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Hydrogeological Investigation, Terrain Analysis & Impact Assessment
New Multi-Tenant Commercial Development
2822 Carp Road
Carp, Ontario

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Submitted to:

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Hydrogeological Investigation, Terrain Analysis & Impact Assessment
New Multi-Tenant Commercial Development
2822 Carp Road
Carp, Ontario

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Project: 65057.01

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1.0 INTRODUCTION

GEMTEC Consulting Engineers and Scientists Limited (GEMTEC) was retained by 2513287 Ontario Inc. to carry out a hydrogeological investigation, terrain analysis and groundwater impact assessment in support of a proposed multi-tenant commercial development to be located at 2822 Carp Road in Ottawa, Ontario. 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 well water meets the Ontario Drinking Water Standards and maximum treatable limits prescribed in MECP Procedure D-5-5;
- Confirm that the quantity of water meets the MECP requirements;
- Confirm that the septic impact assessment meets the MECP requirements; and,
- Complete a groundwater water balance.

2.0 SITE BACKGROUND

2.1 Project Description

Plans are being prepared for the new multi-tenant commercial development, which will have a footprint of less than 600 square metres per building. A copy of the construction drawings for the proposed development is provided in the Appendix A.

The site is currently being used as a sale yard for used cars and trucks. The total site area is 1.01 hectares.

2.2 Site Geology

Surficial geology maps (Ontario Geologic Survey, 2010) indicate that the site is underlain by coarse textured glaciomarine deposits consisting of sand, gravel with minor silt and clay. Bedrock geology maps (Armstrong and Dodge, 2007) indicate that bedrock is comprised of interbedded limestone and shale of the Verulam formation. Overburden thickness mapping indicates the drift thickness ranges from 3 and 17 metres (Gao et al. 2006). Available karst mapping (Brunton and Dodge, 2008) does not indicate the presence of any inferred or potential karstic features.

2.3 Background Studies

A number of available background reports were reviewed as part of this investigation, including:

- “Carp Road Corridor, Community Design Plan” prepared by the City of Ottawa and dated June 2004 (Publication No. 3-08). This report is referred to herein as the “CDP Report”.

- "Carp Road Corridor, Groundwater Study" prepared by Dillon Consulting Limited and dated November 30, 2004 (ref: 04-3219). This report will herein be referred to as the "Groundwater Study Report"

Based on the background reports, Schedule 2 of the CDP Report and the Groundwater Study Report prepared by Dillon (2004) indicates the majority of the site is located in a high groundwater recharge area.

2.4 Additional Studies Completed by GEMTEC

The studies completed by GEMTEC for the subject site include:

- "Geotechnical Investigation, New Multi-Tenant Commercial Development, 2822 Carp Road, Carp, Ontario" dated October 28, 2020 (herein referred to as GEMTEC geotechnical investigation).

The relevant subsurface information from the geotechnical investigation is discussed in the terrain analysis section below.

3.0 TERRAIN ANALYSIS

3.1 Subsurface Conditions

The subsurface conditions at the subject site are described in the geotechnical investigation completed by GEMTEC. The field work for the geotechnical investigation was carried out on August 21 and 24, 2020. Seven boreholes numbered 20-1 to 20-7, inclusively, were advanced across the subject site to depths between approximately 3.0 and 5.0 metres below ground surface. The results of the boreholes are provided on the Record of Borehole sheets in Appendix B. The locations of the test holes are shown on the Detailed Site Plan, Figure 2. The overburden thickness map is shown on Figure 3.

One well screen was sealed in the overburden at borehole 20-03 to measure the groundwater level. The groundwater conditions in the other test holes were observed on completion of drilling or excavating.

A summary of the soil conditions, based on the geotechnical investigation, are summarized below.

3.1.1 Topsoil

Topsoil was encountered from ground surface at boreholes 20-2, 20-5, 20-6, and 20-7. The thickness of the topsoil ranged from about 200 to 300 millimetres. The topsoil is composed of dark brown silty sand with organic material.

3.1.2 Fill Material

Fill material, having a thickness of about 1.0 metre, was encountered from ground surface at boreholes 20-3 and 20-4, extending to elevations of 113.6 and 114.0 metres, respectively. The fill material can be described as dark brown sandy silt, some gravel with cobbles and organics.

3.1.3 Sandy Silt

A 0.5 metre thick native deposit of dark grey sandy silt was encountered beneath the granular pavement structure at borehole 20-1, extending from a depth of about 0.4 metres (elevation 114.7 metres) to a depth of about 0.9 metres (elevation 114.2 metres).

3.1.4 Sand

Native deposits of grey brown sand with some silt were encountered at all borehole locations. Where fully penetrated, the thickness of the sand deposits ranges from about 0.8 to 2.7 metres, extending from depths of about 0.2 to 1.0 metres (elevation 113.6 to 114.5 metres) to depths ranging from about 1.7 to 3.1 metres (elevation 111.7 to 113.3 metres). Borehole 20-1 was terminated within the sand deposit at 3.1 metres below surface grade.

The results of two grain size distribution tests carried out on samples of the sand are provided in Appendix B.

3.1.5 Silty Sand

Silty sand deposits were encountered underlying the sand deposits at boreholes 20-3, 20-4, and 20-6, at depths ranging from about 1.7 to 1.8 metres below ground surface (elevation 112.7 to 113.3 metres) and extending to depths ranging from about 2.4 to 2.8 metres below ground surface (elevation 111.8 to 112.5 metres).

The results of a grain size distribution test carried out on a sample of the silty sand are provided in Appendix B.

3.1.6 Interbedded Silty Sand and Silty Clay

A layer of interbedded grey silty sand and grey silty clay was encountered underlying the silty sand and sand deposits at boreholes 20-4 and 20-5, respectively. The layer extends from depths of about 2.5 and 3.1 metres below ground surface (elevations 112.5 and 111.7 metres) to depths of about 3.6 metres below ground surface (elevations 111.4 and 111.2 metres).

3.1.7 Glacial Till

Deposits of glacial till were encountered in boreholes 20-2 to 20-7 at depths ranging from 1.8 to 3.6 metres below ground surface (elevation 111.2 to 113.1 metres). The glacial till is generally composed of grey gravel with varying proportions of silt and sand, and probable cobbles and boulders. Auger refusal occurred within the glacial till at boreholes 20-2 to 20-5. Boreholes 20-6

and 20-7 were terminated within the glacial till. The maximum recorded thickness of the glacial till was about 2.2 metres at borehole 20-3.

Standard penetration tests (SPT) carried out in the glacial till gave N values ranging from 14 blows for 0.3 metres of penetration to 50 blows for 80 millimetres of penetration, which reflects a compact to very dense relative density. The higher N values are likely due to the presence of cobbles and boulders.

3.1.8 Possible Bedrock

Practical auger refusal on possible bedrock occurred at boreholes 20-2 to 20-5 at depths ranging from 3.4 to 5.0 metres below ground surface (elevation 109.6 to 111.6 metres). It should be noted that practical auger refusal can sometimes occur within cobbles and boulders and may not necessarily be representative of the upper surface of the bedrock.

3.2 Groundwater Level

The groundwater level in the well screen at borehole 20-03 was measured to be 1.4 metres below ground surface (elevation 113.3 metres), on September 15, 2020. Based on the Carp Road Corridor Groundwater Study (Dillon, 2004), the general shallow groundwater flow direction along the Carp Road corridor is north to northeast, towards the Carp River.

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

4.0 GROUNDWATER SUPPLY INVESTIGATION

4.1 Background Water Well Records

A search of the Ministry of Environment, Conservation and Parks (MECP) water well records (https://www.ontario.ca/environment-and-energy/map-well-records) returned 69 water well records within 500 metres of the subject site. The results of the well record search are provided in Appendix C. The well depths, excluding monitoring or test holes, range from 7.9 to 97.5 metres below ground surface, with an average well depth of approximately 38 metres.

A review of the well construction details indicates that the majority of wells are completed into the limestone bedrock. Several wells are completed with overburden sands and gravels.

4.2 On-Site Test Well Construction

A water supply well (TW20-1) was constructed at 2822 Carp Road on September 29, 2020, by a licensed MECP well contractor (Saunders Well Drilling; License No. 4879). The approximate location of the water well is provided on the Detailed Site Plan, Figure 2. A copy of the MECP Water Well Record and Certificate of Well Compliance is provided in Appendix C, that stipulates that the supply well was constructed in compliance with O.Reg. 903.

The construction details from the MECP Water Well Record are summarized in Table 1:

Table 1: On-Site Water Well Construction Details

Well Construction Details – Well ID A296836 (TW20-1)	
Depth to Bedrock	3.05 metres
Length of Well Casing	13.4 metres
Length of Well Casing Below Ground Surface	12.2 metres
Length of Well Casing Set Into Bedrock	9.1 metres
Depth Water Found	44.3 metres
Total Well Depth	47.2 metres
Overburden Description	Sand (grey sand and gravel)
Bedrock Description	Grey limestone

The water well construction recommendations were provided to Saunders Well Drilling by GEMTEC. Due to the variable overburden thickness in the vicinity of the subject site, mapped ranging from 3 to 17 metres below ground surface, the well casing was extended from the minimum MECP requirements of 6 metres to at least 12.0 metres below ground surface. The extended well casing recommendation is provided to reduce potential impacts from the surface. The well casing has a stick-up greater than one metre and is grouted with bentonite, in compliance with O.Reg. 903. Ground surface will be graded away from the well (Grading and Servicing Plan in Appendix A), as reflected in the site plan. Snow storage and the septic bed will be located onsite downgradient of the supply well to avoid potential contamination. Stormwater runoff will be directed through a vegetated drainage channel to reduce total suspended solids. The well will be located in a landscaped area, and it is recommended that the well head be protected from vehicular impacts. These design provisions, as well as the 3-metre thick overburden layer at the site, should reduce the potential risk of groundwater contamination in the future.

4.3 Groundwater Quantity

A pumping test was carried out on the water well by a GEMTEC technologist on September 29, 2020. The well was pumped at a constant rate of 38.7 litres per minute for a period of eight hours. The pumping rate of 38.7 litres per minute is expected to exceed the anticipated water demand

for the proposed development, conservatively estimated to be 50% greater than the proposed septic flows of 7,200 litres per day (water demand of 10,800 litres per day). 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). The pumping test drawdown and recovery graph is provided in Appendix D.

During the pumping test the water level decreased approximately 9.5 metres from a static water level of 1.1 metres below ground surface, following approximately 60 minutes of pumping. After 60 minutes, the water level gradually decreased an additional 1.4 metres throughout the remaining 7.05 hours of pumping. Frequent flow rate measurements confirmed that the pumping was maintained at a constant rate of 38.7 litres per minute. The pumping test withdrew approximately 18,770 litres, which is greater than the expected water demand of 10,800 litres per day (50% greater than the proposed septic flows of 7,200 litres per day). Following cessation of pumping, the well recovered 99% within five hours.

The transmissivity of the water supply aquifer was estimated from the pumping test drawdown data using Aqtesolv (Version 4.5), a commercially available software program from HydroSOLVE Inc. An analysis of the pumping test and recovery data was carried out using the Cooper-Jacob and Theis recovery method of analyses. The results of the Aqtesolv analyses are provided in Appendix D.

The Cooper-Jacob and Theis recovery analyses indicate that the transmissivity of the water supply aquifer is calculated to be 1.6 m^2/day. The maximum drawdown in the water level of the well was approximately 9.9 metres following 8 hours of pumping at a flow rate of 38.7 litres per minute. Based on a static water level of 1.1 metres below ground surface, the recommended pump intake depth of 44.2 metres and the water level after 8 hours of pumping, the remaining available drawdown in the well is approximately 34.3 metres.

4.4 Groundwater Quality

Water samples were collected by a GEMTEC technologist after four and eight hours of pumping and were submitted to AGAT Laboratories, located in Ottawa 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, ‘heavy metals’ were analyzed in the eight-hour sample. Due to total coliform exceedances, additional water quality sampling was completed on October 22, 2020 following well chlorination on October 20, 2020. Copies of the laboratory certificates of analysis for the water samples are provided in Appendix E.

Field measurements were taken at regular intervals throughout the pumping test and are summarized in Appendix E.

The results of the laboratory analysis on the water samples are also summarized in Appendix D, along with the applicable standards, guidelines and objectives provided in the Ontario Drinking Water Quality Standards (ODWQS).

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

4.4.1 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 (TW20-1), the 4-hour and 8-hour samples reported total coliform concentrations of 12 and 16 CFU/100mL, respectively, which exceeds the Ontario Drinking Water Quality Standards (ODWQS).

Due to the total coliform exceedances, the water supply well was chlorinated on October 20, 2020 and additional well development was completed on October 22, 2020 at a rate of approximately 38 litres per minute for eight hours. At the time of water quality sampling, the field measured chlorine concentration was non-detectable, and two water quality samples were collected, 15 minutes apart. The reported total coliform concentrations were 1 and 0 CFU/100mL and E. coli and fecal coliform concentrations were reported to be non-detectable.

Although the total coliform concentrations exceed the ODWQS maximum acceptable concentration of 0 CFU/100mL, the total coliform concentrations detected meet the MECP Procedure D-5-5 limit of less than 6 counts per 100 mL for Total Coliform bacteria, with non-detectable e.coli and fecal coliform concentrations.

Based on the bacteriological testing, the water is suitable for consumption.

4.4.2 Chemical Results

The results of the chemical testing on the water samples indicate the operational guideline for hardness and the aesthetic objectives for colour, organic nitrogen, and sulphide were exceeded in the water samples.

The above noted exceedances are discussed in the follow sections:

4.4.2.1 Hardness

The hardness of the water samples was reported to be 216 and 206 mg/L as $CaCO_3$, which exceeds the ODWQS operational guideline for hardness. Water having a hardness above 100

milligrams per litre as $CaCO_3$ is often softened for domestic use. Water softeners are widely used throughout rural areas to treat hardness and there is no upper treatable limit for hardness. The ODQWS indicates that hardness levels exceeding 200 mg/L as $CaCO_3$ is considered poor but tolerable and hardness levels exceeding 500 mg/L as $CaCO_3$ 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.

4.4.2.2 Colour

The colour level was reported to be 12 TCU during the pumping test on September 29, 2020 and 16 TCU during resampling on October 22, 2020, which exceeds the aesthetic objective of 5 TCU listed by the ODWQS. Elevated levels of colour can be associated with certain metals and organic substances in the water. The colour level is not within the maximum concentration considered reasonably treatable (7 TCU) provided in Table 3 of the MECP Guideline D-5-5.

However, it should be noted that colour may be affected by various factors to which the water sample would have been subjected from the time of sampling to the time of analysis. As such, field measurements of colour are considered to be more representative of the water being sampled. During the pumping test, the unfiltered colour (Actual Colour Unit; ACU) was measured to be 13 and 0 ACU in the 3-hour and 6-hour samples respectively, and the filtered colour (True Colour Unit; TCU) was measured to be 15 TCU and 0 TCU in the 3-hour and 6-hour samples respectively. Upon resampling on October 22, 2020, the field measured colour was 43 ACU and 0 TCU.

Colour exceeding the aesthetic objective may be caused by organics, dissolved organic carbon, iron, manganese and/or sulphide. Colour is not generally considered a health issue and the aesthetic objective is set by appearance. The source of the elevated colour is unknown and may be reduced through the use of carbon filter treatment systems (organic related colour), manganese greensand filters (iron or manganese related colour) and/or aeration/oxidation (sulphide related colour).

4.4.2.3 Organic Nitrogen

The organic nitrogen concentration was calculated to be 0.22 and 0.19 mg/L [TKN – ammonia] during the pumping test which slightly exceeds the ODWQS operational guideline of 0.15 mg/L.

The ODWQS indicates that high levels of organic nitrogen may be caused by septic tank or sewage effluent contamination and organic nitrogen concentrations greater than 0.15 mg/L are typically associated with Dissolved Organic Carbon (DOC) contribution of 0.6 mg/L. DOC concentrations in the onsite well were 3.7 mg/L. At the concentrations calculated in TW20-1, the organic nitrogen is unlikely associated with septic tank or sewage effluent contamination, given the non-detectable nitrate concentrations (<0.05 mg/L), low levels total coliform and non-detectable fecal coliform and e. Coli concentrations.

The source of the organic nitrogen is presently not known but given the absence of other elevated septic indicators, septic effluent does not appear to be an issue. Elevated DOC can be related to naturally occurring sources.

Organic nitrogen can react with chlorine and severely reduce its disinfectant power; in addition, taste and odour problems are common.

4.4.2.4 Sulphide

Sulphide concentrations were reported as 0.13 and 0.14 mg/L (as S_2), which exceeds the ODWQS aesthetic objective for sulphide concentrations of 0.05 mg/L. Sulfide and hydrogen sulphide concentrations are associated with taste and odour issues in drinking water (odour noted in field measurements; Appendix E). The taste and odour thresholds for hydrogen sulphide and sulphide are between 0.05 to 0.2 mg/L (as H_2S) (Health Canada, 1992). In addition to the aesthetic issues, hydrogen sulphide may also be associated with promoting corrosion and association with soluble iron, the later having the potential to stain laundry and cause black deposits throughout the distribution system. Large quantities of sulphide ingestion may cause harmful effects in humans, but this level of exposure is unlikely due to the unpleasant aesthetic properties imparted on the water at high concentrations (Health Canada, 1992). Sulphide may be converted to sulphate via oxidation/aeration treatments, reducing the aesthetic and health related concerns (Health Canada, 1992).

5.0 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, or highly permeable soils were not encountered at the subject site. The overburden thickness ranges from 3.05 to 5.0 metres across the site (Figure 3). Karst mapping (Brunton and Dodge, 2008) does not indicate the presence of any inferred or potential karstic features.

5.2 Groundwater Impacts

5.2.1 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 1.01 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 1.01 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 0.378 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 F);
    - Ottawa International Airport (1939-2013), 75 mm WHC - surplus of 0.378 metres/yr.
- Post-Development hard surface area of approximately 38%;
- Negligible background nitrate concentration in the receiving aquifer; 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 4,549 litres per day. The calculations and assumptions of this are provided in Appendix F.

Based on information provided to us, the average DDSSF to support the proposed development is 3,960 litres per day. The DDSSF of 3,960 litres per day is accommodated by the maximum allowable flow of 4,549 litres per day based on the D-5-4 nitrate impact assessment and an advanced treatment septic system. The proposed septic bed is a Level 4 Tertiary Treatment system conforming to the OBC requirements

5.2.2 Septic Impacts to Neighbouring Properties

The proposed on-site septic system is located in the northeast portion of the subject site, adjacent to agricultural lands (Figure 1). The subject site is not considered to be hydrogeologically sensitive and based on the nitrate impact assessment, a septic system with a maximum allowable flow of 2,926 litres per day is not anticipated to result in negative impacts at the property boundary. Therefore, nitrate impacts to neighbouring water well users are not anticipated.

5.3 Background Nitrate Conditions

To further evaluate the potential risk of septic effluent on the water supply aquifer, the background water quality in the receiving overburden aquifer was assessed. Water samples were collected on November 9, 2020, from BH20-3 reported a nitrate concentration of 0.34 mg/L. To note, the pumping test completed for TW20-1 reported nitrate concentration of <0.05 mg/L in the bedrock aquifer. Based on the thin overburden aquifer encountered at the subject site, ranging from 3.05 to 5.0 metres below ground surface, the upper bedrock water supply aquifer may also be the receiving aquifer. The nitrate concentrations in the overburden and bedrock aquifer range from <0.05 to 0.34 mg/L and are considered negligible.

6.0 WATER BALANCE

The subject site is located within an area of high groundwater recharge area based on available Carp Road Corridor studies (City of Ottawa, 2004 and Dillon, 2004). Pre and post-development water budgets were calculated for the subject site in order to assess the groundwater impact of the proposed development.

6.1 Water Balance Method

The water balance of the site was assessed, based on the following equation:

Mean Annual Precipitation – Change in Groundwater Storage – Evapotranspiration = Runoff + Infiltration

where:

- Mean annual precipitation is based on data provided by Environment Canada, from the Ottawa Int A weather station for the period of 1939-2013 and Carlton Place – Appleton weather stations for the period of 1984-2006. The Ottawa Intl A and Carleton-Place – Appleton weather station are located approximately 26 and 38 kilometres from the subject site respectively.

- Long term changes to groundwater storage are assumed to be negligible. Short term or seasonal changes are anticipated to balance out (e.g., increased groundwater recharge following spring freshet, followed by dry conditions in the summer months).

- Evapotranspiration is calculated based on the Thornthwaite and Mather (1955) model, run by Environment Canada. The technical documentation provided by Environment Canada is titled “Water Balance Tabulations for Canadian Climate Stations”, written by K.Johnstone and P.Y.T. Louie, Hydrometeorology Division, Canadian Climate Centre, Atmospheric Environmental Services (undated).

The hydrologic factors used to estimate infiltration, such as topography, soil, cover and water holding capacities are based on the Ministry of Environment (MOE) Stormwater Management Planning and Design Manual Section 3.0 (MOE, 2003) and the Ministry of the Environment and Energy (MOEE) Hydrogeological Technical Information Requirements for Land Development Applications (MOEE, 1995).

6.2 Pre-Development

The subject site is currently occupied by a used car dealership, with a small building and asphalt parking lot. The soil conditions across the site consist of fill material and native fine sands. The site is vegetated with grasses and shrubs. The subject site is generally flat, with a sloping gently to the northeast. Based on the site characteristics, the infiltration factor is estimated to be 0.70, based on the following:

- Topography factor of 0.2 – rolling land with an average slope between 2.8 m to 3.8 m/km;
    - The site is generally flat, sloping to the northwest.
- Soil factor of 0.4 – open sandy loam; and,
    - On-site soils characterized as fine sand.
- Cover factor of 0.1 – Cultivated land.
    - The site consists of fill material and short grasses.

An estimated water holding capacity of 150 mm was selected from Table 3.1 of the MOE Stormwater Management Planning and Design Manual (MOE, 2003). The site vegetation is classified as pasture and shrubs underlain by fine sandy loam. The infiltration for the existing building and asphalt parking area cover approximately 14% of the total site area and are considered impervious, with an infiltration factor of 0.

6.3 Post-Development

The post-development conditions at the subject site will consist of one multi-use commercial building, gravel parking areas, a stormwater management pond, and a septic bed. The remaining vegetated areas are anticipated to be landscaped (refer to construction drawings, Appendix A). Based on the anticipated post-development site characteristics, there are no changes to the estimated infiltration factor for vegetated areas, which remains to be 0.70. The areas covered by the proposed building, gravel parking, and stormwater management pond (38% coverage) are considered as impervious and were assigned an infiltration factor of 0. It is anticipated that landscaping of the site may alter the water holding capacity. The post-development water holding capacity is expected to be 75 mm, selected from Table 3.1 of the MOE Stormwater Management Planning and Design Manual (MOE, 2003). The post-development site vegetation will be classified as urban lawns, underlain by fine sandy loam.

6.4 Water Balance Summary

Based on the water balance calculations, the annual infiltration volumes will decrease from 2,302 m^3 to 1,667 m^3 and the runoff will increase from 2,011 m^3 to 3,470 m^3 post-development. The hydrologic factors and the water balance calculations are provided in Appendix G. The pre- and post-development infiltration and runoff factors are summarized in Table 2. The water balance reflects a need to infiltrate runoff generated from the increase in impervious surface area, which may be achieved through low impact developments and stormwater management structures.

