluoromethane	0.0362	0.0010	mg/L	ND	90.6	50-140			
1,2-Dibromoethane	0.0393	0.0002	mg/L	ND	98.4	60-130			
1,2-Dichlorobenzene	0.0438	0.0005	mg/L	ND	110	60-130			
1,3-Dichlorobenzene	0.0412	0.0005	mg/L	ND	103	60-130			
1,4-Dichlorobenzene	0.0416	0.0005	mg/L	ND	104	60-130			
1,1-Dichloroethane	0.0386	0.0005	mg/L	ND	96.6	60-130			
1,2-Dichloroethane	0.0374	0.0005	mg/L	ND	93.4	60-130			
1,1-Dichloroethylene	0.0343	0.0005	mg/L	ND	85.7	60-130			
cis-1,2-Dichloroethylene	0.0423	0.0005	mg/L	ND	106	60-130			
trans-1,2-Dichloroethylene	0.0381	0.0005	mg/L	ND	95.2	60-130			
1,2-Dichloropropane	0.0387	0.0005	mg/L	ND	96.8	60-130			
cis-1,3-Dichloropropylene	0.0375	0.0005	mg/L	ND	93.7	60-130			
trans-1,3-Dichloropropylene	0.0399	0.0005	mg/L	ND	99.7	60-130			
Ethylbenzene	0.0388	0.0005	mg/L	ND	97.0	60-130			
Hexane	0.0371	0.0010	mg/L	ND	92.8	60-130			
Methyl Ethyl Ketone (2-Butanone)	0.100	0.0050	mg/L	ND	100	50-140			
Methyl Isobutyl Ketone	0.0994	0.0050	mg/L	ND	99.4	50-140			
Methyl tert-butyl ether	0.0854	0.0020	mg/L	ND	85.4	50-140			
Methylene Chloride	0.0410	0.0050	mg/L	ND	102	60-130			
Styrene	0.0375	0.0005	mg/L	ND	93.8	60-130			
1,1,1,2-Tetrachloroethane	0.0370	0.0005	mg/L	ND	92.4	60-130			
1,1,2,2-Tetrachloroethane	0.0420	0.0005	mg/L	ND	105	60-130			
Tetrachloroethylene	0.0349	0.0005	mg/L	ND	87.2	60-130			
Toluene	0.0405	0.0005	mg/L	ND	101	60-130			
1,1,1-Trichloroethane	0.0411	0.0005	mg/L	ND	103	60-130			
1,1,2-Trichloroethane	0.0420	0.0005	mg/L	ND	105	60-130			
Trichloroethylene	0.0409	0.0005	mg/L	ND	102	60-130			
Trichlorofluoromethane	0.0384	0.0010	mg/L	ND	96.1	60-130			
Vinyl chloride	0.0373	0.0002	mg/L	ND	93.3	50-140			
m,p-Xylenes	0.0792	0.0005	mg/L	ND	99.0	60-130			
o-Xylene	0.0393	0.0005	mg/L	ND	98.2	60-130			
Surrogate: 4-Bromofluorobenzene	0.0736		mg/L		92.0	50-140			
Surrogate: Dibromofluoromethane	0.0698		mg/L		87.2	50-140			
Surrogate: Toluene-d8	0.0704		mg/L		88.0	50-140			

Certificate of Analysis

Report Date: 07-Oct-2022

Client: **GEMTEC Consulting Engineers and Scientists Limited**

Order Date: 29-Sep-2022

Client PO:

Project Description: **101688.002**

**Qualifier Notes:**

***Login Qualifiers :***

Container and COC sample IDs don't match - Metals bottle missing the 8 hr in the sample ID.

*Applies to samples: TW22-1 8hr (Filtered)*

***Sample Qualifiers :***

4 : Subcontracted analysis - Eurofins Environment Testing

**Sample Data Revisions**

None

**Work Order Revisions / Comments:**

None

**Other Report Notes:**

n/a: not applicable

ND: Not Detected

MDL: Method Detection Limit

Source Result: Data used as source for matrix and duplicate samples

%REC: Percent recovery.

RPD: Relative percent difference.

