SERVICING BRIEF &
STORMWATER MANAGEMENT REPORT

135 Cardevco Road
Ottawa, Ontario

Report No. 21081

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This Servicing Brief & Stormwater Management Report is a description of the services for an existing 189 m^2 warehouse building and proposed 91 m^2 addition; and it addresses the stormwater management requirements of 2,026 m^2 of land located at 135 Cardevco Road Lane in Ottawa. There are 195 m^2 of additions to the existing building that will be demolished.

This report forms part of the stormwater management design for the proposed development. Also refer to drawings C-1 to C-4 prepared by D. B. Gray Engineering Inc.

WATER SUPPLY FOR FIREFIGHTING:

As per OBC A-3.2.5.7. Table 2, the required water supply flow rate for firefighting for the existing building to remain and proposed addition (280 m^2 building) is 1,800 L/min. (i.e. a 1-storey building not exceeding 600 sq.m.) which calculated to be a 54,000 L volume for 30-minute water supply. However, in the City of Ottawa, buildings less than 600 m^2 typically do not require an onsite water supply; therefore, since the total area of the building is only 280 m^2 it is expected that it will be exempt from requiring an on-site water supply for firefighting. (Also, the Ottawa Fire Services (OFS) may determine that a storage credit of 57,000 L is available. It is available if the site meets the FUS requirements for superior tanker shuttle; specifically the site must be within 5 km of a fire station and 2.5 km of an OFS approved water source.) It is understood that the proposed development is subject to the OBC on-site firefighting storage requirement.

ON-SITE WELL:

An existing drilled well will provide the domestic water supply. It is located in the rear yard approximately 1.2 m from an existing addition building to be demolished and 2.2 m from the proposed addition. As per the Hydrogeological Assessment and Terrain Analysis, prepared by Paterson Group (report number PH46600-LET.01 dated October 13, 2022): *"The pumping test was carried out at a pumping rate of 27 L/min for a duration of 8 hours. … The selected rate of 27 L/min provides approximately 8.5 times the maximum total daily design volume for the septic system during the 8 hour pumping test. The rate was determined to be representative of a flow rate which would be in excess of what the development would require. … The water supply aquifer intercepted by the existing well is considered to be adequate to support the water quantity demands for the proposed renovation."*

ON-SITE SEWAGE SYSTEM:

The existing private on-site septic system that services the existing development will be decommissioned; a new on-site septic system is proposed. As stated in the Hydrogeological Assessment and Terrain Analysis, prepared by Paterson Group (report number PH46600-LET.01 dated October 13, 2022): *"Paterson has completed a replacement sewage system design for the proposed development due to Site Plan requirements related to the Nitrate Impact Assessment (NIA). A septic flow value was calculated for the proposed building renovation and resulted in a total daily design sewage flow (TDDSF) of 1,026 L/day. A Design Swage flow rate of 1,500 L/day was used for design purposes. … The approved OSSO septic permit has been included in the Site Plan application submission package."* For more specific details refer to Paterson Group drawings PH4600-1(rev.1) – Sewage System Layout Plan and PH4600-2(rev.1) – Sewage System Detail & Notes.

STORMWATER MANAGEMENT:

Water Quality:

It is expected that the Mississippi Valley Conservation Authority (MVCA) will require an enhanced level of protection with 80% total suspended solids (TSS) removal from the rainwater runoff. To meet the water quality target of 80% TSS removal an oil grit separator (OGS) is proposed to be located downstream of the inlet control device (ICD). A catchment area of 2026 m^2 and a weighted runoff coefficient of 0.51 were provided to the manufacturer of the OGS, and the manufacturer selected a CDS Model PMSU2015-4 based on the information provided and the manufacturer's software which calculated that it would remove 90% of the TSS. The OGS has an oil capacity of 232 L and a sediment capacity of 0.7 m^3. (Refer to Appendix B.)