Table 2: Water Balance Summary

	Infiltration (mm/year)[1]	Runoff (mm/year)	Infiltration (m^3/year)	Runoff (m^3/year)
Pre-Development	227	199	2,302	2,011
Post-Development[1]	165	343	1,667	3,470
Change	-63	144	-635	1,459

Notes: 1. Weighted averages based on area (refer to Appendix F).

7.0 CONCLUSIONS AND RECOMMENDATIONS

7.1 Conclusions

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

- The surficial soils encountered at the subject site consist of fine sand and fill material underlain by silty sand and glacial till, ranging in thickness from 3.05 to 5.0 metres below ground surface.

- The test well is capable of providing at least 18,770 litres per day, which is greater than the anticipated maximum water demand of 10,800 litres (equivalent to 1.5 times the proposed septic flows). The maximum drawdown in the water level of the well was approximately 10.9 metres following 8 hours of pumping at a flow rate of 38.7 litres per minute. Based on a static water level of 1.1 metres below ground surface, the proposed pump intake depth of 44.2 metres and the water level after 8 hours of pumping, the remaining available drawdown in the well is approximately 34.3 metres.

- The groundwater quality exceeds the ODWQS for the operational guideline for hardness and the aesthetic objectives for colour, organic nitrogen, and sulphide. It is noted that colour also exceeds the maximum concentration considered to be reasonably treatable.

- The site is not considered to be hydrogeologically sensitive as thin soils, highly permeable soils or karst geology were not encountered. The on-site test well (TW20-1) casing extends 12.2 metres below ground surface as an extra protective measure. Given the relatively think overburden soils, neighbouring dug wells are not expected. Based on MECP water well records and aerial photos, neighbouring bedrock water supply wells are likely more than 15 metres away from the storm water management pond.

- Nearby borehole logs and design drawings for the stormwater management pond suggest that there will be greater than 2 metres of overburden separating the pond from the bedrock aquifer; however, this should be confirmed during installation. Water entering/exiting the storm water management pond must be of adequate quality to not impact the downgradient groundwater system (see Section 7.2.3 for recommendations).

- An oil-grit separator will be installed to treat outflows from the multi-tenant property.

- Background nitrates are considered to be negligible, measured to be 0.34 mg/L in the receiving overburden aquifer and <0.05 mg/L in the water supply aquifer.

- The maximum allowable septic flow, as per MECP Procedure D-5-4 commercial predicative assessment, is calculated to be 4,549 litres per day, assuming the use of an advanced treatment septic system capable of reducing nitrates by 50%. The maximum allowable septic flows as per MECP Procedure D-5-4 is greater than the anticipated average DDSSF of 3,960 litres per day.

    - 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.

- Based on the water budget calculations, the annual infiltration volumes will decrease from 2,302 m^3 to 1,667 m^3 and the runoff will increase from 2,011 m^3 to 3,470 m^3 post-development. The subject site is located within a high groundwater recharge zone based on Carp Road Corridor studies (City of Ottawa, 2004 and Dillon, 2004) and post-development infiltration should be maintained in order to maintain recharge to the bedrock aquifer.

    - Low impact development (LID) and stormwater management measures will be required in order to maintain pre-development infiltration rates.

7.2 Recommendations

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

7.2.1 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”.

- The use of earth energy systems shall not be permitted.
- Groundwater quality treatment may be utilized to treat the following ODWQS exceedances:
  - Hardness – Hardness levels in TW20-1 exceed the ODWQS operational guideline and can be treated using water softening by conventional sodium ion exchange. Water softening by conventional sodium ion exchange 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 the water at background levels. Consideration could also be given to providing a bypass of the water softener for drinking water purposes.
  - Colour – Colour exceeded the ODWQS aesthetic objective concentration of 5 TCU and the maximum concentration considered to be reasonably treatable of 7 TCU. The source of the elevated colour is unknown and may be treated using carbon filter treatment systems (organic related colour), manganese greensand filters (iron and manganese related colour) and/or aeration/oxidation (sulphide related colour).
  - Organic Nitrogen – Organic nitrogen can react with chlorine and severely reduce its disinfectant power; in addition, taste and odour problems are common. Ongoing chlorination is not recommended as it may result in chlorination by-products, namely trihalomethanes.
  - Hydrogen sulphide / sulphide – Sulphide concentrations exceeded the ODWQS aesthetic objective for sulphide concentrations. Sulfide and hydrogen sulphide concentrations are associated with taste and odour issues in drinking water. Treatment options typically include oxidation processes to convert sulphide to sulphate.

7.2.2 Septic System Recommendations

- Based on the current lot development plan (construction drawings provided in Appendix A) and a DDSSF of 3,960 litres per day, the proposed development should be serviced by advanced treatment septic sewage disposal system that can achieve a minimum of 50% reduction in nitrogen (to 10 mg/L), approved under the Ontario Building Code, prior to the effluent being disposed to a Class IV leaching bed (Type A or Type B). The advanced treatment septic system is recommended to be BNQ or NSF certified. A site-specific investigation should be conducted on each lot for the design of the septic system;

- It is required that the property owners enter a maintenance agreement with authorized agents of the advanced treatment septic system manufacturer for the service life of the system;

- The maximum daily design sewage flows based on the MECP Procedure D-5-4 nitrate impact assessment is calculated to be 4,549 litres per day assuming the use of advanced septic sewage disposal system that achieve a minimum of 50% reduction in nitrogen (details provided in the construction drawings of Appendix A);
- It is recommended that the property owners construct, maintain and check their onsite septic system in accordance with the Ontario Building Code.

7.2.3 Groundwater Impact Mitigation Recommendations

- Low Impact Development (LID) and stormwater management measures are recommended to maintain pre-development infiltration rates of 227 mm/year. The post-development infiltration rates are calculated to be 165 mm/year.

- The post-development water balance indicates significant increase in runoff, which may be diverted to the grass swales and the stormwater retention pond. The stormwater management report indicates that the grass swales and retention pond will remove 80% TSS. It should be confirmed that greater than 2 metres of overburden separate the base of the storm water management pond from the bedrock aquifer. Further, it is recommended that an Environmental Compliance Approval be obtained for the on-site stormwater management.

- The post-development water balance indicates an increase in runoff, which will be diverted to the grass swales and the stormwater retention pond (refer to Grading and Servicing Plan, Appendix A). Potential impacts from contaminant sources include winter maintenance (road salting), snow storage, and fuel spills from commercial tenants. A single oil-grit separator will be installed for the entire multi-tenant building. It is recommended that BMP for road salting and fuel storage/spills be followed. It is recommended that:

    - the best management practices for the application of road salts should follow the City of Ottawa's "Material Application Policy, Revision 3.2, October 31, 2011" Salt Management Plan.
    - the best management practices for fuel storage follow the Liquid Fuels Handling Code and the Ontario Water Resources Act.
    - best management practices 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.

- only clean stormwater should be infiltrated through the grass swales or SWMP, which can be achieved through adherence with BMPs and effective and properly maintained treatment systems (in this case swales, an oil-grit separator, a septic bed, and a storm water management pond).

8.0 LIMITATIONS OF REPORT

This report was prepared for 2513287 Ontario Inc. and is intended for the exclusive use of 2513287 Ontario Inc. This report may not be relied upon by any other person or entity without the express written consent of GEMTEC and 2513287 Ontario Inc. 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.

9.0 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

Jean-Philippe Gobeil, M.Sc., P.Geo.
Hydrogeologist

JKA / AP / JPG

10.0 REFERENCES

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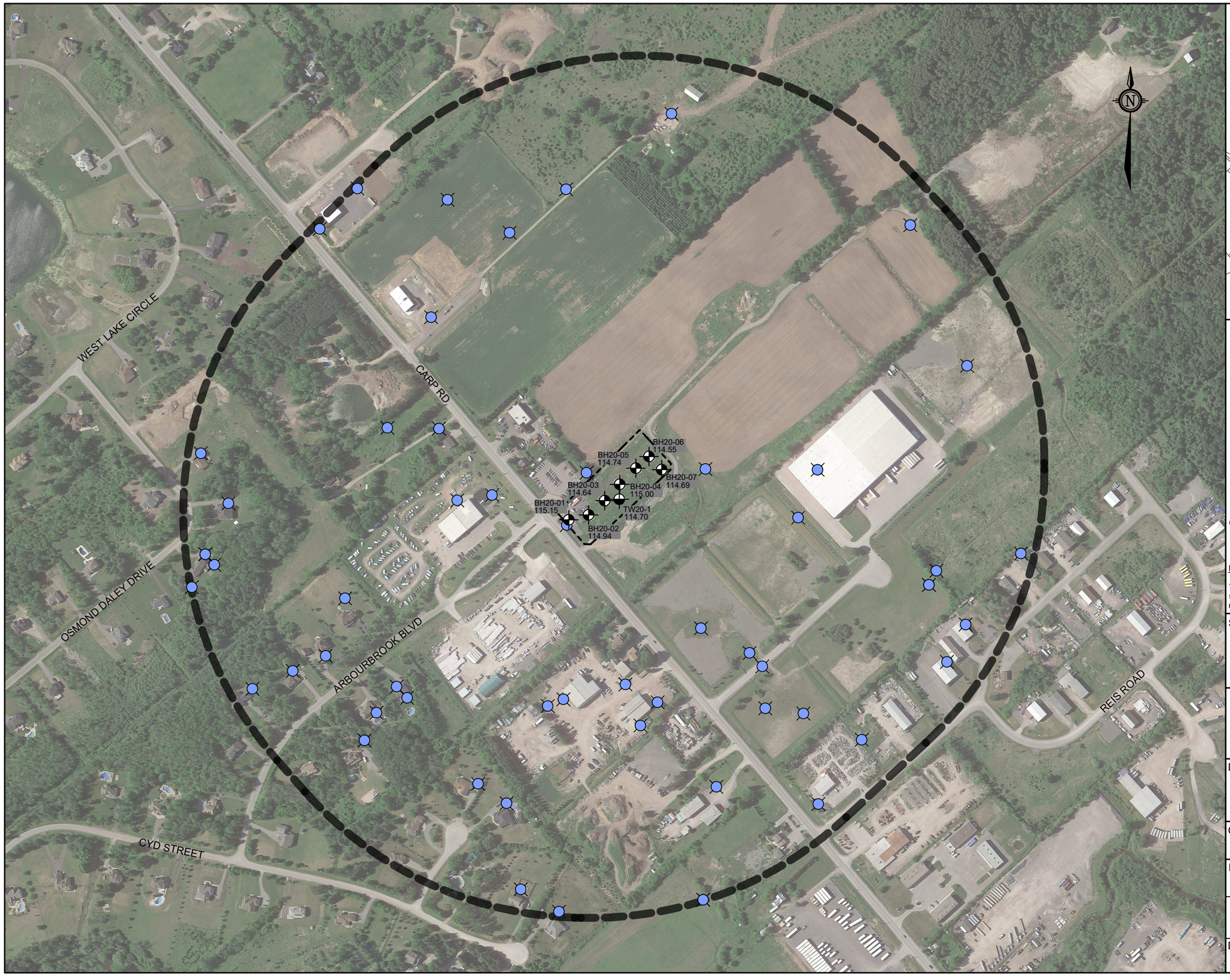

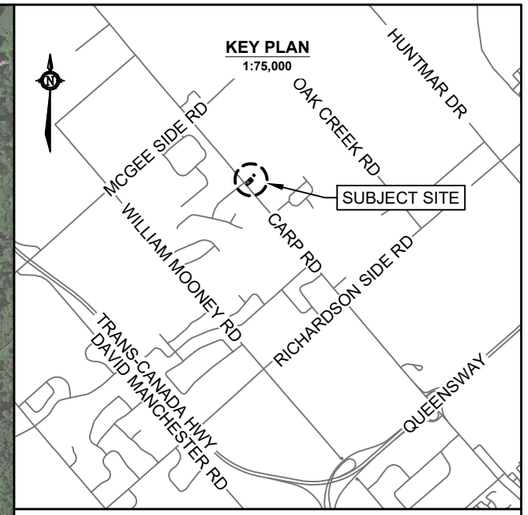

LEGEND

- **BOREHOLE LOCATION** (current investigation by GEMTEC)
- **TEST WELL LOCATION** (current investigation by GEMTEC)
- **BH/ TW #** — BOREHOLE/ TEST WELL ID
- **XX.XX** — GROUND SURFACE ELEVATION, IN METRES GEODETIC DATUM
- MECP WELL LOCATION
- SUBJECT SITE
- STUDY AREA 500m AROUND SUBJECT SITE

Note:

This drawing is conceptual and is intended for illustration purposes only. All structures shown on this plan have been drawn to scale and meet the minimum separation distances required.

Scale 1:5000

0 100 200 300m

GEMTEC
Consulting Engineers and Scientists
32 Steacie Drive
Ottawa, ON K2K 2A9
Tel: (613) 836-1422
www.gemtec.ca
ottawa@gemtec.ca

Drawing: SITE PLAN

Client: 2513287 ONTARIO INC.

Project		HYDROGEOLOGICAL INVESTIGATION 2822 CARP ROAD CARP, ONTARIO
65057.01		
Drwn by: S.L.	Chkd by: A.P.	
Date: AUGUST, 2022	Rev.: 1	**FIGURE 1**

LEGEND

BOREHOLE LOCATION
(current investigation by GEMTEC)

TEST WELL LOCATION
(current investigation by GEMTEC)

BH/ TW # — BOREHOLE/ TEST WELL ID

XX.XX — GROUND SURFACE ELEVATION, IN METRES GEODETIC DATUM

SUBJECT SITE

EXISTING INFRASTRUCTURE

PROPOSED INFRASTRUCTURE

Note:

This drawing is conceptual and is intended for illustration purposes only. All structures shown on this plan have been drawn to scale and meet the minimum separation distances required.

Scale 1:750

0 15 30 45m

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Drawing: DETAILED SITE PLAN

Client: 2513287 ONTARIO INC.

Project: 65057.01

HYDROGEOLOGICAL INVESTIGATION
2822 CARP ROAD
CARP, ONTARIO

Drwn by: S.L.

Chkd by: A.P.

Date: AUGUST, 2022

Rev.: 1

FIGURE 2

LEGEND

BOREHOLE LOCATION
(current investigation by GEMTEC)

TEST WELL LOCATION
(current investigation by GEMTEC)

BH/ TW # — BOREHOLE/ TEST WELL ID
XX.XX — GROUND SURFACE ELEVATION, IN METRES GEODETIC DATUM
XX.XX — OBVERBURDEN THICKNESS

SUBJECT SITE

EXISTING INFRASTRUCTURE

Note:

This drawing is conceptual and is intended for illustration purposes only. All structures shown on this plan have been drawn to scale and meet the minimum separation distances required.

Scale 1:750

0 15 30 45m

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ottawa@gemtec.ca

Drawing: OVERBURDEN THICKNESS MAP

Client: 2513287 ONTARIO INC.

Project: 65057.01

HYDROGEOLOGICAL INVESTIGATION
2822 CARP ROAD
CARP, ONTARIO

Drwn by: S.L.
Chkd by: A.P.

Date: AUGUST, 2022
Rev.: 1

FIGURE 3

LEGEND

BOREHOLE LOCATION
(current investigation by GEMTEC)

TEST WELL LOCATION
(current investigation by GEMTEC)

BH/ TW # — BOREHOLE/ TEST WELL ID

XX.XX — GROUND SURFACE ELEVATION, IN METRES GEODETIC DATUM

SUBJECT SITE

EXISTING INFRASTRUCTURE

Note:

This drawing is conceptual and is intended for illustration purposes only. All structures shown on this plan have been drawn to scale and meet the minimum separation distances required.

Scale 1:750

0 15 30 45m

GEMTEC
Consulting Engineers and Scientists
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Ottawa, ON K2K 2A9
Tel: (613) 836-1422
www.gemtec.ca
ottawa@gemtec.ca

Drawing: PRE-DEVELOPMENT CONDITIONS

Client: 2513287 ONTARIO INC.

Project: 65057.01

HYDROGEOLOGICAL INVESTIGATION
2822 CARP ROAD
CARP, ONTARIO

Drwn by: S.L.

Chkd by: A.P.

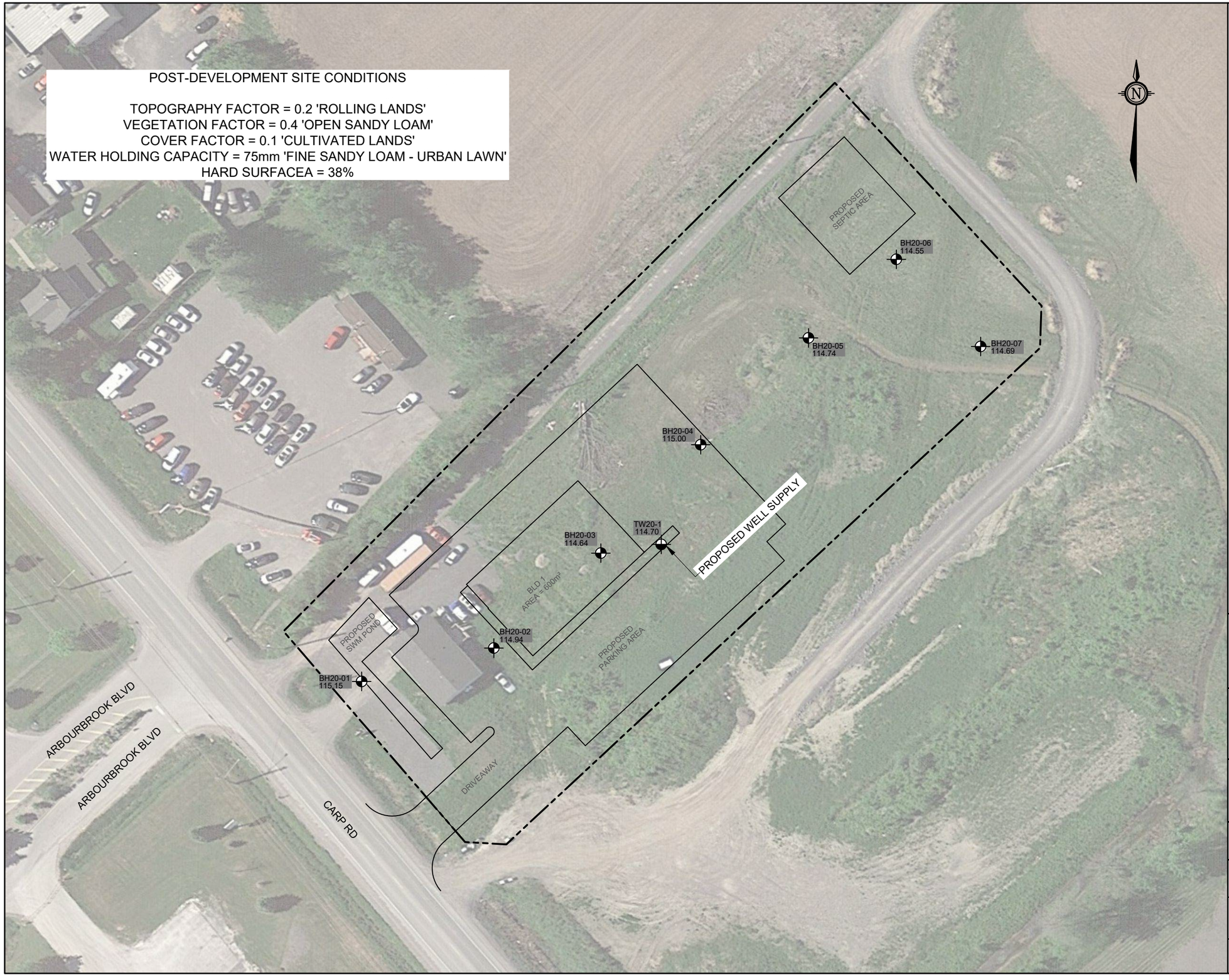
Date: AUGUST, 2022

Rev.: 1

FIGURE 4

POST-DEVELOPMENT SITE CONDITIONS

TOPOGRAPHY FACTOR = 0.2 'ROLLING LANDS'
VEGETATION FACTOR = 0.4 'OPEN SANDY LOAM'
COVER FACTOR = 0.1 'CULTIVATED LANDS'
WATER HOLDING CAPACITY = 75mm 'FINE SANDY LOAM - URBAN LAWN'
HARD SURFACEA = 38%



LEGEND

BOREHOLE LOCATION
(current investigation by GEMTEC)

TEST WELL LOCATION
(current investigation by GEMTEC)

BH/ TW # — BOREHOLE/ TEST WELL ID
XX.XX — GROUND SURFACE ELEVATION, IN METRES GEODETIC DATUM

SUBJECT SITE

PROPOSED INFRASTRUCTURE

PROPERTY AREA = 10120.59m²

HARD SURFACE AREA = 3821.53m², 38% OF PROPERTY AREA

VEGETATED AREA = 6,299.06m², 62% OF PROPERTY AREA

Note:

This drawing is conceptual and is intended for illustration purposes only. All structures shown on this plan have been drawn to scale and meet the minimum separation distances required.

Scale 1:750

0 15 30 45m

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Drawing: POST-DEVELOPMENT CONDITIONS

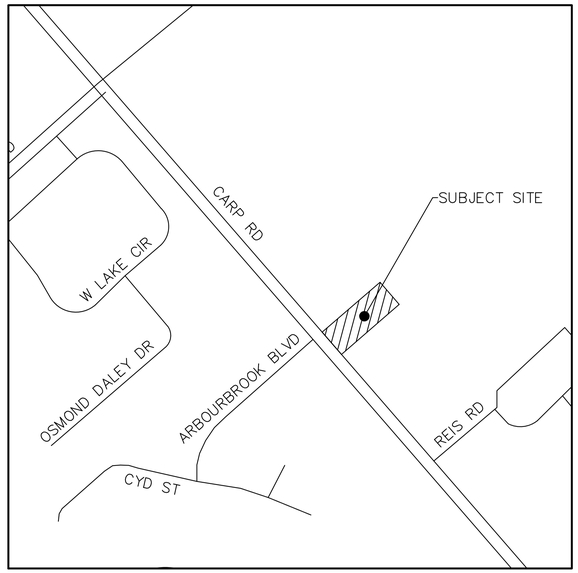
Client: 2513287 ONTARIO INC.

Project		HYDROGEOLOGICAL INVESTIGATION 2822 CARP ROAD CARP, ONTARIO
65057.01		
Drwn by: S.L.	Chkd by: A.P.	
Date: AUGUST, 2022	Rev.: 1	**FIGURE 5**

APPENDIX A

Construction Drawings

Multi-Tenant Commercial Development
2822 Carp Rd, Carp
City of Ottawa



Drawing List

CITY OF OTTAWA
110 LAURIER AVE W
OTTAWA, ONTARIO
K1P 1J1

ARGUE CONSTRUCTION LTD.
2900 CARP RD
CARP, ONTARIO
K0A 1L0

PEARSON
ENGINEERING LTD.
PEARSONENG.COM PH. 705.719.4785

19124 – 2822 CARP RD – 2 – JUNE 2022

1. DRAWINGS

A. THE NOTES ON THIS SHEET APPLY TO ALL WORKS UNDER THIS CONTRACT UNLESS OTHERWISE NOTED ON THE SPECIFIC DETAIL DWGS.

B. THE STANDARD DRAWINGS OF THE CITY OF OTTAWA, ONTARIO PROVINCIAL STANDARDS AND SPECIFICATIONS, (OPSS) AND THE ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD) CONSTITUTE PART OF THE PLANS OF THIS CONTRACT.