NC: Not Calculated

## Certificate of Analysis

**GEMTEC Consulting Engineers and Scientists Limited**

32 Steacie Drive  
Kanata, ON K2K 2A9  
Attn: Brent Redmond

Client PO: 2885 Carp Rd  
Project: 101688.002  
Custody: 16469

Report Date: 28-Oct-2022  
Order Date: 24-Oct-2022

**Order #: 2244097**

This Certificate of Analysis contains analytical data applicable to the following samples as submitted :

Paracel ID	Client ID
2244097-01	PW2885

Approved By:



Dale Robertson, BSc  
Laboratory Director

Certificate of Analysis  
Client: **GEMTEC Consulting Engineers and Scientists Limited**  
Client PO: 2885 Carp Rd

Report Date: 28-Oct-2022  
Order Date: 24-Oct-2022  
Project Description: **101688.002**

**Analysis Summary Table**

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Anions	EPA 300.1 - IC	26-Oct-22	26-Oct-22
E. coli	MOE E3407	25-Oct-22	25-Oct-22
Fecal Coliform	SM 9222D	25-Oct-22	25-Oct-22
Heterotrophic Plate Count	SM 9215C	25-Oct-22	25-Oct-22
Total Coliform	MOE E3407	25-Oct-22	25-Oct-22

Certificate of Analysis

Report Date: 28-Oct-2022

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 24-Oct-2022

Client PO: 2885 Carp Rd

Project Description: 101688.002

<b>Client ID:</b>	PW2885	-	-	-
<b>Sample Date:</b>	24-Oct-22 12:30	-	-	-
<b>Sample ID:</b>	2244097-01	-	-	-
<b>MDL/Units</b>	Drinking Water	-	-	-

**Microbiological Parameters**

E. coli	1 CFU/100mL	ND	-	-	-
Fecal Coliforms	1 CFU/100mL	ND	-	-	-
Total Coliforms	1 CFU/100mL	ND	-	-	-
Heterotrophic Plate Count	10 CFU/mL	<10	-	-	-

**Anions**

Nitrate as N	0.1 mg/L	0.2 [1]	-	-	-
Nitrite as N	0.10 mg/L	<0.10 [1]	-	-	-



Certificate of Analysis  
 Client: **GEMTEC Consulting Engineers and Scientists Limited**  
 Client PO: 2885 Carp Rd

Report Date: 28-Oct-2022  
 Order Date: 24-Oct-2022  
 Project Description: **101688.002**

**Method Quality Control: Blank**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>Microbiological Parameters</b>									
E. coli	ND	1	CFU/100mL						
Fecal Coliforms	ND	1	CFU/100mL						
Total Coliforms	ND	1	CFU/100mL						
Heterotrophic Plate Count	ND	10	CFU/mL						

Certificate of Analysis  
 Client: **GEMTEC Consulting Engineers and Scientists Limited**  
 Client PO: 2885 Carp Rd

Report Date: 28-Oct-2022  
 Order Date: 24-Oct-2022  
 Project Description: **101688.002**

**Method Quality Control: Duplicate**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>Microbiological Parameters</b>									
E. coli	ND	1	CFU/100mL	ND			NC	30	
Fecal Coliforms	ND	1	CFU/100mL	ND			NC	30	
Total Coliforms	ND	1	CFU/100mL	ND			NC	30	
Heterotrophic Plate Count	160	10	CFU/mL	210			27.0	30	

Certificate of Analysis

Report Date: 28-Oct-2022

Client: **GEMTEC Consulting Engineers and Scientists Limited**

Order Date: 24-Oct-2022

Client PO: 2885 Carp Rd

Project Description: 101688.002

**Qualifier Notes:**

*Sample Qualifiers :*

1 : Subcontracted analysis - Eurofins Environment Testing

**Sample Data Revisions**

None

**Work Order Revisions / Comments:**

None

**Other Report Notes:**

n/a: not applicable

ND: Not Detected

MDL: Method Detection Limit

Source Result: Data used as source for matrix and duplicate samples

%REC: Percent recovery.

RPD: Relative percent difference.