It is also expected that the MVCA will require that the stormwater management design consider temperature mitigation because the property is within the Huntley Creek Subwatershed which is a cool water system. Promoting runoff to infiltrate into the ground is an effective method to achieve temperature mitigation. Two infiltration trenches, having a total storage volume of 10.4 m^3 are proposed. This is about 82% greater than the volume required to capture the runoff from a 5 mm rainfall event (5.7 m^3 – refer to Appendix B). In Ottawa, rainfall in 65% of days with precipitation is less than 5 mm (Government of Canada, Environment and Natural Resources, Ottawa (Airport) (1991-2020)); therefore, the entire runoff from the majority of rainfall events will infiltrate into the ground. The two infiltration trenches are proposed to be located at the bottom of each of two proposed stormwater detention areas. Based on 'In-Situ Infiltration Testing', prepared by Paterson Group (file number PH4600-LET.02, dated August 20, 2024) two in-situ infiltration tests were conducted at two test pits. The location of the test pits were selected provide general coverage of the proposed infiltration systems. The field saturated hydraulic conductivity values (Kfs) of the underlying soil (glacial till) were

determined and converted to unfactored infiltration rates of 100 and 102 mm/hr. However, as per the City of Ottawa LID Technical Guidance Report a factor of safety should be considered: A safety correction factor of 2.5 has been applied to the infiltration rates. Therefore, the design infiltration rate of 40 mm/hr was used, and the trenches, having a depth of 200 mm, will have a drawdown time of 2 hours (as per the MOE Stormwater Management Planning and Design Manual a maximum drawdown time of 24 to 48 hours is recommended).

As is stated in the Geotechnical Investigation (Report PG6018 -1 Revision 5 dated February 3, 2025) prepared by the Paterson Group: *"Based on the observed groundwater elevations and infiltration depths, the long-term groundwater table is anticipated to range between the geodetic elevation of 117.0 m and 116.0 m ASL. The value provided for the long-term groundwater table does not account for seasonal high groundwater levels."* The infiltration trenches are proposed to be constructed at the highest practical elevation; and based on the long-term groundwater table elevations the underside of the infiltration trenches will be 0.75 m to 1.75 m above the long-term groundwater level. It should be noted that the highest recorded groundwater elevations were made on July 9, 2024, and from May 1st, 2024 to July 8th, 2024 rainfall in Ottawa was 155% of the 1991-2020 average for the same period (refer to calculations in Appendix B). In addition, in the 8 days prior to the test pits being excavated Ottawa received 235% of the estimated average rainfall for that 8-day period, including a storm on July 6th, 2024, that is estimated to be a 25 to 50-year storm event. Given the extreme amount of rain that fell in Ottawa in the days and months prior to the test pits being excavated, the July 9th, 2024 groundwater level observations are expected to be higher than normal groundwater levels for the time of year. It should also be noted that the infiltration trenches are adjacent to the roadside ditch and groundwater is not expected to be significantly above the bottom of ditch elevation for any appreciable amount of time. The underside of the infiltration trenches is about 1.05 m above the bottom of the roadside ditch elevation. As per the MOE Stormwater Management Planning and Design Manual it is recommended that the underside of an infiltration trenches be a minimum of 1 m above the seasonal high groundwater level. Therefore, given the above observations, and reasoning, the minimum of 1 m separation to groundwater is expected to be met most of the time. Regardless, the 'City of Ottawa Low Impact Development Technical Guidance Report Implementation in Areas with Potential Hydrogeological Constraints' states: *"… while the function of some infiltration-based LID options may be limited during seasonal high groundwater conditions (i.e., during spring freshet conditions), they may still be feasible during the remainder of the year … Seasonally high groundwater conditions may not completely exclude the use of infiltration-based LIDs … seasonal groundwater conditions can be assessed and may indicate that poor infiltration conditions may be limited to a single season (i.e. spring) and/or represent only a portion of the total year."* Furthermore, the infiltration trenches are not primarily designed for quality control (the proposed OGS manhole will provide the quality control) or quantity control; they are designed to provide temperature mitigation and to meet annual infiltration targets; in addition, the trenches have a drawdown time of 2 hours; therefore, given all of the above rationale, groundwater mounding is not a concern, a groundwater mounding analysis is not required, and the proposed design should be considered acceptable.