C. THE STANDARD DRAWINGS INCLUDED WITH THESE PLANS ARE PROVIDED FOR CONVENIENCE ONLY AND ARE NOT TO BE CONSTRUED TO BE A COMPLETE SET FOR THE PURPOSE OF THE CONTRACT. IT IS THE CONTRACTOR'S RESPONSIBILITY TO OBTAIN ALL RELEVANT STANDARD DRAWINGS AND SPECIFICATIONS AS REQUIRED FOR THIS CONTRACT.

2. MEASUREMENTS

A. ALL DIMENSIONS ARE IN METRES, EXCEPT PIPE DIAMETERS, WHICH ARE IN MILLIMETRES, UNLESS SPECIFIED OTHERWISE.

B. ALL DIMENSIONS SHALL BE CHECKED AND VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO ANY CONSTRUCTION, AND ANY DISCREPANCIES SHALL BE REPORTED IMMEDIATELY TO THE ENGINEER.

3. GENERAL

A. EXISTING SERVICES AND UTILITIES SHOWN ON THESE CONTRACT DRAWINGS ARE BASED ON THE BEST INFORMATION AVAILABLE AND THEIR LOCATIONS ARE NOT GUARANTEED. THE CONTRACTOR SHALL INTERPRET THIS INFORMATION AS HE WISHES WITH THE UNDERSTANDING THAT THE OWNER DISCLAIMS ALL RESPONSIBILITY FOR ITS ACCURACY AND/OR SUFFICIENCY. THE CONTRACTOR IS REQUIRED TO NOTIFY THE VARIOUS UTILITY COMPANIES 48 HOURS PRIOR TO THE COMMENCEMENT OF ANY WORK.

B. NATIVE MATERIAL, SUITABLE FOR BACKFILL, SHALL BE COMPACTED TO 95% STANDARD PROCTOR MAXIMUM DRY DENSITY.

C. GRANULAR MATERIAL, USED FOR BACKFILL, SHALL BE PLACED IN LAYERS 150mm IN DEPTH MAXIMUM AND COMPACTED TO 100% STANDARD PROCTOR MAXIMUM DRY DENSITY.

D. ALL DISTURBED AREAS ARE TO BE REINSTATED TO THEIR ORIGINAL CONDITION OR BETTER, AS DETERMINED BY THE ENGINEER. ALL GRASS AND VEGETATION COVERED AREAS SHALL BE RESTORED BY PLACING 200mm OF APPROVED TOPSOIL AND NURSERY SOD UNLESS NOTED OTHERWISE.

4. PAVEMENT

A. THE PAVEMENT STRUCTURE SHALL CONSIST OF THE FOLLOWING (REFER TO GEOTECHNICAL INVESTIGATION PREPARES BY GEMTEC FOR PAVEMENT STRUCTURE DETAILS):

LIGHT DUTY PARKING AREAS

- 60mm SUPERPAVE 12.5
- 150mm GRANULAR 'A' BASE
- 300mm GRANULAR 'B' TYPE II SUBBASE

HEAVY DUTY PARKING AREAS

- 40mm SUPERPAVE 12.5
- 60mm SUPERPAVE 19.0
- 150mm GRANULAR 'A' BASE
- 450mm GRANULAR 'B' TYPE II SUBBASE

REFERENCED FROM GEOTECHNICAL REPORT COMPLETED BY GEMTEC DATED OCTOBER 23, 2020

5. SEPTIC DESIGN NOTES:

DESIGN DAILY SEWAGE FLOW

CATEGORY	QUANTITY	FLOW
WATER CLOSETS	4	3800 L/DAY
FUEL OUTLET	0	0 L/DAY
VEHICLES SERVED*	8	160 L/DAY
TOTAL FLOW		Q = 3960 L/DAY

*ASSUME 2 CARS/BAY/DAY

SEPTIC SYSTEM

TYPE A DISPERSAL BED AS PER OBC 8.7.7.

SEPTIC TANK

MINIMUM SIZE OF SEPTIC TANK TO BE 21,510 L (O.B.C 8.2.2.3.(1))
RECOMMENDED SIZE OF SEPTIC TANK TO BE 23,00 L

REQ'D TYPE A DISPERSAL BED STONE AREA

A = Q/50 (O.B.C. 8.7.7.1.(6))
A = 3960 / 50
A = 79.2m²

PROVIDED AREA BED STONE AREA

A = 5.0m x 16.0m
A = 80.0m²

REQ'D SAND AREA OF TYPE A DISPERSAL BED

A = QT/400 (O.B.C. 8.7.7.1.(5))
A = 3960 x 20 / 400
A = 198.0m²

PROVIDED SAND AREA OF TYPE A DISPERSAL BED

A = 378.0m²

* GEO-TECHNICAL ENGINEER TO REVIEW TYPE A DISPERSAL BED AREA SUBGRADE PRIOR TO SEPTIC BED INSTALLATION

PROPOSED SEPTIC BED SHALL HAVE A MINIMUM TOPSOIL COVER OF 150mm AND A MAXIMUM COVER OF 500mm

TERTIARY TREATMENT REQUIRED

DISTRIBUTION PIPE

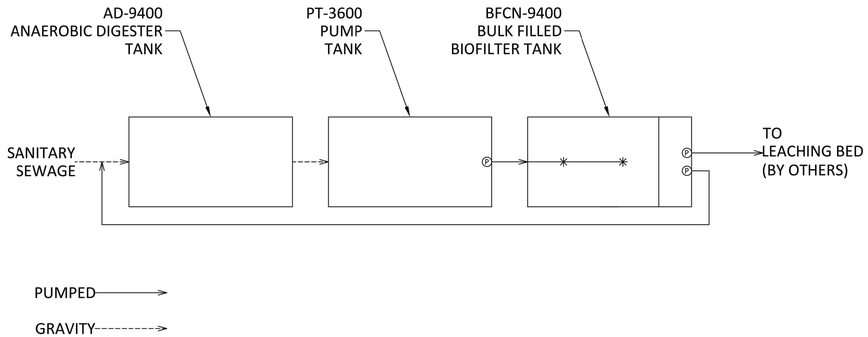
DISTRIBUTION PIPE TO BE INSTALLED WITHIN A LAYER OF STONE AS PER O.B.C. 8.7.3.3.(5). CONTRACTOR TO ENSURE THAT ALL TOPSOIL IS STRIPPED FROM SEPTIC BED AREA. ALL HEAVY EQUIPMENT TO BE KEPT OFF LEACHING BED AREA. BASE OF BED TO BE INSPECTED AND APPROVED BY THE ENGINEER PRIOR TO THE PLACEMENT OF DISTRIBUTION PIPING.

REINSTATEMENT:

ALL TOPSOIL FROM CONSTRUCTION AREAS TO BE STOCKPILED AND THEN REPLACED TO A MINIMUM DEPTH OF 150mm. SOD AND/OR SEED AND MULCH TO BE APPLIED TO ALL DISTURBED AREAS. ALL MATERIALS AND CONSTRUCTION TO BE IN ACCORDANCE WITH LATEST EDITION OF THE ONTARIO BUILDING CODE (PART 8). ALL SURFACE DRAINAGE, FOOTING DRAINS, ROOF LEADERS AND SUMP PUMP DRAINS MUST BE DIRECTED AWAY FROM BED.

PROPOSED SEPTIC BED SHALL HAVE A CLEAN TOPSOIL COVER OF 300 mm. TOPSOIL IS TO HAVE A MINIMUM HYDRAULIC CONDUCTIVITY OF 0.01 m/d.

PRELIMINARY SCHEMATIC ONLY



NOTES:

1. THIS IS A PRELIMINARY SCHEMATIC FOR A WATERLOO BIOFILTER SEWAGE TREATMENT SYSTEM. THIS IS FOR PLANNING PURPOSES ONLY AND IS NOT AN ENGINEERED DESIGN.

2. THE PEAK SEWAGE FLOW FOR THIS FACILITY IS 3,910 L/day. PEAK FLOWS ARE EXPECTED TO OCCUR INFREQUENTLY.

3. THE RAW SEWAGE IS EXPECTED TO HAVE THE FOLLOWING CHARACTERISTICS:

BOD = 190 mg/L
TSS = 210 mg/L
TKN = 50 mg/L
IT IS ALSO ASSUMED THAT THERE IS SUFFICIENT ALKALINITY FOR THOROUGH NITRIFICATION.

4. WASTEWATER FROM THE FACILITY FLOWS BY GRAVITY INTO AN AD-9400 SINGLE COMPARTMENT ANAEROBIC DIGESTER TANK. THE INLET OF THE TANK IS EQUIPPED WITH AN INNERTUBE. THE OUTLET IS EQUIPPED WITH AN EFFLUENT FILTER.

5. THE ANAEROBIC DIGESTER TANK EFFLUENT FLOWS BY GRAVITY INTO A PT-3600 PUMP TANK. THE PUMP TANK IS EQUIPPED WITH A SUBMERSIBLE EFFLUENT PUMP (P) OPERATING ON A TIMER.

6. THE PUMP IN THE PUMP TANK DOSES THE SEWAGE TO THE FIRST COMPARTMENT OF A DOUBLE COMPARTMENT BFCN-9400 BULK-FILLED BIOFILTER TANK. THE FIRST COMPARTMENT IS FILLED WITH BIOFILTER MEDIUM. THE SEWAGE IS EVENLY DISTRIBUTED OVER THE SURFACE OF THE MEDIUM AND TREATED AS IT TRICKLES THROUGH THE INTERIOR OF THE MEDIUM. A LOW VOLTAGE AIR FAN AND PASSIVE VENTING PROMOTES AEROBIC CONDITIONS. THE TANK IS EQUIPPED WITH A SUBMERSIBLE EFFLUENT PUMP (P) OPERATING ON A TIMER AND A SUBMERSIBLE EFFLUENT PUMP (P) OPERATING ON DEMAND.

7. THE TIMER PUMP IN THE BULK-FILLED BIOFILTER TANK RECIRCULATES A PORTION OF THE EFFLUENT TO THE INLET OF THE ANAEROBIC DIGESTER TANK.

8. THE DEMAND PUMP IN THE BULK-FILLED BIOFILTER TANK IS PUMPED TO A LEACHING BED (BY OTHERS).

9. ALL PUMPS ARE RUN BY A WATERLOO SMART PANEL. THE WATERLOO SMART PANEL PROVIDES REMOTE MONITORING, CONTROL, AND DATA LOGGING OVER A STABLE WIRELESS CELLULAR NETWORK. THIS FUNCTIONALITY ALLOWS FOR REAL TIME OPERATIONAL ADJUSTMENTS TO OPTIMIZE SYSTEM PERFORMANCE. THE WATERLOO SMART PANEL ALSO IMMEDIATELY NOTIFIES THE SERVICE PROVIDER OF A PUMP FAILURE OR HIGH LEVEL ALARM, PROVIDING THEM WITH VITAL INFORMATION TO LIMIT SITE VISITS WHILE KEEPING THE SYSTEM OPERATING PROPERLY.

10.BY ADHERING TO BEST MANAGEMENT PRACTICES (PROVIDING THE APPROPRIATE STRENGTH SEWAGE, PERFORMING ROUTINE MAINTENANCE, LIMITING TOXINS ENTERING THE SYSTEM) THE WATERLOO BIOFILTER TREATMENT SYSTEM OUTLINED IN THIS SCHEMATIC IS DESIGNED FOR THE FOLLOWING EFFLUENT OBJECTIVES.

cBOD = 10 mg/L
TSS = 10 mg/L
TOTAL NITROGEN ≥ 50% REMOVAL

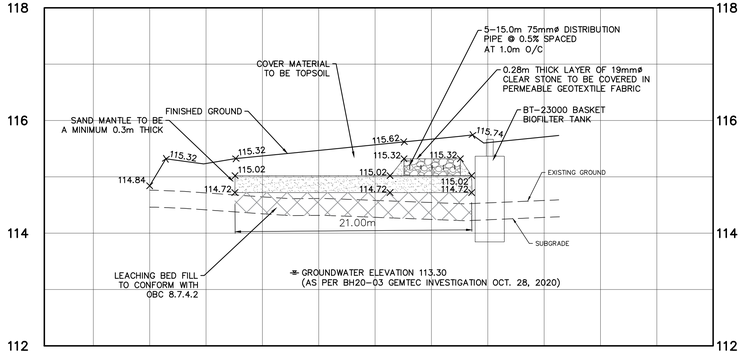
Waterloo BIOFILTER
65 MASSEY ROAD SUITE C, GUELPH ON N1H 7M6
TEL: 519-856-0757 FAX: 519-856-0759
EMAIL: INFO@WATERLOO-BIOFILTER.COM

TITLE: PROCESS SCHEMATIC

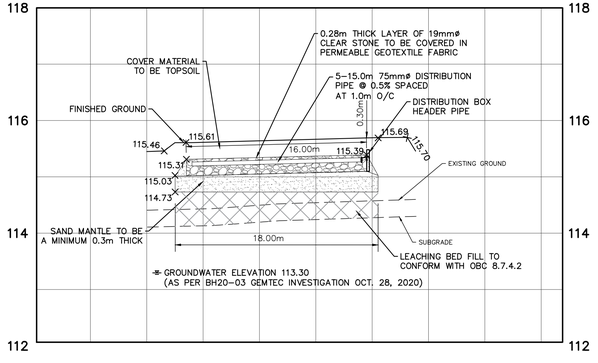
PROJECT: 2822 CARP ROAD - OTTAWA

FOR: PEARSON ENGINEERING

PROJECT NUMBER:	SEWAGE FLOW:	CONFIGURATION:	DATE:
ON-C-2016-0100-B	3,960 L/day	BFCN	JANUARY 7, 2022
DRAWN BY:	PERCOLATION RATE:	DISCHARGE:	1 OF 1
B. STRAW	N/A	LEACHING BED	



SECTION C-C
HORIZONTAL SCALE 1:250
VERTICAL SCALE 1:50



SECTION D-D
HORIZONTAL SCALE 1:250
VERTICAL SCALE 1:50

NO.	REVISION NOTE	DATE	BY
2.	UPDATED GRADING	06/16/22	NW
1.	AS PER 1ST SUBMISSION COMMENTS	01/07/22	NW

BENCHMARK

ELEVATIONS SHOWN ARE GEODETIC AND ARE REFERRED TO BENCHMARK 68U001/CGVD28 GEODETIC DATUM.

BEARINGS ARE GRID, DERIVED FROM THE SOUTHWESTERLY LIMIT OF PART 1 PLAN 4R-30382 SHOWN TO BE N41°38'40"W THERON AND ARE REFERRED TO THE CENTRAL MERIDIAN OF MTM ZONE 9 (76°30' WEST LONGITUDE) NAD-83 (ORIGINAL)

LICENSED PROFESSIONAL ENGINEER
G. M. PEARSON
100091966
06/16/22
PROVINCE OF ONTARIO

MULTI-TENANT COMMERCIAL BLDGS
2822 CARP ROAD
CITY OF OTTAWA

NOTES AND DETAILS

PEARSON ENGINEERING LTD.
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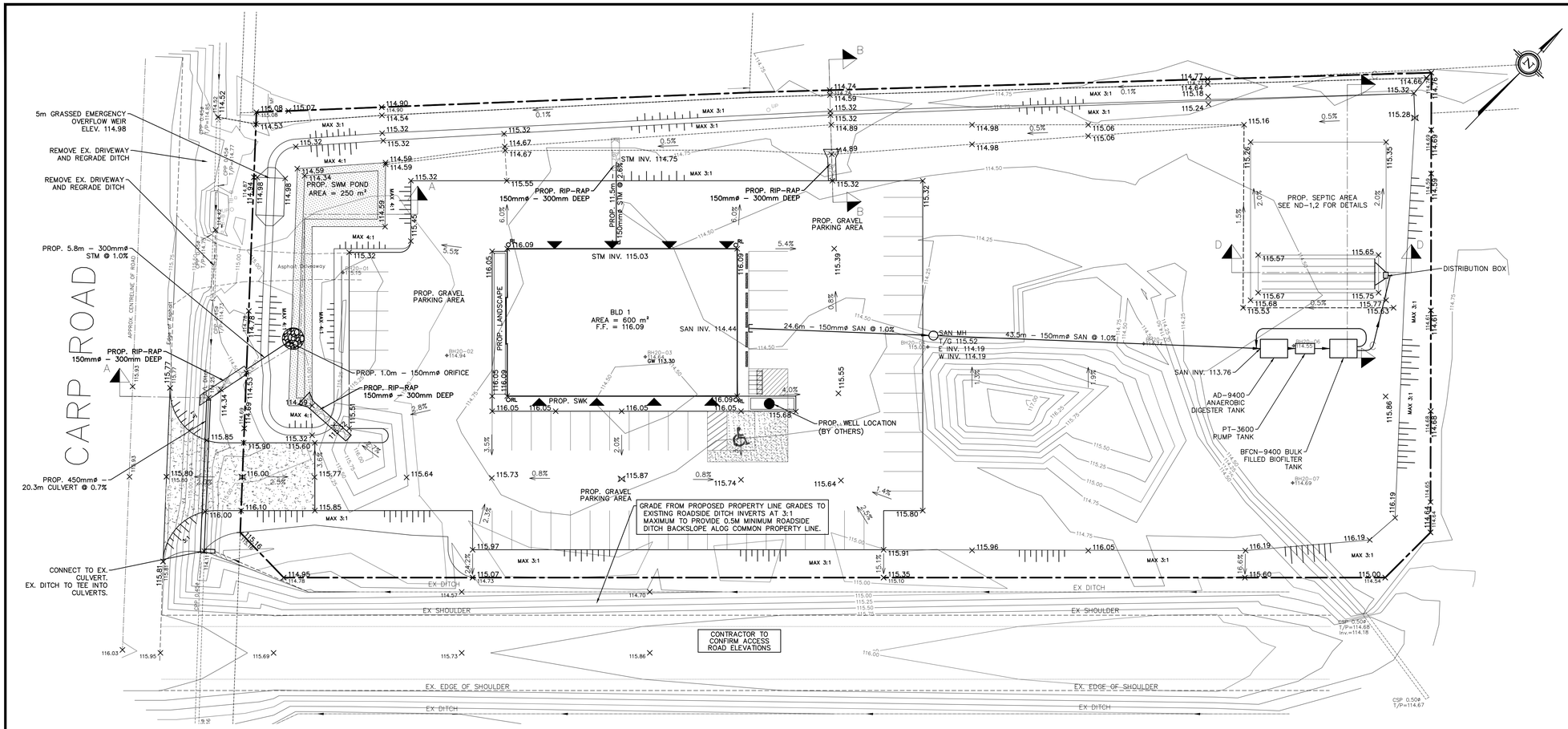
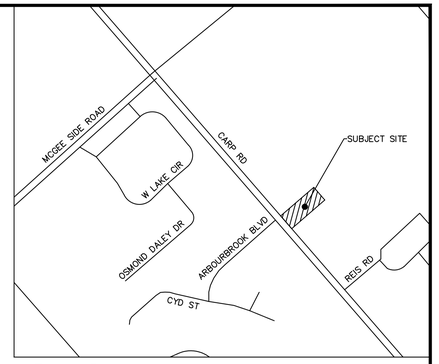
DESIGNED BY	NW/MWD	HORIZ SCALE	1:300
DRAWN BY	NW	VERT SCALE	N/A
CHECKED BY	GMP	DATE	SEPTEMBER 2020
PROJECT #	19124		
DRAWING #	ND-1		
REVISION #	2		

P:\Autodesk Vault\Working Folders\19124 - Argue, 2822 Carp Rd, Carp\Engineering\Archive\19124 - BASE Submission 3.dwg Layout:ND-1 Plotted: Jun 16, 2022 @ 4:24pm by nwells @ PEARSON ENGINEERING LTD.

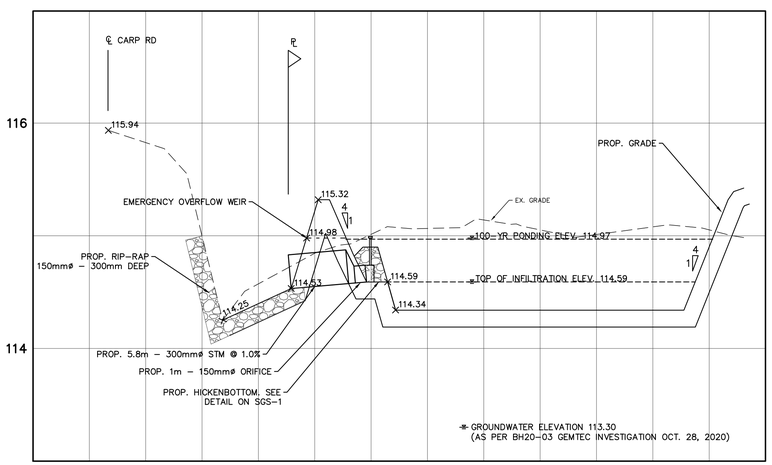




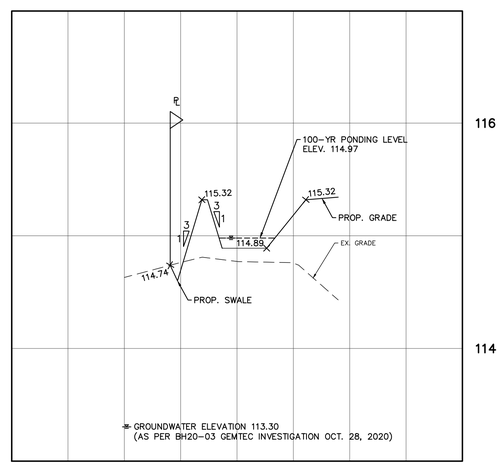
KEY MAP N.T.S

LEGEND

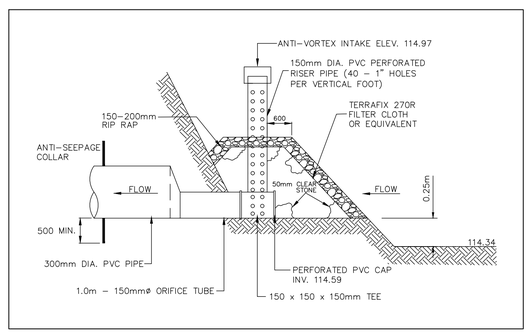
- MH — SANITARY MANHOLE
- 254.63 / 254.09 — PROPOSED ELEVATION / EXISTING ELEVATION
- 1.5% — PROPOSED DIRECTION AND GRADE
-) (— HIGH POINT
- BH20-03 / GW 113.30 — BORE HOLE NUMBER / EX. GROUND ELEVATION / GROUNDWATER ELEVATION
- INFILTRATION AREA
- EXTENT OF ASPHALT DRIVEWAY
- DRL — ROOF LEADER c/w SPLASH PAD



SECTION A–A
HORIZONTAL SCALE 1:250
VERTICAL SCALE 1:50



SECTION B–B
HORIZONTAL SCALE 1:250
VERTICAL SCALE 1:50



HICKENBOTTOM DETAIL
N.T.S.