NC: Not Calculated



## **APPENDIX G**

Water Surplus Datasheet  
Ottawa International Airport

Ottawa Intl A WATER BUDGET MEANS FOR THE PERIOD 1939-2020 DC20492

LAT.... 45.32 WATER HOLDING CAPACITY... 75 MM HEAT INDEX... 36.69  
 LONG... 75.67 LOWER ZONE..... 45 MM A..... 1.079

DATE	TEMP (C)	PCPN	RAIN	MELT	PE	AE	DEF	SURP	SNOW	SOIL	ACC P
31- 1	-10.6	62	12	14	0	0	0	25	83	74	295
28- 2	-9.0	56	10	17	1	1	0	26	112	74	351
31- 3	-2.8	66	31	78	5	5	0	103	69	75	416
30- 4	5.7	73	68	74	31	31	0	111	0	75	490
31- 5	13.1	76	76	0	80	80	0	14	0	56	566
30- 6	18.3	85	85	0	116	107	-9	5	0	30	651
31- 7	20.9	88	88	0	136	103	-33	3	0	11	739
31- 8	19.6	84	84	0	118	84	-34	1	0	11	823
30- 9	14.8	82	82	0	75	65	-10	4	0	24	906
31-10	8.3	77	77	0	37	36	-1	14	0	52	77
30-11	1.3	76	59	8	10	10	0	38	9	71	154
31-12	-6.9	79	27	14	1	1	0	36	47	74	233
AVE	6.0 TTL	904	699	205	610	523	-87	380			

Ottawa Intl A STANDARD DEVIATIONS FOR THE PERIOD 1939-2020 DC20492

DATE	TEMP (C)	PCPN	RAIN	MELT	PE	AE	DEF	SURP	SNOW	SOIL	ACC P
31- 1	2.9	26	15	17	1	1	0	29	44	3	59
28- 2	2.6	26	14	26	1	1	0	35	59	3	63
31- 3	2.6	28	22	49	5	5	0	55	87	0	71
30- 4	1.8	32	33	88	9	9	0	89	2	2	80
31- 5	1.8	34	34	2	12	12	0	24	0	22	94
30- 6	1.2	38	38	0	8	18	18	16	0	29	105
31- 7	1.2	45	45	0	8	31	33	16	0	22	117
31- 8	1.3	37	37	0	8	29	31	4	0	21	126
30- 9	1.5	39	39	0	8	16	16	15	0	29	132
31-10	1.5	37	37	1	7	7	2	21	0	27	37
30-11	1.8	27	27	8	4	4	0	32	13	12	45
31-12	3.0	30	22	14	1	1	0	30	34	4	55



## **APPENDIX H**

### Nitrate Dilution Calculations

## Allowable Flows - Commercial Septic Systems - 2885 Carp Road, Carp, Ontario

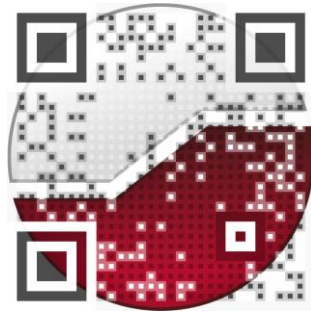
Site	Area m <sup>2</sup>	Topography Factor	Soil Factor	Cover Factor	Infiltration Factor	Annual Water Surplus (m/year)	Infiltration Volume (m <sup>3</sup> /year)
2885 Carp Road, Carp, Ontario	12041	0.20	0.40	0.10	0.70	0.380	4576

Hard Surface Area	Available Infiltration <sup>1</sup> (litres per day)	Maximum Septic Flow- Conventional <sup>2</sup> (litres per day)	Maximum Number of Users <sup>3</sup>	Maximum Septic Flow-Advanced <sup>2</sup> (litres per day)	Maximum Number of Users <sup>3</sup>
20%	7020	2340	31	7020	94

**Notes:**

1. Available infiltration (litres per day) = Infiltration volume (m<sup>3</sup>/year) x (1000 litres/m<sup>3</sup>) / (365 days/year) x (1 - hard surface area) x Infiltration Factor
2. Incorporates a value of 20 mg/L nitrate in the discharged effluent from the tertiary treatment system. The calculated maximum allowable flow is based on a simplification of the formula provided in Section 5.6.3, utilizing a concentration of 20 mg/L of Nitrate in the effluent discharging from the tertiary treatment unit
3. Assumes 75 litres per day per person

experience • knowledge • integrity



civil  
geotechnical  
environmental  
field services  
materials testing

civil  
géotechnique  
environnementale  
surveillance de chantier  
service de laboratoire des matériaux

expérience • connaissance • intégrité