The Geotechnical Investigation and indicates that according to geological mapping bedrock is 5 to 10 m below grade. Refusal to excavation was only encountered at one of seven test pits at 2.20 m depth (and that may have been due to a boulder in the glacial till). Bedrock was not encountered in either of the two 1.7m deep test pits excavated in the area of the infiltration trenches for the 'In-Situ Infiltration Testing' (the bottom these test pits are approximately 1 m below the underside of the infiltration trenches). As per the MOE Stormwater Management Planning and Design Manual it is recommended that the underside of an infiltration trench be a minimum of 1 m above bedrock; therefore, bedrock is not expected to be an issue.

As per the MOE Stormwater Management Planning and Design Manual, if an infiltration trench is being used to treat stormwater runoff from roads and parking lots, pre-treatment is necessary to minimize the potential for suspended sediments to clog the trench. Only rainfall runoff from roofs and grassed areas will drain, via two culverts, directly to the surface of the infiltration trenches. Virtually all the asphalted surfaces will drain to infiltration trenches, via perforated sub-drain (with a filter sock) connected to a catch basin. The sump of the catch basin and the filter sock will prevent sediment from the asphalted areas from entering the infiltration trenches. Regardless, for the infiltration trenches to function adequately requires regular maintenance: annually, in the spring (and more frequently if necessary), any sediment accumulated on the surface of the infiltration trenches, and in the sump of the catch basin, should be removed; and prior to removal of any sediment, the perforated sub-drain connected to the catch basin should be flushed free of sediment with water. Periodically (about once every five years, more frequently if ponding on the surface of the infiltration trenches is observed after the spring thaw and before freezing conditions), the top 50 mm of clear stone (above the geotextile fabric) should be removed and replaced. Any geotextile material that has been damaged should also be replaced.

As per the Ministry of Environment, Conservation and Parks' (MECP's) Source Protection Information Atlas, the source protection plan for the subject property is the Mississippi-Rideau Source Protection Plan; and as per this plan the subject property is within a Significant Groundwater Recharge Area with a score of 6 and within an area that has a Highly Vulnerable Aquifer with a score of 6. Spills potentially entering the groundwater can be a concern with infiltration trenches. As will be required by the Environmental Compliance Approval (ECA – see page 7), within six months from the issuance of an ECA, the owner is required to implement a spill contingency plan that includes a set of procedures describing how to mitigate the impacts of a spill. Among other items, the spill contingency plan would include:

- a site plan showing buildings, streets, drainage patterns, the infiltration trenches and any other feature that could potentially be significantly impacted by a spill;
- physical obstructions and location of response and clean-up equipment,
- steps to be taken to report, contain, clean up and dispose of contaminants following a spill,
- a listing of telephone numbers for local clean-up company(ies) who may be called upon to assist in responding to spills; local emergency responders including health institution(s); and Ministry Spills Action Centre 1-800-268-6060,

- Safety Data Sheets (SDS) for each hazardous material which may be transported or stored within the area,
- the means (internal corporate procedures) by which the spill contingency plan is activated,
- a description of the spill response training provided to employees and the date(s) on which the training was provided and by whom, and
- an inventory of response and clean-up equipment available to implement the spill.

The spill contingency plan has to be kept in a conspicuous, readily accessible location on-site; and the plan needs to be amended as required by changes in the operation of the facility.