NO.	REVISION NOTE	DATE	BY
2.	UPDATED GRADING	06/16/22	NW
1.	AS PER 1ST SUBMISSION COMMENTS	01/07/22	NW

BENCHMARK

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LICENSED PROFESSIONAL ENGINEER G. M. PEARSON 100081986 06/16/22 PROVINCE OF ONTARIO

MULTI-TENANT COMMERCIAL BLDGS
2822 CARP ROAD
CITY OF OTTAWA

GRADING AND SERVICING PLAN

PEARSON ENGINEERING LTD.
PEARSONENG.COM PH. 705.719.4785

DESIGNED BY	NW/MWD	HORIZ SCALE	1:300
DRAWN BY	NW	VERT SCALE	N/A
CHECKED BY	GMP	DATE	SEPTEMBER 2020

PROJECT # 19124
DRAWING # SGS-1
REVISION # 2

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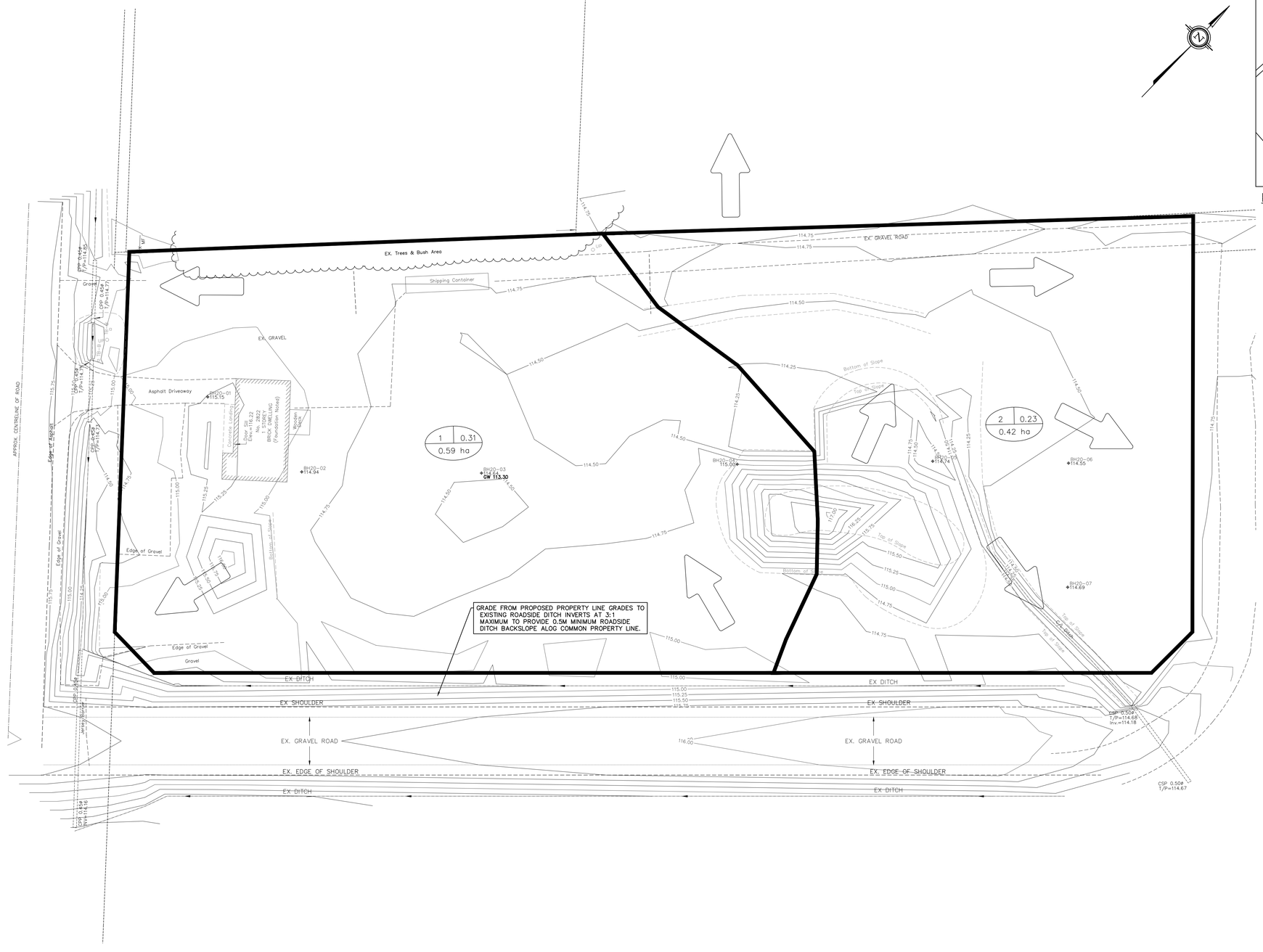

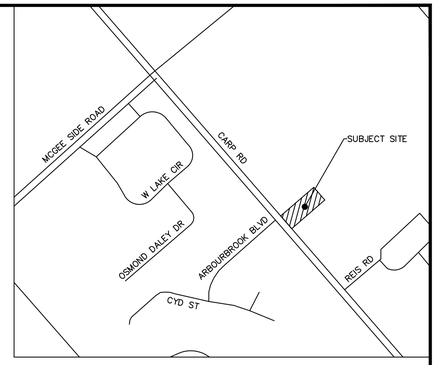

KEY MAP N.T.S

LEGEND

- OVERLAND FLOW DIRECTION
- CATCHMENT AREA (1 | 0.75 | 1.00 ha) RUNOFF COEFFICIENT, AREA IN HECTARES
- CATCHMENT BOUNDARY

NO.	REVISION NOTE	DATE	BY
2.	UPDATED GRADING	06/16/22	NW
1.	AS PER 1ST SUBMISSION COMMENTS	01/07/22	NW

BENCHMARK

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LICENSED PROFESSIONAL ENGINEER G. M. PEARSON 100061986 06/16/22 PROVINCE OF ONTARIO

MULTI-TENANT COMMERCIAL BLDGS
2822 CARP ROAD
CITY OF OTTAWA

PRE-DEVELOPMENT STORM CATCHMENT PLAN

PEARSON ENGINEERING LTD.
PEARSONENG.COM PH. 705.719.4785

DESIGNED BY	NW/MWD	HORIZ SCALE	1:300
DRAWN BY	NW	VERT SCALE	N/A
CHECKED BY	GMP	DATE	SEPTEMBER 2020
PROJECT #	19124		
DRAWING #	STM-1		
REVISION #	2		

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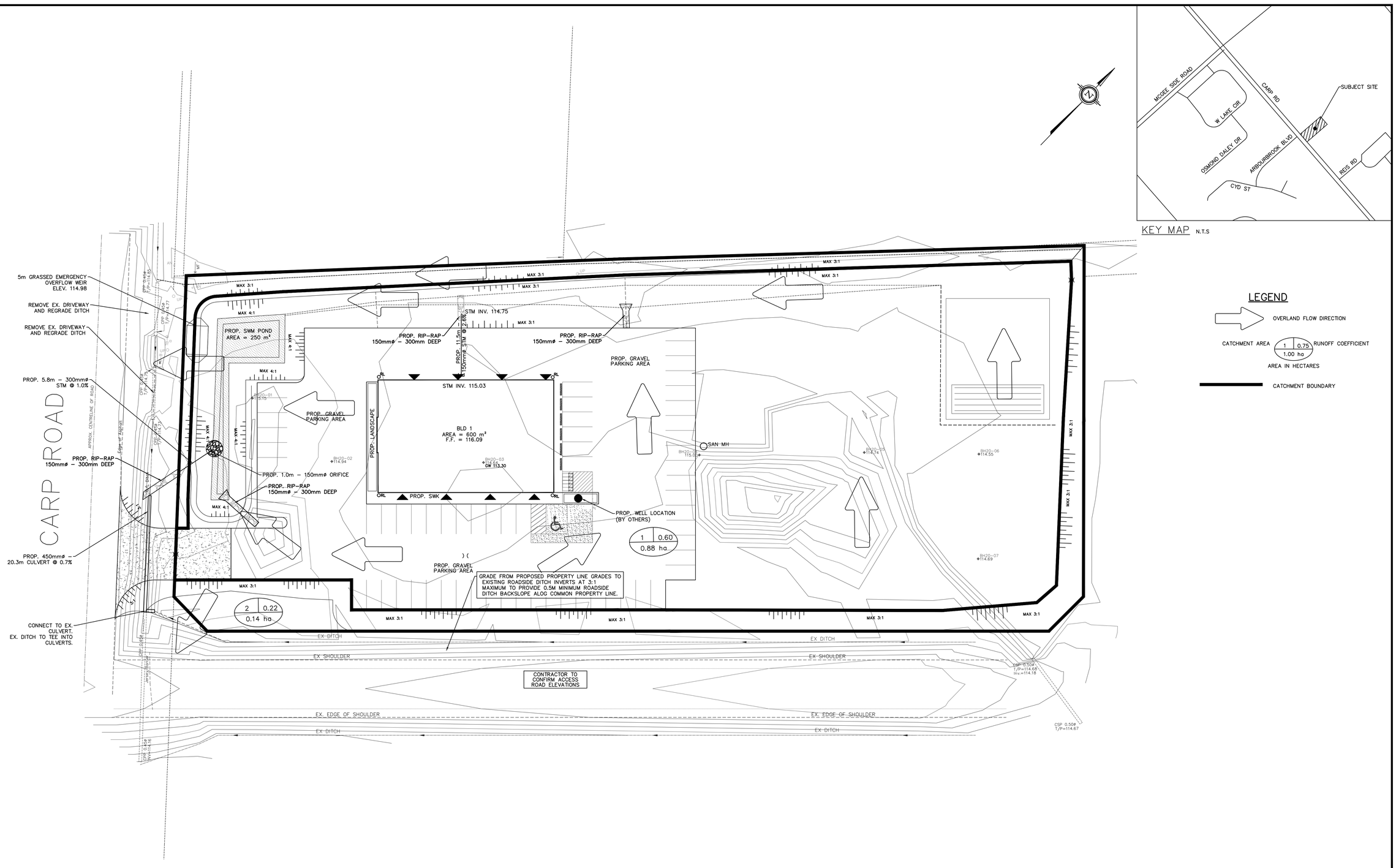

KEY MAP N.T.S

LEGEND

OVERLAND FLOW DIRECTION

CATCHMENT AREA 1 | 0.75 RUNOFF COEFFICIENT
1.00 ha
AREA IN HECTARES

CATCHMENT BOUNDARY

NO.	REVISION NOTE	DATE	BY
2.	UPDATED GRADING	06/16/22	NW
1.	AS PER 1ST SUBMISSION COMMENTS	01/07/22	NW

BENCHMARK

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LICENSED PROFESSIONAL ENGINEER
G. M. PEARSON
100091966
06/16/22
PROVINCE OF ONTARIO

MULTI-TENANT COMMERCIAL BLDGS
2822 CARP ROAD
CITY OF OTTAWA

POST-DEVELOPMENT STORM CATCHMENT PLAN

PEARSON ENGINEERING LTD.
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DESIGNED BY	NW/MWD	HORIZ SCALE	1:300
DRAWN BY	NW	VERT SCALE	N/A
CHECKED BY	GMP	DATE	SEPTEMBER 2020
PROJECT #	19124		
DRAWING #	STM-2		
REVISION #	2		

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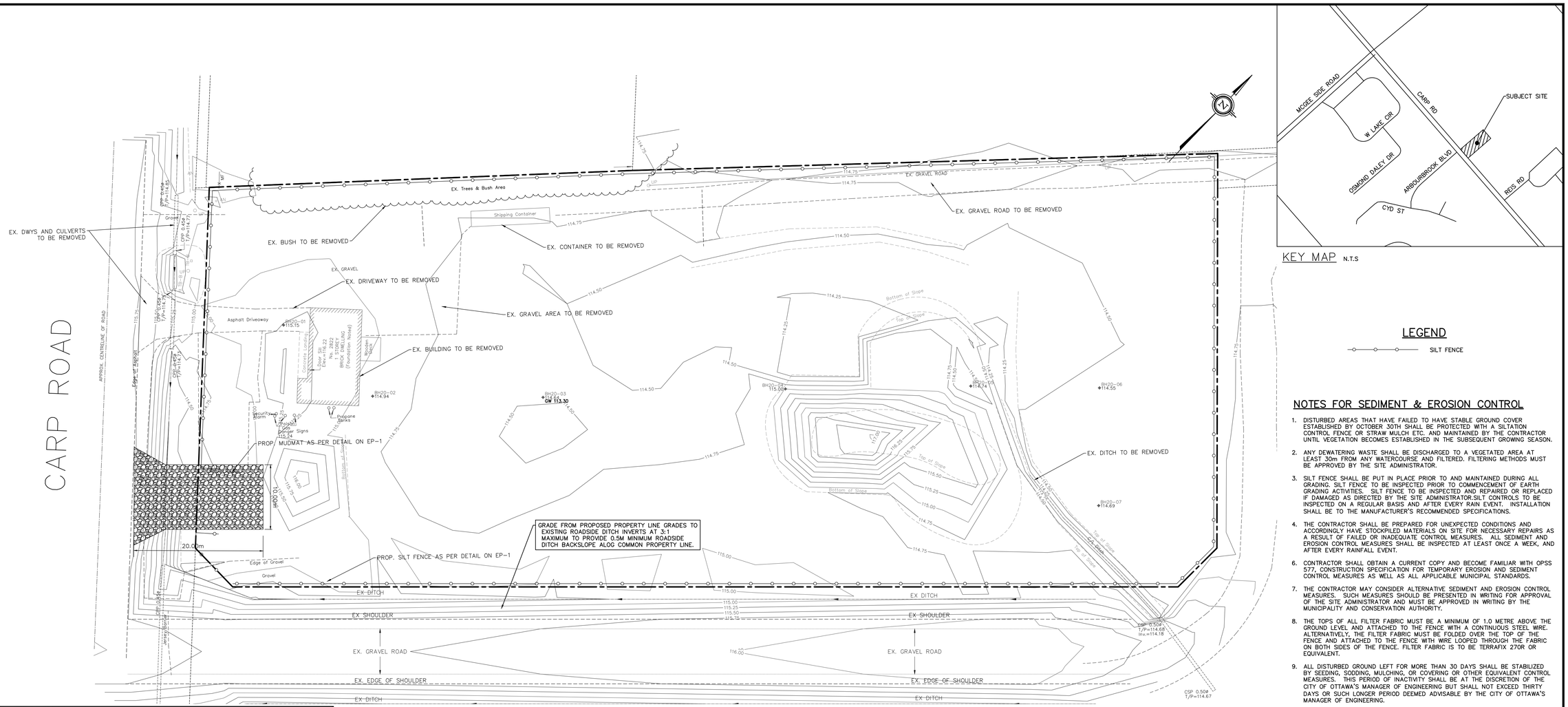


KEY MAP N.T.S

LEGEND

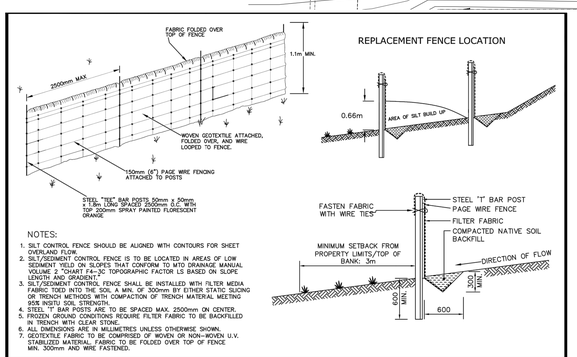
SILT FENCE

NOTES FOR SEDIMENT & EROSION CONTROL

1. DISTURBED AREAS THAT HAVE FAILED TO HAVE STABLE GROUND COVER ESTABLISHED BY OCTOBER 30TH SHALL BE PROTECTED WITH A SILTATION CONTROL FENCE OR STRAW MULCH ETC. AND MAINTAINED BY THE CONTRACTOR UNTIL VEGETATION BECOMES ESTABLISHED IN THE SUBSEQUENT GROWING SEASON.
2. ANY DEWATERING WASTE SHALL BE DISCHARGED TO A VEGETATED AREA AT LEAST 30m FROM ANY WATERCOURSE AND FILTERED. FILTERING METHODS MUST BE APPROVED BY THE SITE ADMINISTRATOR.
3. SILT FENCE SHALL BE PUT IN PLACE PRIOR TO AND MAINTAINED DURING ALL GRADING. SILT FENCE TO BE INSPECTED PRIOR TO COMMENCEMENT OF EARTH GRADING ACTIVITIES. SILT FENCE TO BE INSPECTED AND REPAIRED OR REPLACED IF DAMAGED AS DIRECTED BY THE SITE ADMINISTRATOR.SILT CONTROLS TO BE INSPECTED ON A REGULAR BASIS AND AFTER EVERY RAIN EVENT. INSTALLATION SHALL BE TO THE MANUFACTURER'S RECOMMENDED SPECIFICATIONS.
4. THE CONTRACTOR SHALL BE PREPARED FOR UNEXPECTED CONDITIONS AND ACCORDINGLY HAVE STOCKPILED MATERIALS ON SITE FOR NECESSARY REPAIRS AS A RESULT OF FAILED OR INADEQUATE CONTROL MEASURES. ALL SEDIMENT AND EROSION CONTROL MEASURES SHALL BE INSPECTED AT LEAST ONCE A WEEK, AND AFTER EVERY RAINFALL EVENT.
6. CONTRACTOR SHALL OBTAIN A CURRENT COPY AND BECOME FAMILIAR WITH OPSS 577, CONSTRUCTION SPECIFICATION FOR TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES AS WELL AS ALL APPLICABLE MUNICIPAL STANDARDS.
7. THE CONTRACTOR MAY CONSIDER ALTERNATIVE SEDIMENT AND EROSION CONTROL MEASURES. SUCH MEASURES SHOULD BE PRESENTED IN WRITING FOR APPROVAL OF THE SITE ADMINISTRATOR AND MUST BE APPROVED IN WRITING BY THE MUNICIPALITY AND CONSERVATION AUTHORITY.
8. THE TOPS OF ALL FILTER FABRIC MUST BE A MINIMUM OF 1.0 METRE ABOVE THE GROUND LEVEL AND ATTACHED TO THE FENCE WITH A CONTINUOUS STEEL WIRE. ALTERNATIVELY, THE FILTER FABRIC MUST BE FOLDED OVER THE TOP OF THE FENCE AND ATTACHED TO THE FENCE WITH WIRE LOOPED THROUGH THE FABRIC ON BOTH SIDES OF THE FENCE. FILTER FABRIC IS TO BE TERRAFIX 270R OR EQUIVALENT.
9. ALL DISTURBED GROUND LEFT FOR MORE THAN 30 DAYS SHALL BE STABILIZED BY SEEDING, SODDING, MULCHING, OR COVERING OR OTHER EQUIVALENT CONTROL MEASURES. THIS PERIOD OF INACTIVITY SHALL BE AT THE DISCRETION OF THE CITY OF OTTAWA'S MANAGER OF ENGINEERING BUT SHALL NOT EXCEED THIRTY DAYS OR SUCH LONGER PERIOD DEEMED ADVISABLE BY THE CITY OF OTTAWA'S MANAGER OF ENGINEERING.
10. CONTRACTOR RESPONSIBLE FOR MUD TRACKING, PREVENTION, AND MAINTENANCE ON CARP ROAD.
11. ROADS TO BE LEFT IN A BROOM SWEPT CONDITION AT THE END OF EACH WORK DAY.

SEQUENCE OF CONSTRUCTION

1. ENGINEER TO BE NOTIFIED PRIOR TO INITIATION OF ANY ON SITE WORKS.
2. SILT FENCE AS PER DETAIL FOUND ON EP-1. CONSTRUCTION ACCESS MATS AS PER DETAIL FOUND ON EP-1 AND ARE TO BE INSTALLED PRIOR TO THE COMMENCEMENT OF ANY WORKS ONSITE.
3. VEGETATION REMOVAL MAY COMMENCE AFTER ALL SILT FENCE IS INSTALLED AND APPROVED BY THE ENGINEER.
4. COMMENCE WITH EARTH WORKS AND SITE SERVICING.
5. INSTALLATION OF PROPOSED INFILTRATION FACILITIES AT THE TIME OF LANDSCAPING WORKS.
6. EROSION CONTROL MEASURES TO BE MAINTAINED AS DIRECTED BY THE ENGINEER DURING THE CONSTRUCTION PERIOD. ADDITIONAL CONTROL MEASURES MAY BE REQUIRED AT THE DISCRETION OF THE ENGINEER.
7. ALL DISTURBED GROUND LEFT INACTIVE FOR MORE THAN 30 DAYS SHALL BE STABILIZED WITH SEED, SOD, MULCH OR OTHER ADEQUATE COVERING, AS INSTRUCTED BY THE ENGINEER.



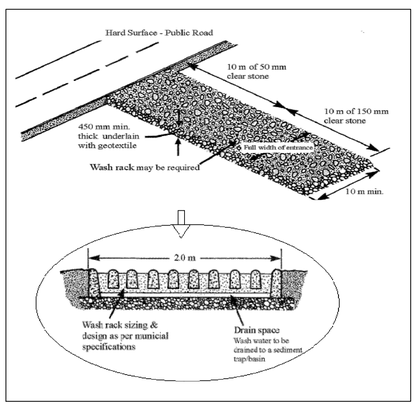
NOTES:

1. SILT CONTROL FENCE SHOULD BE ALIGNED WITH CONTOURS FOR SHEET OVERLAND FLOW.
2. SILT/SEDIMENT CONTROL FENCE IS TO BE LOCATED IN AREAS OF LOW SEDIMENT YIELD ON SLOPES THAT CONFORM TO MTO DRAINAGE MANUAL VOLUME 2 "CHART E4-3C TOPOGRAPHIC FACTOR LS BASED ON SLOPE LENGTH AND GRADIENT".
3. WHERE CONCENTRATIONS FENCE SHALL BE INSTALLED WITH FILTER MEDIA FABRIC TOED INTO THE SOIL A MIN. OF 300mm BY EITHER STATIC SLICING OR TRENCH METHODS WITH COMPACTION OF TRENCH MATERIAL MEETING 90% INSITU SOIL STRENGTH.
4. STEEL "I" BAR POSTS ARE TO BE SPACED MAX. 2500mm ON CENTER.
5. FROZEN GROUND CONDITIONS REQUIRE FILTER FABRIC TO BE BACKFILLED IN TRENCH WITH CLEAR STONE.
6. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SHOWN.
7. GEOTEXTILE FABRIC TO BE COMPRISED OF WOVEN OR NON-WOVEN U.V. STABILIZED MATERIAL. FABRIC TO BE FOLDED OVER TOP OF FENCE MIN. 300mm AND WIRE FASTENED.

TYPICAL DETAIL OF SILT/SEDIMENT FENCE

APP'D: DATE: 03.03.06
DRAWN: A.S.C SCALE: NTS

NO.	REVISION	APP'D	DATE



MUD MAT DETAIL N.T.S.

NO.	REVISION NOTE	DATE	BY
2.	UPDATED GRADING	06/16/22	NW
1.	AS PER 1ST SUBMISSION COMMENTS	01/07/22	NW

BENCHMARK

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LICENSED PROFESSIONAL ENGINEER G. M. PEARSON 100081986 06/16/22 PROVINCE OF ONTARIO

MULTI-TENANT COMMERCIAL BLDGS
2822 CARP ROAD
CITY OF OTTAWA

EROSION AND REMOVALS PLAN

PEARSON ENGINEERING LTD.
PEARSONENG.COM PH. 705.719.4785

DESIGNED BY	NW/MWD	HORIZ SCALE	1: 300
DRAWN BY	NW	VERT SCALE	N/A
CHECKED BY	GMP	DATE	SEPTEMBER 2020
PROJECT #	19124		
DRAWING #	EPR-1		
REVISION #	2		

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APPENDIX B

Record of Borehole and Test Pit Sheets

RECORD OF BOREHOLE 20-1

CLIENT: 2513287 Ontario Inc.
PROJECT: Geotechnical Investigation
JOB#: 65057.01
LOCATION: See Borehole Location Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Aug 21 2020

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m ● / DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m ▲	SHEAR STRENGTH (Cu), kPA + NATURAL ⊕ REMOULDED / WATER CONTENT, % W_P W W_L	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface		115.15								
		Grey sand and gravel, trace silt (BASE/SUBBASE MATERIAL)			1	SS	430	13	●			
				114.74								
		Dark grey SANDY SILT		0.41								
				114.21								
1		Loose to compact, grey brown SAND, some silt		0.94	2	SS	430	8	●			
					3	SS	510	26	●			
2					4	SS	410	16	●			
				112.10								
3		End of borehole		3.05								
4												
5												
6												

10 20 30 40 50 60 70 80 90

GEMTEC
Consulting Engineers and Scientists

LOGGED: A.N.
CHECKED: J.B.

GEO - BOREHOLE LOG 65057.01_GINT_2020-08-28.GPJ GEMTEC 2018.GDT 22/9/20

RECORD OF BOREHOLE 20-2

CLIENT: 2513287 Ontario Inc.
PROJECT: Geotechnical Investigation
JOB#: 65057.01
LOCATION: See Borehole Location Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Aug 21 2020

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED) / WATER CONTENT, %	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface		114.94							
		Dark brown silty sand with organic material (TOPSOIL)		114.63	1	SS	360	5			
		Loose to compact, grey brown SAND, some silt		0.31							
1					2	SS	410	5			
				113.14							
		Compact to very dense, grey brown silty sandy gravel with cobbles and boulders (GLACIAL TILL)		1.80	3	SS	430	27			
2					4	SS	230	37			
3					5	SS	130	50 for 0.19m			
		End of borehole Auger refusal		111.56 3.38							
4											
5											
6											

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL, ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

GEMTEC
Consulting Engineers and Scientists

LOGGED: A.N.
CHECKED: J.B.

GEO - BOREHOLE LOG 65057.01_GINT_2020-08-28.GPJ GEMTEC 2018.GDT 22/9/20

RECORD OF BOREHOLE 20-3

CLIENT: 2513287 Ontario Inc.
PROJECT: Geotechnical Investigation
JOB#: 65057.01
LOCATION: See Borehole Location Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Aug 21 2020

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA (+ NATURAL, ⊕ REMOULDED) / WATER CONTENT, % (W_P, W, W_L)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface		114.64							
		Dark brown sandy silt, some gravel with cobbles and organics (FILL MATERIAL)			1	SS	150	5			
1				113.60	2	SS	430	10		M	
		Compact, grey brown SAND, some silt		1.04							
				112.81	3	SS	310	16		M	
2		Compact, grey SILTY SAND		1.83							
					4	SS	480	11		M	
				111.80							
3		Compact to very dense, grey gravel, some silt, some sand with cobbles and boulders (GLACIAL TILL)		2.84	5	SS	150	50 for 0.13m			
4					6	SS	50	14			
					7	SS	200	50 for 0.08m			
5				109.64							
		End of borehole Auger refusal		5.00							
6											

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL, ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEV. (m)
20/09/15	1.4 ▽	113.3

GEMTEC
Consulting Engineers and Scientists

LOGGED: A.N.
CHECKED: J.B.

GEO - BOREHOLE LOG 65057.01_GINT_2020-08-28.GPJ GEMTEC 2018.GDT 22/9/20

RECORD OF BOREHOLE 20-4

CLIENT: 2513287 Ontario Inc.
PROJECT: Geotechnical Investigation
JOB#: 65057.01
LOCATION: See Borehole Location Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Aug 21 2020

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m	SHEAR STRENGTH (Cu), kPA: NATURAL / REMOULDED; WATER CONTENT, %	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface		115.00								
		Dark brown sandy silt, some gravel with cobbles and organics (FILL MATERIAL)			1	SS	180	50 for 0.08m				
				114.04								
1		Loose to compact, grey brown SAND, some silt		0.96	2	SS	480	10				
				113.28								
		Loose to compact, grey SILTY SAND		1.72	3	SS	410	12				
2				112.51								
		Interbedded grey SILTY SAND and grey SILTY CLAY		2.49	4	SS	410	5				
3					5	SS	460	6				
				111.39								
		Compact to very dense, grey gravel, some silt, some sand with cobbles and boulders (GLACIAL TILL)		3.61	6	SS	310	25				
4					7	SS	50	50 for 0.13m				
				110.17								
		End of borehole Auger refusal		4.83								
5												
6												

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, % W_P W W_L
10 20 30 40 50 60 70 80 90

GEMTEC
Consulting Engineers and Scientists

LOGGED: A.N.
CHECKED: J.B.

GEO - BOREHOLE LOG 65057.01_GINT_2020-08-28.GPJ GEMTEC 2018.GDT 22/9/20

RECORD OF BOREHOLE 20-5

CLIENT: 2513287 Ontario Inc.
PROJECT: Geotechnical Investigation
JOB#: 65057.01
LOCATION: See Borehole Location Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Aug 21 2020

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED) / WATER CONTENT, %	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface		114.74							
		Dark brown silty sand, with organic material (TOPSOIL)		114.41	1	SS	330	4			
		Loose to compact, grey brown SAND, some silt		0.33							
1					2	SS	410	9			
2					3	SS	460	21			
					4	SS	460	11			
3				111.69							
		Interbedded grey SILTY SAND and grey SILTY CLAY		3.05	5	SS	380	1			
		Compact to very dense, grey silty sandy gravel with cobbles and boulders (GLACIAL TILL)		111.18 3.56	6	SS	80	58 for 0.18			
4		End of borehole Auger refusal		110.40 4.34							
5											
6											

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL, ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

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Consulting Engineers and Scientists

LOGGED: A.N.
CHECKED: J.B.

GEO - BOREHOLE LOG 65057.01_GINT_2020-08-28.GPJ GEMTEC 2018.GDT 22/9/20

RECORD OF BOREHOLE 20-6

CLIENT: 2513287 Ontario Inc.
PROJECT: Geotechnical Investigation
JOB#: 65057.01
LOCATION: See Borehole Location Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Aug 21 2020

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m
		Ground Surface		114.55				
0		Dark brown silty sand, with organic material (TOPSOIL)		114.37				
		Very loose to compact, grey brown SAND, some silt		0.18	1	SS	610	2
					2	SS	610	3
1					3	SS	480	21
				112.72				
		Compact, grey brown SILTY SAND		1.83	4	SS	510	30
2				112.19				
		Compact, grey silty sandy gravel with cobbles and boulders (GLACIAL TILL)		2.36	5	SSS	200	28
3				111.50				
		End of borehole		3.05				
4								
5								
6								

SAMPLES

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

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LOGGED: A.N.
CHECKED: J.B.

GEO - BOREHOLE LOG 65057.01_GINT_2020-08-28.GPJ GEMTEC 2018.GDT 22/9/20

RECORD OF BOREHOLE 20-7

CLIENT: 2513287 Ontario Inc.
PROJECT: Geotechnical Investigation
JOB#: 65057.01
LOCATION: See Borehole Location Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Aug 21 2020

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA (+ NATURAL, ⊕ REMOULDED) / WATER CONTENT, % (W_P, W, W_L)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface		114.69							
		Dark brown silty sand, with organic material (TOPSOIL)		114.49							
		Very loose to compact, grey brown SAND, some silt		0.20	1	SS	480	3			
1					2	SS	530	2			
					3	SS	480	15			
2					4	SS	480	10			
				112.30							
		Very dense, grey silty sandy gravel with cobbles and boulders (GLACIAL TILL)		2.39	5	SS	80	50 for 0.08m			
3				111.64							
		End of borehole		3.05							
4											
5											
6											

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL, ⊕ REMOULDED
WATER CONTENT, %: W_P, W, W_L
10 20 30 40 50 60 70 80 90

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Consulting Engineers and Scientists

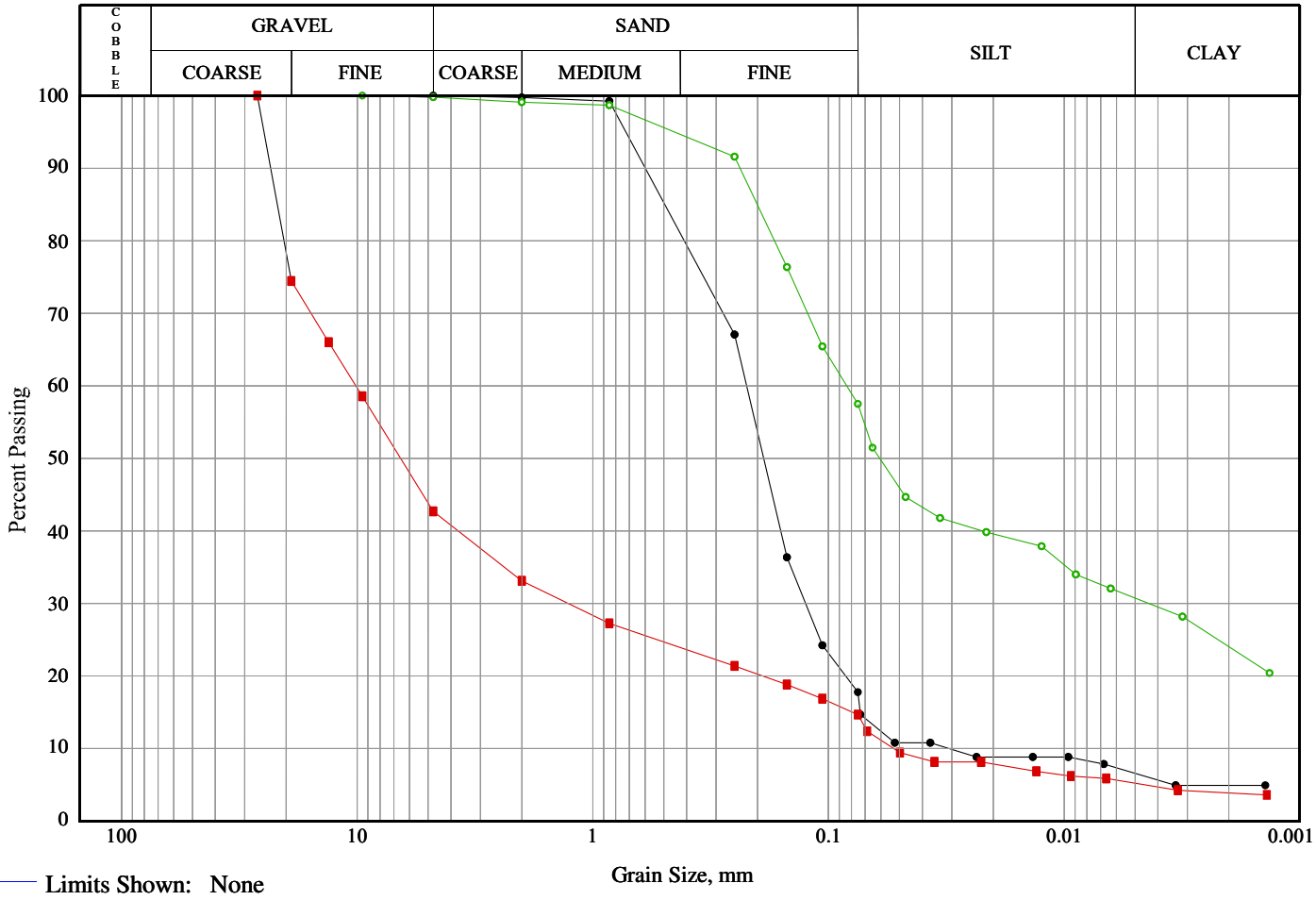
LOGGED: A.N.
CHECKED: J.B.

GEO - BOREHOLE LOG 65057.01_GINT_2020-08-28.GPJ GEMTEC 2018.GDT 22/9/20

GEMTEC
Consulting Engineers and Scientists

Client:	2513287 Ontario Inc.
Project:	Geotechnical and Hydrogeolgical Investigation, New Mu
Project #:	6505701

Soils Grading Chart



Limits Shown: None

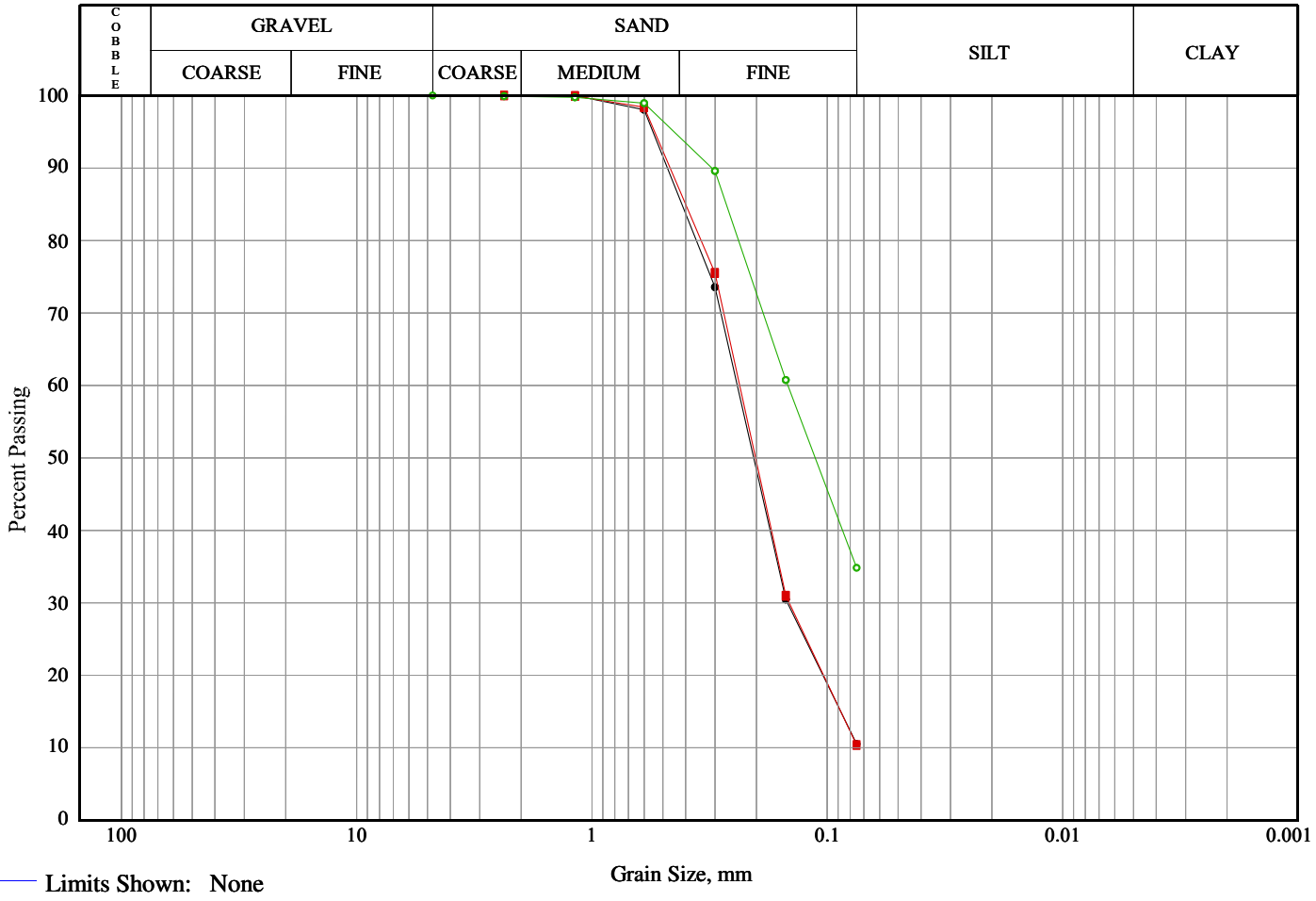
Line Symbol	Sample	Borehole/ Test Pit	Sample Number	Depth	% Cob.+ Gravel	% Sand	% Silt	% Clay
●		20-01	SA 3	1.52-2.13	0.0	82.3	11.2	6.6
■		20-02	SA 4	2.28-2.89	57.3	28.0	9.5	5.2
○		20-04	SA 4	2.28-2.89	0.2	42.3	26.8	30.7

Line Symbol	CanFEM Classification	USCS Symbol	D_{10}	D_{15}	D_{30}	D_{50}	D_{60}	D_{85}	% 5-75µm
●	Sand , some silt , trace clay	N/A	0.03	0.07	0.13	0.19	0.22	0.49	11.2
■	Sandy gravel , trace silt, trace clay	N/A	0.05	0.08	1.28	6.54	10.13	21.80	9.5
○	Silty clayey sand , trace gravel	N/A	---	---	0.00	0.06	0.08	0.20	26.8

GEMTEC
Consulting Engineers and Scientists

Client:	2513287 Ontario Inc.
Project:	Geotechnical Investigation, 2822 Carp Road
Project #:	6505701

Soils Grading Chart



Line Symbol	Sample	Borehole/ Test Pit	Sample Number	Depth	% Cob.+ Gravel	% Sand	% Silt	% Clay
●—	Sand, some silt	20-03	SA 2	0.76-1.37	0.0	89.5	10.5	
■—	Sand, some silt	20-03	SA 3	1.52-2.13	0.0	89.7	10.3	
○—	Silty sand	20-03	SA 4	2.28-2.89	0.0	65.2	34.8	

Line Symbol	CanFEM Classification	USCS Symbol	D_{10}	D_{15}	D_{30}	D_{50}	D_{60}	D_{85}	% 5-75µm
●—	Sand , some silt	N/A	---	0.09	0.15	0.21	0.24	0.41	---
■—	Sand , some silt	N/A	---	0.09	0.15	0.20	0.24	0.40	---
○—	Silty sand	N/A	---	---	---	0.11	0.15	0.27	---

APPENDIX C

TW19-1 Water Well Record and Certificate of Well Compliance

&

Well Record Summary

Ontario — Ministry of the Environment, Conservation and Parks

Well Tag No. *(Place Sticker and/or Print Below)*: A296836

Well Record

Regulation 903 Ontario Water Resources Act

Measurements recorded in: ☐ Metric ☒ Imperial

Page _____ of _____

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
	2513287 ONTARIO INC.		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. *(inc. area code)*
3458 PAUL ANKA DR.	OTTAWA	ONT.	K1V9K6	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
2822 CARP RD	FORMERLY HUNTLEY	PART 9	2

County/District/Municipality	City/Town/Village	Province	Postal Code
OTTAWA	OTTAWA	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	422597	5017507	4R-30382	

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
BROWN	SAND	GREY SAND + GRAVEL		0	10
GREY	SHALE			10	26
GREY	LIMESTONE			26	155

Annular Space

Depth Set at (m/ft) From	Depth Set at (m/ft) To	Type of Sealant Used (Material and Type)	Volume Placed (~~m³/ft³~~ yd³)
0	40	BENTONITE GROUT	.910

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
6 1/4	STEEL	.188	0+4	40
6 1/16	OPEN HOLE		40	155

Construction Record - Screen

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

Status of Well

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

Water Details

Water found at Depth (m/ft)	Kind of Water	Hole Diameter Depth From	Hole Diameter Depth To	Hole Diameter (cm/in)
145+ (m/ft) ☐ Gas	☐ Fresh ☒ Untested ☐ Other, *specify*	0	40	9 3/4
(m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, *specify*	40	155	6 1/16
(m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, *specify*			

Results of Well Yield Testing

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

If pumping discontinued, give reason:

Pump intake set at (m/ft): 145

Pumping rate (l/min / GPM): 10

Duration of pumping: 8 hrs + 0 min

Final water level end of pumping (m/ft): 35.27

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

Recommended pump depth (m/ft): 145

Recommended pump rate (l/min / GPM): 12

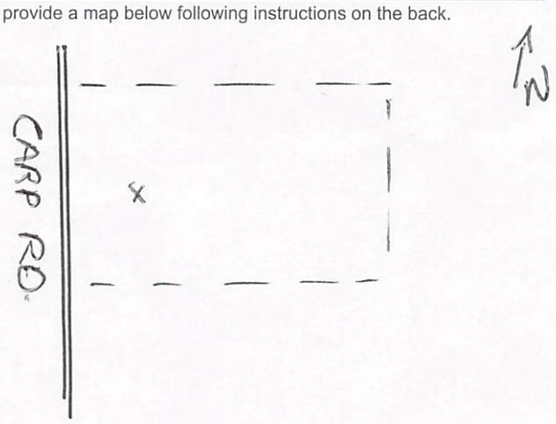
Well production (l/min / GPM): 15+

Disinfected? ☒ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level		2.92		
1	1	9.35	1	35.33
2	2	11.81	2	28.15
3	3	14.07	3	25.46
4	4	16.40	4	20.86
5	5	17.94	5	18.99
10	10	23.65	10	12.07
15	15	27.33	15	8.72
20	20	29.49	20	6.89
25	25	30.80	25	5.77
30	30	31.79	30	5.12
40	40	33.50	40	4.36
50			50	4.03
60	60	34.15	60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
SAUNDERS WELL DRILLING LTD	4879

Business Address (Street Number/Name)	Municipality	Province	Postal Code	Business E-mail Address
1680 SCHEEL DR.	BRAESIDE	ONT.	K0A1G0	

Bus. Telephone No. *(inc. area code)*	Name of Well Technician (Last Name, First Name)
6136235648	SAUNDERS TROY

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
T517	Troy Saunders	2020/10/29

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☒ Yes ☐ No	2020/10/04	2020/09/29

Ministry Use Only

Audit No. Z334368

Received

0506E (2018/12)

Ministry's Copy

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CERTIFICATE OF WELL COMPLIANCE

I, TROY SAUNDERS **DO HEREBY CERTIFY** that I am licensed to drill water wells in the Province of Ontario, and that I have supervised the drilling of a well on the property of 2513287 ONTARIO INC. (Name of Landowner), located at 2822 CARP. RD (Legal Description, Lot / Plan No.) in the City of Ottawa.

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

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

SIGNED this 15th day of Oct., 2020.

Troy Saunders / SAUNDERS WELL DRILLING LTD.
Well Driller / Company

The Engineer on behalf of the landowner set out above **CERTIFIES** that he/she has inspected the well and it was constructed in accordance with the specifications in 0.Reg.903, this report and the Hydrogeological Report with regards to casing length and grouting requirements.

SIGNED this 23rd day of October, 2020.

Andrius Paznekas, P.Geo
Engineer GEMTEC

PROFESSIONAL GEOSCIENTIST
ANDRIUS PAZNEKAS
PRACTISING MEMBER
3154
OCT 23, 2020
ONTARIO

Well Tag #A296836

MECP Water Well Record Search
500 metre Radius - 2822 Carp Road

Borehole_ID	Well_ID	Completed	Depth (m)	Depth to Bedrock (m)	Static Water Level (m bgs)	Water Found (m bgs)	Water Detail	Well Use
1002463513	7124076	2009-04-20	13.6	-	1.7	-	-	DO
10045158	1523383	1989-03-28	-	0	3.7	19.8, 33.5, 59.4	SU	DO
10025106	1503063	1952-02-12	54.6	15.8	7	19.8, 48.2, 53.6	FR	DO
1001605312	7105841	2008-03-26	12.2	-	2.9	11.9	UK	DO
10025163	1503120	1966-04-24	7.9	-	1.8	7	FR	DO
11550209	1536143	2005-10-06	13.6	-	5.6	13.1, 13.4	FR	DO
1006477512	7287146	2016-08-03	83.2	-	4.9	32, 41.1	UT	DO
1006043318	7264607	2016-05-12	54.3	-	1.7	23.8, 35.4, 52.4	UT	CO
1001605300	7105837	2008-03-28	14.6	-	3.8	13.4	UK	DO
10036009	1514027	1974-02-07	23.8	8.5	1.8	23.2	FR	DO
1004689417	7214932	2013-11-20	7	-		-	-	MO
1002951495	7141751	2009-02-09	24.4	-		-	-	-
1006477573	7287149	2016-08-05	-	-		-	-	-
1003101928	7147771	2010-05-20	42.7	-	0.9	39.9	UT	DO
10032573	1510546	1970-01-21	23.2	9.1	3	22.9	FR	DO
1005554681	7246316	2015-07-07	61	-		-	UT	DO
1003810077	7181767	2012-04-27	25.3	-	0.8	24.1		CO
10038066	1516131	1977-08-28	19.5	1.2	9.1	16.8	FR	DO
11550393	1536327	2006-04-24	18.3	5.5	0.9	16.8		DO
10038439	1516528	1978-06-20	72.2	4.3	7.6	71.6	FR	DO
1002951511	7141759	2010-02-08	48.8	-	1.2	45.1, 47.2	UT	DO
1006798880	7299151	2017-09-07	91.4	-	-	-	-	-
1005837009	7254250	2015-10-08	29.6	-	4.5	18.3, 27.4	UT	DO
1007283583	7318349	2018-07-16	3.1	-	-	-	-	-
1007283589	7318351	2018-07-16	3.1	-	-	-	-	-
10516851	1532401	2001-10-12	15.2	5.5	1.2	7.6, 13.7	UK	DO
1004191288	7190611	2012-10-03	42.1	-	3.3	20.7, 38.4	UT	DO
10537533	1533699	2003-03-17	14.6	4	3.4	12.2	UK	DO
11691951	1536857	2006-09-22	12.2	7.3	2.9	-		DO
1004728074	7218704	2013-09-19	21.9	-	4.8	20.7	UT	DO
10049376	1527785	1992-02-29	57.9	9.1	4.9	12.8, 41.1, 50.9	FR	DO
11316492	1535953	2005-09-29	18.3	8.8	6.3	16.5		DO
1005671747	7247944	2015-08-06	64.3	-		15.2, 47.2	UT	TH
1005148527	7228811	2014-07-16	58	-	3.5	54.3	UT	CO
1002937571	7139812	2009-12-11	84.1	-	4.2	59.4, 82.6	UT	DO
1006196188	7268424	2016-06-09	-	-	-	-	-	-
1007293810	7319979	2018-07-15	3.1	-	-	-	-	-
10048643	1526956	1992-07-17	36.6	2.1	5.2	35.1	FR	DO
1003262493	7149249	2010-05-04	45.1	-	4.4	21.3, 43.3	UT	DO
11316286	1535747	2005-07-05	35	12.5	4.3	-		DO
11316635	1536096	2005-10-27	45.7	1.2	1.6	-		DO
10537534	1533700	2003-03-17	62.5	12.2	3.4	18.3, 44.2	UK	NU
10040692	1518822	1983-12-08	65.5	29.3	22.9	56.4, 63.7	FR	DO
11550365	1536299	2006-03-21	13.7	-	4.3	-		DO
1007283580	7318348	2018-07-16	4.7	-	-	-	-	-
11764880	7042385	2007-01-28	12.1	0.9	5.1	9.8, 11.6	FR	DO
10036297	1514322	1974-09-17	9.8	-	1.5	9.4	FR	DO
1007283586	7318350	2018-07-16	3.1	-	-	-	-	-
1003434919	7156112	2010-10-29	83.2	-	4	51.8, 79.2	UT	DO
11172720	1534968	2004-08-24	45.1	4.9	1.9	-		DO
1001605303	7105838	2008-03-27	16.4	-	5.2	15.8	UK	DO
1006199035	7268387	2016-07-14	36.9	-	2	21.3, 35.1	UT	DO
1003074524	7147331	2010-05-12	30.8	-	2.4	11.6, 25, 26.8	UT	DO
1002588860	7126669	2009-06-04	42.7	-	4	20.7, 36, 40.2	UT	DO
1002950099	7141533	2010-01-11	12.8	-	-	-	-	-
10025164	1503121	1960-07-21	24.4	10.4	1.2	24.4	FR	DO
1005671750	7247945	2015-08-06	64.3	-		38.1	UT	TH
10025165	1503122	1961-03-25	25	11.6	4.6	25	FR	DO
11691817	1536723	2006-09-08	73.2	6.4	2.1	-	-	DO
11691941	1536847	2006-11-02	17.8	-		-	-	-
11691739	1536645	2006-07-26	15.2	4.9	1.3	12.5	-	DO
10050135	1528599	1994-05-06	15.2	7	1.5	9.8, 13.1	FR	CO
1006884093	7301325	-	-	-	-	-	-	-
1002950097	7141532	2010-01-11	43.3	-	-	-	-	-
23049235	7049235	2007-07-27	73.2	-	2.9	-	-	DO
1002951610	7141771	2009-12-21	97.5	-	1	90.5, 94.8	UT	DO
1005476375	7244461	2015-06-04	61	-	-	15.2, 50.3, 56.4	UT	DO
1004269688	7199589	2012-12-13	15.2	-	5.3	14	UT	DO
1005554678	7246315	2015-06-06	85.3	-	-	71.6	-	DO

Data from: https://data.ontario.ca/dataset/well-records
Last Updated: April 30, 2020

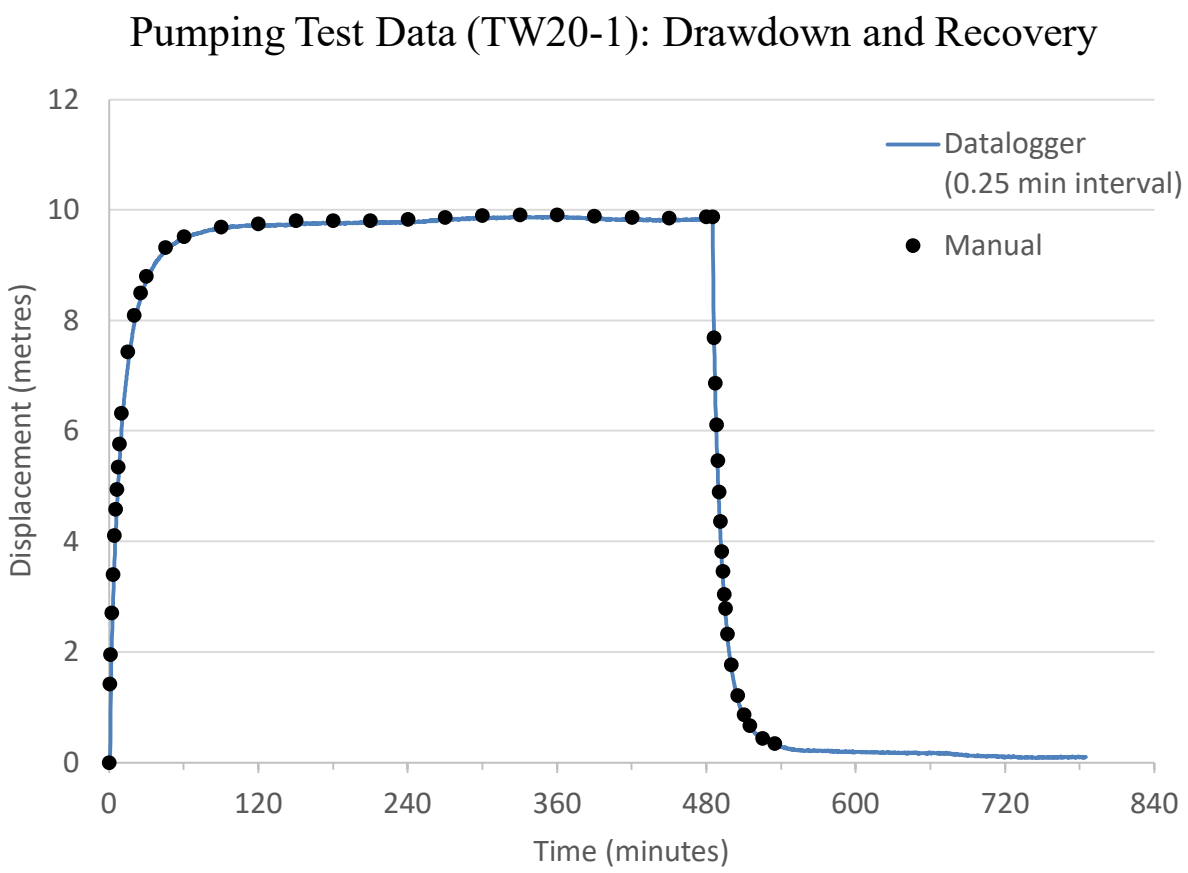
Code	Description for "Water Detail"	Code	Description for "Well Use"
FR	Fresh	DO	Domestic
SA	Salty	ST	Livestock
SU	Sulphur	IR	Irrigation
MN	Mineral	IN	Industrial
UK	Unknown	CO	Commercial
GS	Gas	MN	Municipal
IR	Iron	PS	Public
UT	Untested	AC	Cooling and A/C
OT	Other	NU	Not Used
-	-	OT	Other
-	-	TH	Test Hole
-	-	DE	Dewatering
-	-	MO	Monitoring
-	-	MT	Monitoring Testhole
-	-	AB	Abondoned

GEMTEC
Consulting Engineers and Scientists

APPENDIX D

Pumping Test Data

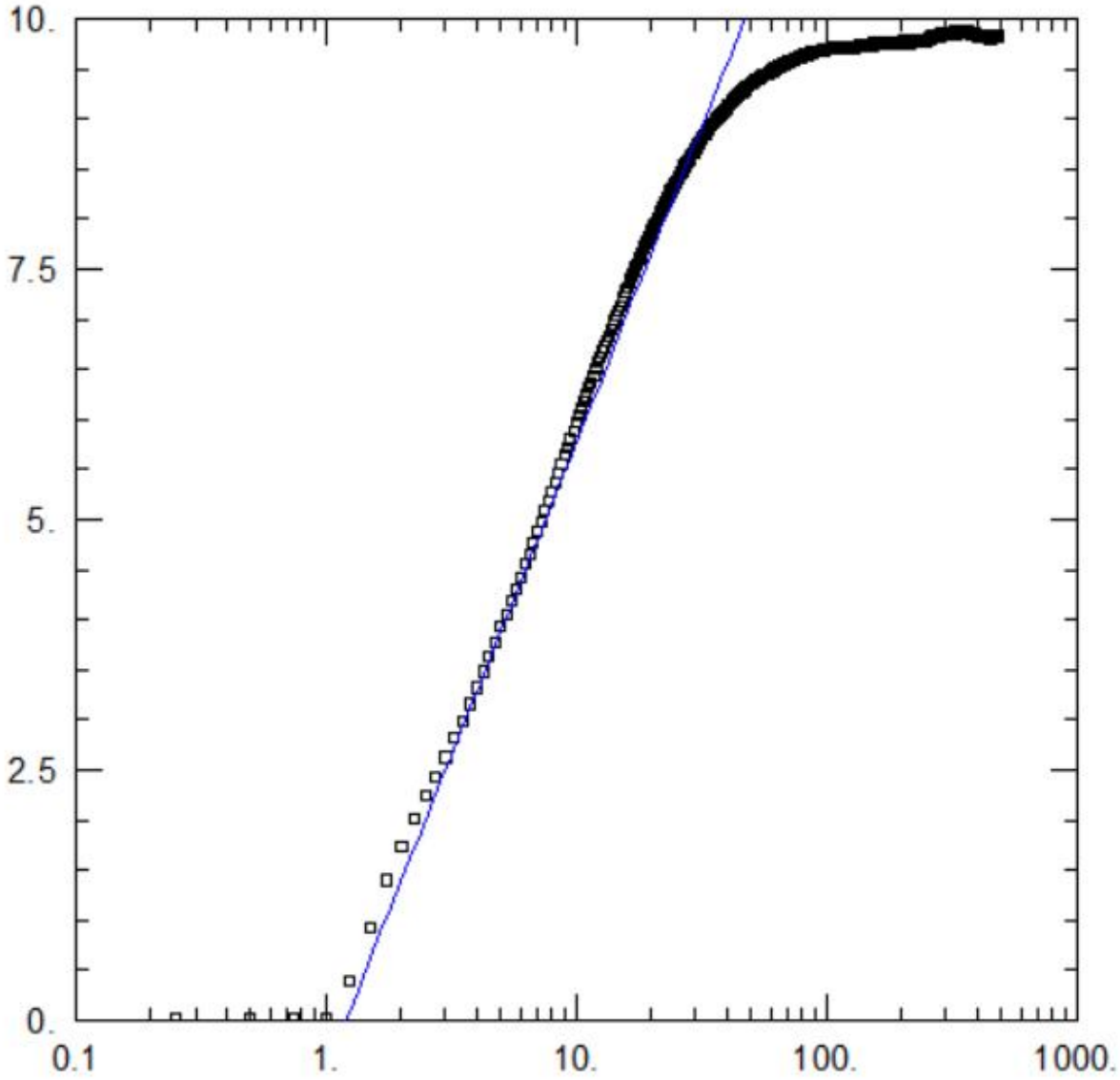
GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report	
	Project: Hydrogeological Investigation	
	Project Number: 65057.01	
	Client: 2513287 Ontario Inc.	
Location: 2822 Carp Road, Ottawa, Ontario		
Test Conducted by: CS	Pumping Well: TW20-1	P-Test Date: Sep 29, 2020
Analysis Performed by: AP	Method: Manual Measurements	Analysis Date: Nov 11, 2020
Aquifer Thickness: 39 m	Discharge: Constant 37.8 L/min	Duration: 8 hours



Water Levels TW20-1
Static : 1.06 m bgs
End of pump test (6-hours): 10.94 m
Following recovery (5-hours): 1.15 m

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report	
	Project: Hydrogeological Investigation	
	Project Number: 65057.01	
	Client: 2513287 Ontario Inc.	
Location: 2822 Carp Road, Ottawa, Ontario		
Test Conducted by: CS	Pumping Well: TW20-1	P-Test Date: Sep 29, 2020
Analysis Performed by: AP	Method: Cooper-Jacob	Analysis Date: Nov 11, 2020
Aquifer Thickness: 39 m	Discharge: Constant 37.8 L/min	Duration: 8 hours

Pumping Test Analysis (TW20-1): Cooper-Jacob (Confined Aquifer)

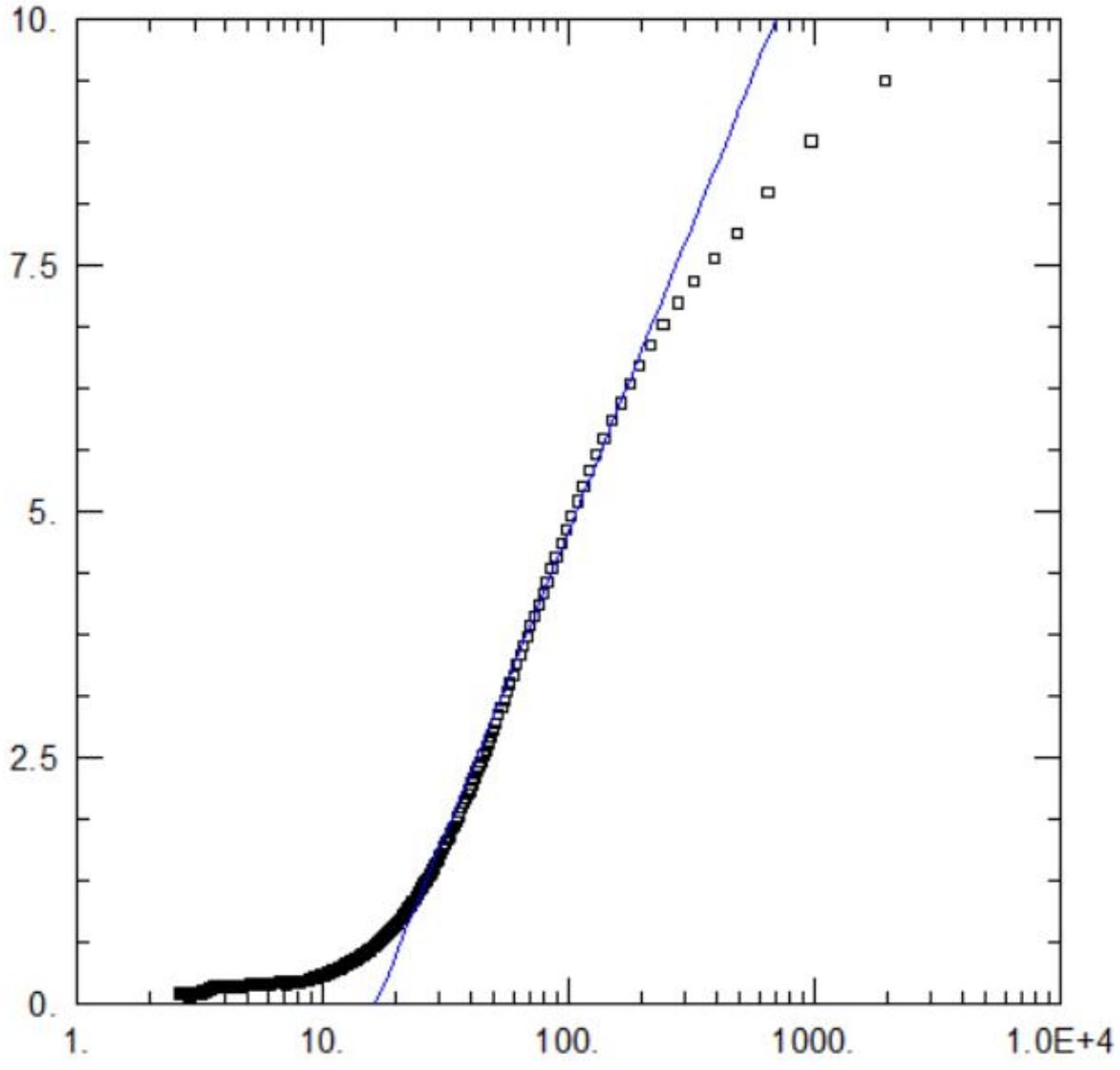


Estimated Transmissivity: 1.6 m^2/day or 2 x 10^{-5} m^2/s

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Hydrogeological Investigation
	Project Number: 65057.01
	Client: 2513287 Ontario Inc.

Location: 2822 Carp Road, Ottawa, Ontario		
Test Conducted by: CS	Pumping Well: TW20-1	P-Test Date: Sep 29, 2020
Analysis Performed by: AP	Method: Cooper-Jacob	Analysis Date: Nov 11, 2020
Aquifer Thickness: 39 m	Discharge: Constant 37.8 L/min	Duration: 8 hours

Pumping Test Analysis (TW20-1): Theis Recovery (Confined Aquifer)



Estimated Transmissivity: 1.6 m^2/day or 2 x 10^{-5} m^2/s

APPENDIX E

Laboratory Certificates of Analysis & Summary Tables

Summary of Measured Field Parameters

Test Well A296836	Time Since Initiation of Pumping (Hours)	Pumping Rate	Temp	pH	Electrical Conductivity (µS/cm)	Total Dissolved Solids (ppm)	Colour (ACU[1])	Colour (TCU[2,3])	Turbidity	Chlorine (mg/L)	Comments
TW20-1	1	37.8	10.4	7.90	476	243	-	-	28.1	-	No odour, slightly turbid
Pumping Test Sep 29, 2020	2	37.8	10.5	7.88	478	246	-	-	8.50	-	Clear, slight sulphur odour
	3	37.8	10.8	7.82	473	237	-	-	4.51	-	Clear, slight sulphur odour
	4	37.8	10.6	7.74	474	236	24	15	3.10	0	Clear, slight sulphur odour
	5	37.8	10.8	7.81	476	237	-	-	4.56	-	Clear, slight sulphur odour
	6	37.8	10.6	7.76	468	233	-	-	2.14	-	Clear, slight sulphur odour
	7	37.8	10.6	7.84	475	240	-	-	3.41	-	Clear, slight sulphur odour
	8	37.8	10.4	7.78	480	238	13	0	2.15	-	Clear, slight sulphur odour
TW20-1 Oct 22, 2020	8	37.8	9.9	7.59	472	236	43	0	2.21	0	Strong 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 (1/2)

	Parameter	Units	TW20-1 4hr September 29, 2020	TW20-1 8hr September 29, 2020	TW20-1 R1 / R2 October 23, 2020	ODWQS	Standard
Microbiological Parameters	Escherichia coli	CFU/100mL	ND (1)	ND (1)	ND (1) / ND (1)	0	MAC
	Fecal Coliform	CFU/100mL	ND (1)	ND (1)	ND (1) / ND (1)	0	MAC
	Total coliforms	CFU/100mL	12	16	1 / ND(1)	0	MAC
	Heterotrophic Plate Count	CFU/1mL	ND (10)	ND (10)	25 / 30	-	-
General Inorganics	Alkalinity (as $CaCO_3$)	mg/L	233	230	-	30-500	OG
	Ammonia as N (NH_3)	mg/L	0.08	0.08	-	-	-
	Dissolved Organic Carbon (DOC)	mg/L	3.7	3.7	-	5 / 10	AO / MCT
	Colour	TCU	**12**	**12**	**16**	5 / 7	AO / MCT
	Electrical Conductivity	uS/cm	433	434	-	-	-
	Total Hardness (as $CaCO_3$)	mg/L	**216**	**206**	-	80-100	OG
	pH	pH units	7.59	7.65	-	6.5-8.5	OG
	Phenols	mg/L	0.002	0.004	-	-	-
	Total Dissolved Solids (TDS)	mg/L	264	262	-	500	AO
	Sulphide (S_2)	mg/L	0.13	0.14	-	0.05	AO
	Tannin and Lignin	mg/L	-	-	-	-	-
	Total Kjeldahl Nitrogen (TKN)	mg/L	0.30	0.27	-	-	-
	Organic Nitrogen (TKN - NH_3)	mg/L	**0.22**	**0.19**	-	0.15	OG
	Turbidity	NTU	2.1	1.1	-	5 / 5	AO / MCT

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

Project: 65057.01
Date: November 2020

Summary of Laboratory Parameters Analyzed (2/2)

	Parameter	Units	TW20-1 4hr September 29, 2020	TW20-1 8hr September 29, 2020	TW20-1 R1 / R2 October 23, 2020	ODWQS	Standard
Anions	Chloride (Cl)	mg/L	11.0	11.5	-	250 / 250	AO / MCT
	Fluoride (F)	mg/L	0.24	0.25	-	1.5	MAC
	Nitrate as N (NO_3)	mg/L	<0.05	<0.05	-	10	MAC
	Nitrite as N (NO_2)	mg/L	<0.05	<0.05	-	0.1	MAC
	Sulphate (SO_4)	mg/L	18.6	17.9	-	500 / 500	AO / MCT
Metals	Calcium (Ca)	mg/L	55.91	52.77	-	-	-
	Iron (Fe)	mg/L	0.110	0.088	-	0.3 / 5-10	AO / MCT
	Magnesium (Mg)	mg/L	18.66	17.97	-	-	-
	Manganese (Mn)	mg/L	0.014	0.015	-	0.05 / 1.0	AO / MCT
	Potassium (K)	mg/L	3.80	3.58	-	-	-
	Sodium (Na)	mg/L	15.81	16.48	-	20 / 200 / 200	WL / AO / MCT

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

Project: 65057.01
Date: November 2020

AGAT Laboratories

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http://www.agatlabs.com

CLIENT NAME: GEMTEC CONSULTING ENGINEERS AND SCIENTISTS
32 STEACIE DRIVE
OTTAWA, ON K2K 2A9
(613) 836-1422
ATTENTION TO: Andrius Paznekas
PROJECT: 65057.01
AGAT WORK ORDER: 20Z657526
MICROBIOLOGY ANALYSIS REVIEWED BY: Nivine Basily, Inorganics Report Writer
WATER ANALYSIS REVIEWED BY: Yris Verastegui, Report Reviewer
DATE REPORTED: Oct 07, 2020
PAGES (INCLUDING COVER): 16
VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

Notes

Disclaimer:

- *All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.*
- *All samples will be disposed of within 30 days following analysis, unless expressly agreed otherwise in writing. Please contact your Client Project Manager if you require additional sample storage time.*
- *AGAT's liability in connection with any delay, performance or non-performance of these services is only to the Client and does not extend to any other third party. Unless expressly agreed otherwise in writing, AGAT's liability is limited to the actual cost of the specific analysis or analyses included in the services.*
- *This Certificate shall not be reproduced except in full, without the written approval of the laboratory.*
- *The test results reported herewith relate only to the samples as received by the laboratory.*
- *Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, warranties of merchantability, fitness for a particular purpose, or non-infringement. AGAT assumes no responsibility for any errors or omissions in the guidelines contained in this document.*
- *All reportable information as specified by ISO/IEC 17025:2017 is available from AGAT Laboratories upon request.*

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Western Enviro-Agricultural Laboratory Association (WEALA)
Environmental Services Association of Alberta (ESAA)

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Certificate of Analysis

AGAT WORK ORDER: 20Z657526

PROJECT: 65057.01

CLIENT NAME: GEMTEC CONSULTING ENGINEERS AND SCIENTISTS

ATTENTION TO: Andrius Paznekas

SAMPLING SITE:

SAMPLED BY:

Fecal Coliforms in Water

DATE RECEIVED: 2020-09-30

DATE REPORTED: 2020-10-07

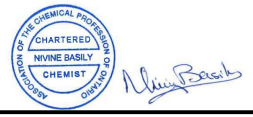
				SAMPLE DESCRIPTION:	TW20-1 4Hr	TW20-1 8Hr
				SAMPLE TYPE:	Water	Water
				DATE SAMPLED:	2020-09-29 12:00	2020-09-29 16:00
Parameter	Unit	G / S	RDL		1502213	1502240
Fecal Coliform	CFU/100mL		1		ND	ND

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

1502213-1502240 ND - Not Detected.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:



Results relate only to the items tested. Results apply to samples as received.

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Certificate of Analysis

AGAT WORK ORDER: 20Z657526

PROJECT: 65057.01

CLIENT NAME: GEMTEC CONSULTING ENGINEERS AND SCIENTISTS

ATTENTION TO: Andrius Paznekas

SAMPLING SITE:

SAMPLED BY:

Heterotrophic Plate Count in Water

DATE RECEIVED: 2020-09-30

DATE REPORTED: 2020-10-07

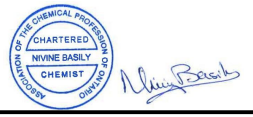
		SAMPLE DESCRIPTION:		TW20-1 4Hr	TW20-1 8Hr
		SAMPLE TYPE:		Water	Water
		DATE SAMPLED:		2020-09-29 12:00	2020-09-29 16:00
Parameter	**Unit**	**G / S**	**RDL**	**1502213**	**1502240**
Heterotrophic Plate Count	CFU/1ml	0	**10**	ND	ND

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O. Reg 169/03 - Ontario Drinking Water Quality Standards - Aesthetic Objectives and Operational Guidelines
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

1502213-1502240 ND - Not Detected.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:



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Certificate of Analysis

AGAT WORK ORDER: 20Z657526

PROJECT: 65057.01

CLIENT NAME: GEMTEC CONSULTING ENGINEERS AND SCIENTISTS

ATTENTION TO: Andrius Paznekas

SAMPLING SITE:

SAMPLED BY:

Total Coliforms & E. Coli (Using MI Agar)

DATE RECEIVED: 2020-09-30

DATE REPORTED: 2020-10-07

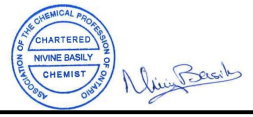
		SAMPLE DESCRIPTION:		TW20-1 4Hr	TW20-1 8Hr
		SAMPLE TYPE:		Water	Water
		DATE SAMPLED:		2020-09-29 12:00	2020-09-29 16:00
Parameter	Unit	G / S	RDL	1502213	1502240
Escherichia coli	CFU/100mL	0	1	ND	ND
Total Coliforms	CFU/100mL	0	1	12	16

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O. Reg 169/03 - Ontario Drinking Water Quality Standards. Na value derived from O. Reg 248
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

1502213-1502240 ND - Not Detected.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:



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AGAT WORK ORDER: 20Z657526

PROJECT: 65057.01

CLIENT NAME: GEMTEC CONSULTING ENGINEERS AND SCIENTISTS

ATTENTION TO: Andrius Paznekas

SAMPLING SITE:

SAMPLED BY:

Metals Scan

DATE RECEIVED: 2020-09-30

DATE REPORTED: 2020-10-07

		SAMPLE DESCRIPTION:		TW20-1 4Hr
		SAMPLE TYPE:		Water
		DATE SAMPLED:		2020-09-29 12:00
Parameter	Unit	G / S	RDL	1502213
Total Iron	mg/L	0.3	0.010	0.110
Total Manganese	mg/L	0.05	0.002	0.014

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O. Reg 169/03 - Ontario Drinking Water Quality Standards - Aesthetic Objectives and Operational Guidelines
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: Iris Verástegui

Results relate only to the items tested. Results apply to samples as received.

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Certificate of Analysis

AGAT WORK ORDER: 20Z657526

PROJECT: 65057.01

CLIENT NAME: GEMTEC CONSULTING ENGINEERS AND SCIENTISTS

ATTENTION TO: Andrius Paznekas

SAMPLING SITE:

SAMPLED BY:

Metals Scan incl. Chromium VI

DATE RECEIVED: 2020-09-30

DATE REPORTED: 2020-10-07

			SAMPLE DESCRIPTION:		TW20-1 8Hr
			SAMPLE TYPE:		Water
			DATE SAMPLED:		2020-09-29 16:00
Parameter	Unit	G / S: A	G / S: B	RDL	1502240
Total Aluminum	mg/L		0.1	0.010	0.055[<B]
Total Antimony	mg/L	0.006		0.003	<0.003[<A]
Total Arsenic	mg/L	0.01		0.003	<0.003[<A]
Total Barium	mg/L	1.0		0.002	0.352[<A]
Total Beryllium	mg/L			0.0005	<0.0005
Total Boron	mg/L	5.0		0.010	0.052[<A]
Total Cadmium	mg/L	0.005		0.0001	<0.0001[<A]
Total Chromium	mg/L	0.05		0.003	<0.003[<A]
Chromium VI	mg/L			0.005	<0.005
Total Cobalt	mg/L			0.0005	<0.0005
Total Copper	mg/L		1	0.001	<0.001[<B]
Total Iron	mg/L		0.3	0.010	0.088[<B]
Total Lead	mg/L	0.010		0.001	<0.001[<A]
Total Manganese	mg/L		0.05	0.002	0.015[<B]
Total Mercury	mg/L	0.001		0.0001	<0.0001[<A]
Total Molybdenum	mg/L			0.002	<0.002
Total Nickel	mg/L			0.003	<0.003
Total Selenium	mg/L	0.05		0.001	<0.001[<A]
Total Silver	mg/L			0.0001	<0.0001
Total Strontium	mg/L			0.005	1.59
Total Thallium	mg/L			0.0003	<0.0003
Total Titanium	mg/L			0.002	0.003
Total Tungsten	mg/L			0.010	<0.010
Total Uranium	mg/L	0.02		0.0005	<0.0005[<A]
Total Vanadium	mg/L			0.002	<0.002
Total Zinc	mg/L		5	0.005	<0.005[<B]
Total Zirconium	mg/L			0.004	<0.004

Certified By: Iris Verástegui

Results relate only to the items tested. Results apply to samples as received.

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Certificate of Analysis

AGAT WORK ORDER: 20Z657526

PROJECT: 65057.01

CLIENT NAME: GEMTEC CONSULTING ENGINEERS AND SCIENTISTS

ATTENTION TO: Andrius Paznekas

SAMPLING SITE:

SAMPLED BY:

Metals Scan incl. Chromium VI

DATE RECEIVED: 2020-09-30

DATE REPORTED: 2020-10-07

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to O. Reg 169/03 - Ontario Drinking Water Quality Standards. Na value derived from O. Reg 248, B Refers to O. Reg 169/03 - Ontario Drinking Water Quality Standards - Aesthetic Objectives and Operational Guidelines
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Analysis performed at AGAT Toronto (unless marked by *)

Certified By: Iris Verástegui

Results relate only to the items tested. Results apply to samples as received.

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Certificate of Analysis

AGAT WORK ORDER: 20Z657526

PROJECT: 65057.01

CLIENT NAME: GEMTEC CONSULTING ENGINEERS AND SCIENTISTS

ATTENTION TO: Andrius Paznekas

SAMPLING SITE:

SAMPLED BY:

Subdiv. Well Water Supply

DATE RECEIVED: 2020-09-30

DATE REPORTED: 2020-10-07

			SAMPLE DESCRIPTION:		TW20-1 4Hr	TW20-1 8Hr
			SAMPLE TYPE:		Water	Water
			DATE SAMPLED:		2020-09-29 12:00	2020-09-29 16:00
Parameter	Unit	G / S: A	G / S: B	RDL	1502213	1502240
Electrical Conductivity	µS/cm			2	433	434
pH	pH Units		6.5-8.5	NA	7.59	7.65
Hardness (as CaCO3) (Calculated)	mg/L		80-100	0.5	216	206
Total Dissolved Solids	mg/L		500	20	264[<B]	262[<B]
Alkalinity (as CaCO3)	mg/L		30-500	5	233	230
Fluoride	mg/L	1.5		0.05	0.24[<A]	0.25[<A]
Chloride	mg/L		250	0.10	11.0[<B]	11.5[<B]
Nitrate as N	mg/L	10.0		0.05	<0.05[<A]	<0.05[<A]
Nitrite as N	mg/L	1.0		0.05	<0.05[<A]	<0.05[<A]
Sulphate	mg/L		500	0.10	18.6[<B]	17.9[<B]
Ammonia as N	mg/L			0.02	0.08	0.08
Total Kjeldahl Nitrogen	mg/L			0.10	0.30	0.27
Dissolved Organic Carbon	mg/L		5	0.5	3.7[<B]	3.7[<B]
Phenols	mg/L			0.001	0.002	0.004
Hydrogen Sulphide	mg/L			0.05	0.13	0.14
True Colour	TCU		5	5	12[>B]	12[>B]
Turbidity	NTU		5	0.5	2.1[<B]	1.1[<B]
Total Calcium	mg/L			0.25	55.91	52.77
Total Magnesium	mg/L			0.25	18.66	17.97
Total Potassium	mg/L			0.25	3.80	3.58
Total Sodium	mg/L	20	200	0.25	15.81[<A]	16.48[<A]
% Difference/ Ion Balance (Calculated)	%			NA	2.43	3.76

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to O. Reg 169/03 - Ontario Drinking Water Quality Standards. Na value derived from O. Reg 248, B Refers to O. Reg 169/03 - Ontario Drinking Water Quality Standards - Aesthetic Objectives and Operational Guidelines
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

1502213-1502240 As per Client's request, Colour analysis was performed on filtered sample.
DOC analysis completed on a lab filtered sample.
Dilution required, RDL has been increased accordingly.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: Iris Verástegui

Results relate only to the items tested. Results apply to samples as received.

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http://www.agatlabs.com

Exceedance Summary

AGAT WORK ORDER: 20Z657526

PROJECT: 65057.01

CLIENT NAME: GEMTEC CONSULTING ENGINEERS AND SCIENTISTS

ATTENTION TO: Andrius Paznekas

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
1502213	TW20-1 4Hr	ON 169/03 AO&OG	Subdiv. Well Water Supply	Hardness (as CaCO3) (Calculated)	mg/L	80-100	216
1502213	TW20-1 4Hr	ON 169/03 AO&OG	Subdiv. Well Water Supply	True Colour	TCU	5	12
1502213	TW20-1 4Hr	ON 169/03 MAC/IMAC	Total Coliforms & E. Coli (Using MI Agar)	Total Coliforms	CFU/100mL	0	12
1502240	TW20-1 8Hr	ON 169/03 AO&OG	Subdiv. Well Water Supply	Hardness (as CaCO3) (Calculated)	mg/L	80-100	206
1502240	TW20-1 8Hr	ON 169/03 AO&OG	Subdiv. Well Water Supply	True Colour	TCU	5	12
1502240	TW20-1 8Hr	ON 169/03 MAC/IMAC	Total Coliforms & E. Coli (Using MI Agar)	Total Coliforms	CFU/100mL	0	16

Results relate only to the items tested. Results apply to samples as received.

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Quality Assurance

CLIENT NAME: GEMTEC CONSULTING ENGINEERS AND SCIENTISTS

AGAT WORK ORDER: 20Z657526

PROJECT: 65057.01

ATTENTION TO: Andrius Paznekas

SAMPLING SITE:

SAMPLED BY:

Microbiology Analysis

RPT Date: Oct 07, 2020			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Fecal Coliforms in Water															
Fecal Coliform	1502213	1502213	ND	ND	NA	< 1									
Heterotrophic Plate Count in Water															
Heterotrophic Plate Count	1502213	1502213	ND	ND	NA	< 10									
Total Coliforms & E. Coli (Using MI Agar)															
Escherichia coli	1502213	1502213	ND	ND	NA	< 1									
Total Coliforms	1502213	1502213	12	12	0.0%	< 1									

Comments: ND - Not Detected, NA - % RPD Not Applicable

Certified By:

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AGAT Laboratories

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Quality Assurance

CLIENT NAME: GEMTEC CONSULTING ENGINEERS AND SCIENTISTS

AGAT WORK ORDER: 20Z657526

PROJECT: 65057.01

ATTENTION TO: Andrius Paznekas

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: Oct 07, 2020			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Metals Scan incl. Chromium VI															
Total Aluminum	1510487		0.012	0.012	NA	< 0.010	99%	70%	130%	107%	80%	120%	100%	70%	130%
Total Antimony	1510487		<0.003	<0.003	NA	< 0.003	102%	70%	130%	107%	80%	120%	98%	70%	130%
Total Arsenic	1510487		<0.003	<0.003	NA	< 0.003	101%	70%	130%	112%	80%	120%	101%	70%	130%
Total Barium	1510487		0.072	0.073	1.4%	< 0.002	97%	70%	130%	103%	80%	120%	98%	70%	130%
Total Beryllium	1510487		<0.0005	<0.0005	NA	< 0.0005	96%	70%	130%	104%	80%	120%	95%	70%	130%
Total Boron	1510487		0.063	0.064	1.6%	< 0.010	96%	70%	130%	107%	80%	120%	98%	70%	130%
Total Cadmium	1510487		<0.0001	<0.0001	NA	< 0.0001	99%	70%	130%	108%	80%	120%	96%	70%	130%
Total Chromium	1510487		<0.003	<0.003	NA	< 0.003	101%	70%	130%	108%	80%	120%	99%	70%	130%
Chromium VI	1515059		<0.005	<0.005	NA	< 0.005	100%	70%	130%	100%	80%	120%	95%	70%	130%
Total Cobalt	1510487		0.0006	0.0006	NA	< 0.0005	109%	70%	130%	110%	80%	120%	102%	70%	130%
Total Copper	1510487		<0.001	<0.001	NA	< 0.001	101%	70%	130%	110%	80%	120%	98%	70%	130%
Total Iron	1510487		0.065	0.066	1.5%	< 0.010	104%	70%	130%	109%	80%	120%	103%	70%	130%
Total Lead	1510487		0.003	<0.001	NA	< 0.001	96%	70%	130%	98%	80%	120%	86%	70%	130%
Total Manganese	1510487		0.111	0.109	1.8%	< 0.002	108%	70%	130%	111%	80%	120%	98%	70%	130%
Total Mercury	1502269		<0.0001	<0.0001	NA	< 0.0001	103%	70%	130%	96%	80%	120%	96%	70%	130%
Total Molybdenum	1510487		0.004	0.004	NA	< 0.002	102%	70%	130%	111%	80%	120%	102%	70%	130%
Total Nickel	1510487		<0.003	<0.003	NA	< 0.003	109%	70%	130%	109%	80%	120%	102%	70%	130%
Total Selenium	1510487		<0.001	<0.001	NA	< 0.001	106%	70%	130%	90%	80%	120%	99%	70%	130%
Total Silver	1510487		<0.0001	<0.0001	NA	< 0.0001	110%	70%	130%	110%	80%	120%	97%	70%	130%
Total Strontium	1510487		0.280	0.275	1.8%	< 0.005	109%	70%	130%	109%	80%	120%	122%	70%	130%
Total Thallium	1510487		<0.0003	<0.0003	NA	< 0.0003	101%	70%	130%	108%	80%	120%	100%	70%	130%
Total Titanium	1510487		<0.002	<0.002	NA	< 0.002	110%	70%	130%	108%	80%	120%	108%	70%	130%
Total Tungsten	1510487		<0.010	<0.010	NA	< 0.010	97%	70%	130%	109%	80%	120%	98%	70%	130%
Total Uranium	1510487		<0.0005	<0.0005	NA	< 0.0005	101%	70%	130%	107%	80%	120%	103%	70%	130%
Total Vanadium	1510487		<0.002	<0.002	NA	< 0.002	110%	70%	130%	110%	80%	120%	102%	70%	130%
Total Zinc	1510487		<0.005	0.006	NA	< 0.005	99%	70%	130%	111%	80%	120%	99%	70%	130%
Total Zirconium	1510487		<0.004	<0.004	NA	< 0.004	102%	70%	130%	110%	80%	120%	101%	70%	130%
Subdiv. Well Water Supply															
Electrical Conductivity	1501901		1720	1720	0.0%	< 2	98%	90%	110%						
pH	1501901		7.51	7.54	0.4%	NA	100%	90%	110%						
Total Dissolved Solids	1498591		702	710	1.1%	< 20	100%	80%	120%						
Alkalinity (as CaCO3)	1501901		503	505	0.4%	< 5	98%	80%	120%						
Fluoride	1498798		<0.07	<0.07	NA	< 0.05	103%	90%	110%	98%	90%	110%	108%	85%	115%
Chloride	1498798		80.3	70.5	13.0%	< 0.10	94%	70%	130%	102%	80%	120%	103%	70%	130%
Nitrate as N	1498798		<0.5	<0.5	NA	< 0.05	95%	70%	130%	99%	80%	120%	102%	70%	130%
Nitrite as N	1498798		<0.5	<0.5	NA	< 0.05	98%	70%	130%	100%	80%	120%	95%	70%	130%
Sulphate	1498798		3.2	2.9	9.8%	< 0.10	93%	70%	130%	99%	80%	120%	100%	70%	130%
Ammonia as N	1503654		<0.02	<0.02	NA	< 0.02	106%	70%	130%	102%	80%	120%	96%	70%	130%

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Quality Assurance

CLIENT NAME: GEMTEC CONSULTING ENGINEERS AND SCIENTISTS

AGAT WORK ORDER: 20Z657526

PROJECT: 65057.01

ATTENTION TO: Andrius Paznekas

SAMPLING SITE:

SAMPLED BY:

Water Analysis (Continued)

RPT Date: Oct 07, 2020			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Total Kjeldahl Nitrogen	1503654		0.35	0.33	NA	< 0.10	101%	70%	130%	101%	80%	120%	101%	70%	130%
Dissolved Organic Carbon	1454971		3.6	3.5	2.8%	< 0.5	107%	90%	110%	102%	90%	110%	99%	80%	120%
Phenols	1483748		0.001	<0.001	NA	< 0.001	97%	90%	110%	103%	90%	110%	104%	80%	120%
Sulphide	1502635		<0.05	<0.05	NA	< 0.05	99%	80%	120%	99%	85%	115%	98%	70%	130%
Hydrogen Sulphide	1502635		<0.05	<0.05	NA	< 0.05	99%	90%	110%	99%	90%	110%	98%	80%	120%
True Colour	1502635		18	19	NA	< 5	103%	90%	110%						
Turbidity	1502213	1502213	2.1	2.1	NA	< 0.5	102%	80%	120%						
Total Calcium	1510487		43.4	42.5	2.1%	< 0.05	96%	70%	130%	88%	80%	120%	96%	70%	130%
Total Magnesium	1510487		11.2	11.2	0.0%	< 0.05	94%	70%	130%	86%	80%	120%	95%	70%	130%
Total Potassium	1510487		3.34	3.34	0.0%	< 0.05	95%	70%	130%	87%	80%	120%	94%	70%	130%
Total Sodium	1510487		39.5	38.9	1.5%	< 0.05	100%	70%	130%	92%	80%	120%	98%	70%	130%

Comments: NA signifies Not Applicable.
If the RPD value is NA, the results of the duplicates are under 5X the RDL and will not be calculated.

Certified By: Iris Veraistegui

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Method Summary

CLIENT NAME: GEMTEC CONSULTING ENGINEERS AND SCIENTISTS | **AGAT WORK ORDER: 20Z657526**

PROJECT: 65057.01 | **ATTENTION TO: Andrius Paznekas**

SAMPLING SITE: | **SAMPLED BY:**

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Microbiology Analysis			
Fecal Coliform	MIC-93-7000	SM 9222 D	MF/INCUBATOR
Heterotrophic Plate Count	MIC-93- 7020	SM 9215 C	INCUBATOR
Escherichia coli	MIC-93-7010	EPA 1604	Membrane Filtration
Total Coliforms	MIC-93-7010	EPA 1604	Membrane Filtration

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Method Summary

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AGAT WORK ORDER: 20Z657526

PROJECT: 65057.01

ATTENTION TO: Andrius Paznekas

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Total Iron	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Manganese	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Aluminum	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Antimony	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Arsenic	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Barium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Beryllium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Boron	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Cadmium	MET -93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Chromium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Chromium VI	INOR-93-6034	modified from SM 3500-CR B	SPECTROPHOTOMETER
Total Cobalt	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Copper	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Lead	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Mercury	MET-93-6100	modified from EPA 245.2 and SM 3112 B	CVAAS
Total Molybdenum	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Nickel	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Selenium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Silver	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Strontium	INOR-93-6003	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Thallium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Titanium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Tungsten	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Uranium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Vanadium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Zinc	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Zirconium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Electrical Conductivity	INOR-93-6000	modified from SM 2510 B	PC TITRATE
pH	INOR-93-6000	modified from SM 4500-H+ B	PC TITRATE

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PROJECT: 65057.01

ATTENTION TO: Andrius Paznekas

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Hardness (as CaCO3) (Calculated)	MET-93-6105	modified from EPA SW-846 6010C & 200.7 & SM 2340 B	CALCULATION
Total Dissolved Solids	INOR-93-6028	modified from EPA 1684,ON MOECC E3139,SM 2540C,D	BALANCE
Alkalinity (as CaCO3)	INOR-93-6000	SM 2320 B	PC TITRATE
Fluoride	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Chloride	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Nitrate as N	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Sulphate	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Ammonia as N	INOR-93-6059	modified from SM 4500-NH3 H	LACHAT FIA
Total Kjeldahl Nitrogen	INOR-93-6048	modified from EPA 351.2 and SM 4500-NORG D	LACHAT FIA
Dissolved Organic Carbon	INOR-93-6049	EPA 415.1 & SM 5310 B	SHIMADZU CARBON ANALYZER
Phenols	INOR-93-6072	modified from SM 5530 D	LACHAT FIA
Hydrogen Sulphide	INOR-93-6054	SM 4500 S2- D	SPECTROPHOTOMETER
True Colour	INOR-93-6046	SM 2120 C	SPECTROPHOTOMETER
Turbidity	INOR-93-6044	modified from SM 2130 B	NEPHELOMETER
Total Calcium	MET-93-6105	modified from EPA 6010D	ICP/OES
Total Magnesium	MET-93-6105	modified from EPA 6010D	ICP/OES
Total Potassium	MET-93-6105	modified from EPA 6010D	ICP/OES
Total Sodium	MET-93-6105	modified from EPA 6010D	ICP/OES
% Difference/ Ion Balance (Calculated)		SM 1030 E	CALCULATION

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CLIENT NAME: GEMTEC CONSULTING ENGINEERS AND SCIENTISTS
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OTTAWA, ON K2K 2A9
(613) 836-1422

ATTENTION TO: Andrius Paznekas

PROJECT: 65057.01

AGAT WORK ORDER: 20Z667841

MICROBIOLOGY ANALYSIS REVIEWED BY: Nivine Basily, Inorganics Report Writer

WATER ANALYSIS REVIEWED BY: Yris Verastegui, Report Reviewer

DATE REPORTED: Oct 27, 2020

PAGES (INCLUDING COVER): 10

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*Notes

Disclaimer:

- *All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.*
- *All samples will be disposed of within 30 days following analysis, unless expressly agreed otherwise in writing. Please contact your Client Project Manager if you require additional sample storage time.*
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- *The test results reported herewith relate only to the samples as received by the laboratory.*
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- *All reportable information as specified by ISO/IEC 17025:2017 is available from AGAT Laboratories upon request.*

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Environmental Services Association of Alberta (ESAA)

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Certificate of Analysis

AGAT WORK ORDER: 20Z667841

PROJECT: 65057.01

CLIENT NAME: GEMTEC CONSULTING ENGINEERS AND SCIENTISTS

ATTENTION TO: Andrius Paznekas

SAMPLING SITE:

SAMPLED BY:

Fecal Coliforms in Water

DATE RECEIVED: 2020-10-23

DATE REPORTED: 2020-10-27

				SAMPLE DESCRIPTION:	TW20-1 R1	TW20-1 R2
				SAMPLE TYPE:	Water	Water
				DATE SAMPLED:	2020-10-22 16:15	2020-10-22 16:30
Parameter	Unit	G / S	RDL		1596479	1596587
Fecal Coliform	CFU/100mL		1		ND	ND

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

1596479-1596587 ND - Not Detected.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

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AGAT WORK ORDER: 20Z667841

PROJECT: 65057.01

CLIENT NAME: GEMTEC CONSULTING ENGINEERS AND SCIENTISTS

ATTENTION TO: Andrius Paznekas

SAMPLING SITE:

SAMPLED BY:

Heterotrophic Plate Count in Water

DATE RECEIVED: 2020-10-23

DATE REPORTED: 2020-10-27

				SAMPLE DESCRIPTION:	TW20-1 R1	TW20-1 R2
				SAMPLE TYPE:	Water	Water
				DATE SAMPLED:	2020-10-22 16:15	2020-10-22 16:30
Parameter	Unit	G / S	RDL		1596479	1596587
Heterotrophic Plate Count	CFU/1ml		5		25	30

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

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CLIENT NAME: GEMTEC CONSULTING ENGINEERS AND SCIENTISTS

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SAMPLING SITE:

SAMPLED BY:

Total Coliforms & E. Coli (Using MI Agar)

DATE RECEIVED: 2020-10-23

DATE REPORTED: 2020-10-27

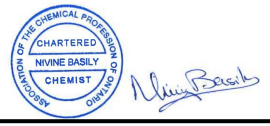
				SAMPLE DESCRIPTION:	TW20-1 R1	TW20-1 R2
				SAMPLE TYPE:	Water	Water
				DATE SAMPLED:	2020-10-22 16:15	2020-10-22 16:30
Parameter	Unit	G / S	RDL		1596479	1596587
Escherichia coli	CFU/100mL	0	1		ND	ND
Total Coliforms	CFU/100mL	0	1		1	ND

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O. Reg 169/03 - Ontario Drinking Water Quality Standards. Na value derived from O. Reg 248
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

1596479-1596587 ND - Not Detected.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:



Results relate only to the items tested. Results apply to samples as received.

AGAT Laboratories

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MISSISSAUGA, ONTARIO
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FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 20Z667841

PROJECT: 65057.01

CLIENT NAME: GEMTEC CONSULTING ENGINEERS AND SCIENTISTS

ATTENTION TO: Andrius Paznekas

SAMPLING SITE:

SAMPLED BY:

Colour (Water)

DATE RECEIVED: 2020-10-23

DATE REPORTED: 2020-10-27

				SAMPLE DESCRIPTION:	TW20-1 R1
				SAMPLE TYPE:	Water
				DATE SAMPLED:	2020-10-22 16:15
Parameter	Unit	G / S	RDL	1596479	
True Colour	TCU	5	5	16	

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O. Reg 169/03 - Ontario Drinking Water Quality Standards - Aesthetic Objectives and Operational Guidelines
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: Iris Verástegui

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Exceedance Summary

AGAT WORK ORDER: 20Z667841

PROJECT: 65057.01

CLIENT NAME: GEMTEC CONSULTING ENGINEERS AND SCIENTISTS

ATTENTION TO: Andrius Paznekas

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
1596479	TW20-1 R1	ON 169/03 AO&OG	Colour (Water)	True Colour	TCU	5	16
1596479	TW20-1 R1	ON 169/03 MAC/IMAC	Total Coliforms & E. Coli (Using MI Agar)	Total Coliforms	CFU/100mL	0	1

Results relate only to the items tested. Results apply to samples as received.

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Quality Assurance

CLIENT NAME: GEMTEC CONSULTING ENGINEERS AND SCIENTISTS

AGAT WORK ORDER: 20Z667841

PROJECT: 65057.01

ATTENTION TO: Andrius Paznekas

SAMPLING SITE:

SAMPLED BY:

Microbiology Analysis

RPT Date: Oct 27, 2020			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Total Coliforms & E. Coli (Using MI Agar)															
Escherichia coli	1596063		ND	ND	NA	< 1									
Total Coliforms	1596063		ND	ND	NA	< 1									
Fecal Coliforms in Water															
Fecal Coliform	1596479	1596479	ND	ND	NA	< 1									
Heterotrophic Plate Count in Water															
Heterotrophic Plate Count	1596479	1596479	ND	ND	NA	< 5									

Comments: ND - Not Detected, NA - % RPD Not Applicable

Certified By:

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Quality Assurance

CLIENT NAME: GEMTEC CONSULTING ENGINEERS AND SCIENTISTS

AGAT WORK ORDER: 20Z667841

PROJECT: 65057.01

ATTENTION TO: Andrius Paznekas

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: Oct 27, 2020			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Colour (Water)															
True Colour	1596764		28	28	0.0%	< 5	100%	90%	110%						

Certified By:

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Method Summary

CLIENT NAME: GEMTEC CONSULTING ENGINEERS AND SCIENTISTS

AGAT WORK ORDER: 20Z667841

PROJECT: 65057.01

ATTENTION TO: Andrius Paznekas

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Microbiology Analysis			
Fecal Coliform	MIC-93-7000	SM 9222 D	MF/INCUBATOR
Heterotrophic Plate Count	MIC-93- 7020	SM 9215 C	INCUBATOR
Escherichia coli	MIC-93-7010	EPA 1604	Membrane Filtration
Total Coliforms	MIC-93-7010	EPA 1604	Membrane Filtration
Water Analysis			
True Colour	INOR-93-6046	SM 2120 B	SPECTROPHOTOMETER

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CLIENT NAME: GEMTEC CONSULTING ENGINEERS AND SCIENTISTS
32 STEACIE DRIVE
OTTAWA, ON K2K 2A9
(613) 836-1422
ATTENTION TO: Andrius Paznekas
PROJECT: 65057.01
AGAT WORK ORDER: 20Z675747
WATER ANALYSIS REVIEWED BY: Yris Verastegui, Report Reviewer
DATE REPORTED: Nov 11, 2020
PAGES (INCLUDING COVER): 7
VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*Notes

Disclaimer:

- All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.
- All samples will be disposed of within 30 days following analysis, unless expressly agreed otherwise in writing. Please contact your Client Project Manager if you require additional sample storage time.
- AGAT's liability in connection with any delay, performance or non-performance of these services is only to the Client and does not extend to any other third party. Unless expressly agreed otherwise in writing, AGAT's liability is limited to the actual cost of the specific analysis or analyses included in the services.
- This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
- The test results reported herewith relate only to the samples as received by the laboratory.
- Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, warranties of merchantability, fitness for a particular purpose, or non-infringement. AGAT assumes no responsibility for any errors or omissions in the guidelines contained in this document.
- All reportable information as specified by ISO/IEC 17025:2017 is available from AGAT Laboratories upon request.

Member of: Association of Professional Engineers and Geoscientists of Alberta (APEGA)
Western Enviro-Agricultural Laboratory Association (WEALA)
Environmental Services Association of Alberta (ESAA)

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Certificate of Analysis

AGAT WORK ORDER: 20Z675747

PROJECT: 65057.01

CLIENT NAME: GEMTEC CONSULTING ENGINEERS AND SCIENTISTS

ATTENTION TO: Andrius Paznekas

SAMPLING SITE:

SAMPLED BY:

Nitrate, Nitrite (Water)

DATE RECEIVED: 2020-11-09

DATE REPORTED: 2020-11-11

		SAMPLE DESCRIPTION:		MW20-3
		SAMPLE TYPE:		Water
		DATE SAMPLED:		2020-11-09
Parameter	Unit	G / S	RDL	1665519
Nitrate as N	mg/L	10.0	0.05	0.23
Nitrite as N	mg/L	1.0	0.05	<0.05

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O. Reg 169/03 - Ontario Drinking Water Quality Standards. Na value derived from O. Reg 248
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: Iris Verástegui

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Quality Assurance

CLIENT NAME: GEMTEC CONSULTING ENGINEERS AND SCIENTISTS

AGAT WORK ORDER: 20Z675747

PROJECT: 65057.01

ATTENTION TO: Andrius Paznekas

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: Nov 11, 2020			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Nitrate, Nitrite (Water)															
Nitrate as N	1668761		0.44	0.45	2.2%	< 0.05	92%	70%	130%	108%	80%	120%	108%	70%	130%
Nitrite as N	1668761		<0.25	<0.25	NA	< 0.05	94%	70%	130%	97%	80%	120%	100%	70%	130%

Comments: NA Signifies Not Applicable
Duplicate NA: results are under 5X the RDL and will not be calculated.

Certified By: Iris Verástegui

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Method Summary

CLIENT NAME: GEMTEC CONSULTING ENGINEERS AND SCIENTISTS

AGAT WORK ORDER: 20Z675747

PROJECT: 65057.01

ATTENTION TO: Andrius Paznekas

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Nitrate as N	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH

Results relate only to the items tested. Results apply to samples as received.

APPENDIX F

Nitrate Dilution Calculations

Allowable Flows - Commercial Septic Systems

Site	Area m^2	Topography Factor	Soil Factor	Cover Factor	Infiltration Factor	Annual Water Surplus (m/year)	Potential Infiltration (m^3/year)
2822 Carp Road	10,120	0.20	0.40	0.10	0.70	0.378	3825

Hard Surface Area	Available Infiltration [1] (litres per day)	Maximum Septic Flow-Conventional (litres per day)[3]	Maximum Number of Users[4]	Maximum Septic Flow-Advanced[2, 3] (litres per day)	Maximum Number of Users[4]
38%	4549	1516	20	4549	61

Notes:
Computations were carried out in accordance with Section 5.6.3 of the MECP Procedure D-5-4 using a calculated surfce area of 38%.

1. Available infiltration (litres per day) = Infiltration volume (m^3/year) x (1000 litres/m^3) / (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.
3. The calculated maximum allowable flow is based on a simplification of the formula provided in Section 5.6.3.
4. Assumes 75 litres per day per person.

Ottawa Intl A WATER BUDGET MEANS FOR THE PERIOD 1939-2013 DC20492

LAT.... 45.32 WATER HOLDING CAPACITY... 75 MM HEAT INDEX... 36.57
LONG... 75.67 LOWER ZONE..... 45 MM A..... 1.078

DATE	TEMP (C)	PCPN	RAIN	MELT	PE	AE	DEF	SURP	SNOW	SOIL	ACC P
31- 1	-10.7	62	11	14	0	0	0	24	85	74	296
28- 2	-9.0	55	10	16	1	1	0	25	115	74	352
31- 3	-2.7	66	31	79	6	6	0	104	71	75	418
30- 4	5.7	71	67	76	32	32	0	111	0	75	489
31- 5	13.0	76	76	0	80	80	0	14	0	57	566
30- 6	18.3	84	84	0	116	107	-9	5	0	29	649
31- 7	20.9	86	86	0	136	103	-33	2	0	10	735
31- 8	19.6	83	83	0	117	82	-35	1	0	10	818
30- 9	14.7	84	84	0	75	65	-10	4	0	25	902
31-10	8.2	75	75	0	37	36	-1	14	0	51	76
30-11	1.3	78	60	8	10	10	0	38	10	70	154
31-12	-7.1	81	27	15	1	1	0	36	49	74	234
AVE	6.0 TTL	901	694	208	611	523	-88	378			

Ottawa Intl A STANDARD DEVIATIONS FOR THE PERIOD 1939-2013 DC20492

DATE	TEMP (C)	PCPN	RAIN	MELT	PE	AE	DEF	SURP	SNOW	SOIL	ACC P
31- 1	2.9	26	15	18	1	1	0	29	45	3	59
28- 2	2.5	27	14	25	1	1	0	35	60	3	63
31- 3	2.6	28	22	50	5	5	0	56	90	0	70
30- 4	1.8	31	32	91	9	9	0	91	3	2	78
31- 5	1.9	32	32	3	12	12	0	23	0	22	90
30- 6	1.2	39	39	0	8	18	18	17	0	29	101
31- 7	1.1	40	40	0	8	31	32	10	0	21	104
31- 8	1.3	38	38	0	8	29	31	4	0	21	117
30- 9	1.4	40	40	0	8	16	16	15	0	29	124
31-10	1.5	36	36	1	7	7	2	22	0	28	36
30-11	1.7	27	27	8	4	4	0	33	13	12	45
31-12	2.9	30	23	14	1	1	0	31	35	4	56

APPENDIX G

Water Balance Calculations

Water Budget - 2822 Carp Road

Pre-Development Conditions

Geology	Land Use[1]	Water Holding Capacity (mm)[1]	Area (m2)	Surplus[2] (mm/yr)	Topography Factor	Soil Factor	Vegetation Factor	Infiltration Coefficient	Runoff Coefficient	Infiltration (mm/yr)	Runoff (mm/yr)	Infiltration Volume (m3/yr)	Runoff Volume (m3/yr)
Fine Sandy Loam	Pasture and Shrubs	150	8,700	378	0.2	0.4	0.1	0.7	0.3	265	113	2302	987
Hard Surface (building and parking)	Impermeable[3]		1,421	721	-	-	-	0	1	0	721	0	1025
Total			10,121									2302	2011
									Weighted Average	227	199		

1. Table 3.1 MOE SWMP Planning and Design Manual (2003)

2. Surplus data from Environment Canada Water Budget Means for Ottawa Intl A 1939-2013.

3. Hard Surface surplus calculated to be average precipitation - 20% evaporation (conservative estimate as per Cuddy et al., 2013). Precipitation for Ottawa Intl. A 1939-2013 is 901 mm/year.

Post-Development Conditions

Geology	Land Use[1]	Water Holding Capacity (mm)[1]	Area (m2)	Surplus[2] (mm/yr)	Topography Factor	Soil Factor	Vegetation Factor	Infiltration Coefficient	Runoff Coefficient	Infiltration (mm/yr)	Runoff (mm/yr)	Infiltration Volume (m3/yr)	Runoff Volume (m3/yr)
Fine Sandy Loam	Urban Lawn	75	6299	378	0.2	0.4	0.1	0.7	0.3	265	113	1667	714
Hard Surface (building and parking)	Impermeable[3]	0	3822	721	-	-	-	0	1	0	721	0	2756
Total			10,121									1667	3470
									Weighted Average	165	343		

1. Table 3.1 MOE SWMP Planning and Design Manual (2003)

2. Surplus data from Environment Canada Water Budget Means for Ottawa Intl A 1939-2013.

3. Hard Surface surplus calculated to be average precipitation - 20% evaporation (conservative estimate as per Cuddy et al., 2013). Precipitation for Ottawa Intl. A 1939-2013 is 901 mm/year.

Water Balance Summary

Summary	Infil mm/yr	Runoff mm/yr	Infil m^3/yr	Runoff m^3/yr
Pre-Development	227	199	2302	2011
Post-Development	165	343	1667	3470
Change	**-63**	**144**	**-635**	**1459**

GEMTEC
Consulting Engineers and Scientists

Project: 65057.01
Date: August 2022

Ottawa Intl Airport WATER BUDGET MEANS FOR THE PERIOD 1939-2013 DC20492

LAT.... 45.32 WATER HOLDING CAPACITY...150 MM HEAT INDEX... 36.57
LONG... 75.67 LOWER ZONE..... 90 MM A..... 1.078

DATE	TEMP (C)	PCPN	RAIN	MELT	PE	AE	DEF	SURP	SNOW	SOIL	ACC P
31- 1	-10.7	62	11	14	0	0	0	21	85	142	296
28- 2	-9.0	55	10	16	1	1	0	23	115	144	352
31- 3	-2.7	66	31	79	6	6	0	99	71	149	418
30- 4	5.7	71	67	76	32	32	0	110	0	150	489
31- 5	13.0	76	76	0	80	80	0	14	0	132	566
30- 6	18.3	84	84	0	116	116	0	5	0	95	649
31- 7	20.9	86	86	0	136	126	-9	2	0	52	735
31- 8	19.6	83	83	0	117	97	-21	1	0	38	818
30- 9	14.7	84	84	0	75	67	-8	2	0	52	902
31-10	8.2	75	75	0	37	36	-1	7	0	85	76
30-11	1.3	78	60	8	10	10	0	20	10	123	154
31-12	-7.1	81	27	15	1	1	0	24	49	139	234
AVE	6.0 TTL	901	694	208	611	572	-39	328			

Ottawa Intl Airport STANDARD DEVIATIONS FOR THE PERIOD 1939-2013 DC20492

DATE	TEMP (C)	PCPN	RAIN	MELT	PE	AE	DEF	SURP	SNOW	SOIL	ACC P
31- 1	2.9	26	15	18	1	1	0	29	45	19	59
28- 2	2.5	27	14	25	1	1	0	34	60	17	63
31- 3	2.6	28	22	50	5	5	0	55	90	5	70
30- 4	1.8	31	32	91	9	9	0	90	3	2	78
31- 5	1.9	32	32	3	12	12	0	23	0	22	90
30- 6	1.2	39	39	0	8	8	1	17	0	41	101
31- 7	1.1	40	40	0	8	19	20	10	0	42	104
31- 8	1.3	38	38	0	8	23	24	4	0	42	117
30- 9	1.4	40	40	0	8	13	13	13	0	48	124
31-10	1.5	36	36	1	7	7	2	18	0	47	36
30-11	1.7	27	27	8	4	4	0	29	13	34	45
31-12	2.9	30	23	14	1	1	0	29	35	22	56

Ottawa Intl A WATER BUDGET MEANS FOR THE PERIOD 1939-2013 DC20492

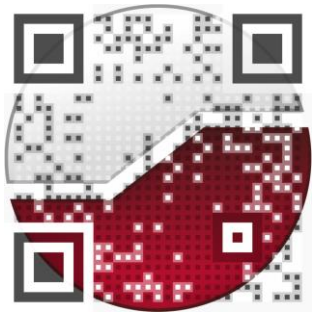
LAT.... 45.32 WATER HOLDING CAPACITY... 75 MM HEAT INDEX... 36.57
LONG... 75.67 LOWER ZONE..... 45 MM A..... 1.078

DATE	TEMP (C)	PCPN	RAIN	MELT	PE	AE	DEF	SURP	SNOW	SOIL	ACC P
31- 1	-10.7	62	11	14	0	0	0	24	85	74	296
28- 2	-9.0	55	10	16	1	1	0	25	115	74	352
31- 3	-2.7	66	31	79	6	6	0	104	71	75	418
30- 4	5.7	71	67	76	32	32	0	111	0	75	489
31- 5	13.0	76	76	0	80	80	0	14	0	57	566
30- 6	18.3	84	84	0	116	107	-9	5	0	29	649
31- 7	20.9	86	86	0	136	103	-33	2	0	10	735
31- 8	19.6	83	83	0	117	82	-35	1	0	10	818
30- 9	14.7	84	84	0	75	65	-10	4	0	25	902
31-10	8.2	75	75	0	37	36	-1	14	0	51	76
30-11	1.3	78	60	8	10	10	0	38	10	70	154
31-12	-7.1	81	27	15	1	1	0	36	49	74	234
AVE	6.0 TTL	901	694	208	611	523	-88	378			

Ottawa Intl A STANDARD DEVIATIONS FOR THE PERIOD 1939-2013 DC20492

DATE	TEMP (C)	PCPN	RAIN	MELT	PE	AE	DEF	SURP	SNOW	SOIL	ACC P
31- 1	2.9	26	15	18	1	1	0	29	45	3	59
28- 2	2.5	27	14	25	1	1	0	35	60	3	63
31- 3	2.6	28	22	50	5	5	0	56	90	0	70
30- 4	1.8	31	32	91	9	9	0	91	3	2	78
31- 5	1.9	32	32	3	12	12	0	23	0	22	90
30- 6	1.2	39	39	0	8	18	18	17	0	29	101
31- 7	1.1	40	40	0	8	31	32	10	0	21	104
31- 8	1.3	38	38	0	8	29	31	4	0	21	117
30- 9	1.4	40	40	0	8	16	16	15	0	29	124
31-10	1.5	36	36	1	7	7	2	22	0	28	36
30-11	1.7	27	27	8	4	4	0	33	13	12	45
31-12	2.9	30	23	14	1	1	0	31	35	4	56

experience • knowledge • integrity



civil	civil
geotechnical	géotechnique
environmental	environnementale
field services	surveillance de chantier
materials testing	service de laboratoire des matériaux

expérience • connaissance • intégrité