The Carp River Watershed / Subwatershed Study requires minimum annual infiltration targets but does not directly address the infiltration target in the area of the subject property; but the City of Ottawa Site Plan Pre-Application Consultation notes a minimum of 104 mm/year is required. Based on water balance and infiltration calculations the pre-development condition (i.e. prior to any development) of the property has an annual infiltration of 128 mm/year. In eastern Ontario, on hard surfaces, approximately 150 mm of the 943 mm annual precipitation (or 16%) is lost to evapotranspiration (Eastern Ontario Water Resources Management Study (2001) & Carp River Watershed / Subwatershed Study). Therefore, 84% of the precipitation on hard surfaces is available for infiltration. As per Government of Canada, Environment and Natural Resources, Ottawa (Airport) (1991-2020), there are on average 57.7 days per year where the precipitation is greater than 5 mm. Conservatively assuming only 5 mm of precipitation on each of the 57.7 days (and assuming 84% available for infiltration), 221 m^3 is available for infiltration from the runoff from the 909 m^2 of hard surfaces draining to the infiltration trenches. Therefore, on average about 3.8 m^3 is available for infiltration in each of the 57.7 days. The infiltration trenches, having a capacity of 10.4 m^3, have the capacity to capture and infiltrate into the ground 100% of this volume or about 221 m^3 annually. Inserting the 221 m^3 into the water balance calculations, the post development annual infiltration for the property is 179 mm/year; 40% greater than the pre-development infiltration and 73% greater than the minimum 104 mm/year target. (Refer to calculations in Appendix B.)

An erosion and sediment control plan has been developed to be implemented during construction, (see drawing C-2 and notes 2.1 to 2.7 on drawing C-2). In summary: to filter out construction sediment a silt fence barrier will be installed around the perimeter of the site where runoff will drain off the site; sediment capture filter sock inserts will be installed at the catch basin; straw bale check dams will be used at the entrance to onsite culverts; and any material deposited on a public road will be removed.

Water Quantity:

The stormwater management criteria for quantity control are to control the post development peak flows for the 5-year and 100-year storm events to peak flows during the 2-year storm event using a pre-development runoff coefficient, whichever is less; and a calculated time of concentration (but not less than 10 minutes). As is required by the City, the pre-development condition is considered to be an undeveloped green field

site. It is calculated that the pre-development conditions reflect a runoff coefficient of 0.30 (for both the 2-year and 5-year events) and a time of concentration of 3 minutes. Therefore, based on runoff coefficient of 0.30, a 10 minute time of concentration; and using the Rational Method; the maximum allowable release rate is 12.98 L/s for all storm events. The Modified Rational Method is used to calculate the required storage volume. The runoff coefficients for the 100-year event are increased by 25% to maximum 1.00. (Refer to calculations Appendix C.)

Stormwater will be stored within the development on the roof of the proposed addition, in two stormwater detention areas and in two infiltration trenches located at the bottom of each stormwater detention area. Drainage will be conveyed to the two stormwater detention / infiltration trenches areas via swales, two culverts and a catch basin (CB-1) via a manhole (MH-2) and a set of three 150 mm sub-drains. The set of three sub-drains connects the two stormwater detention areas / infiltration trenches and manhole. The stormwater released from the detention areas will be controlled by an inlet control device (ICD). Stormwater released through the ICD will drain to the roadside ditch via the OGS manhole.

Drainage Area I (Uncontrolled Flow Off Site – 25 m^2):
The runoff from small areas at the northeast and northwest corners of the site will be allowed to flow uncontrolled off the site. (Refer to calculations in Appendix C)

	100-year	5-year
Maximum flow rate:	0.31 L/s	0.14 L/s

Drainage Area II (Addition Roof – 186 m^2)
The two roof drains on proposed addition roof are to be flow control type roof drains which will restrict the flow of stormwater and cause water to pond on the roof. Each roof drain is to be installed with one parabolic slotted weir and releasing 0.01242 L/s/mm (5 USgpm/in). The roof drains are to be Watts with an Accutrol Weir RD-100-A1 or approved equal. The opening at the top of the flow control weir is to be a minimum 50 mm in diameter. The roof drains will outlet to grade and drain to the Stormwater Detention Area B. Stormwater released from roof drains is added to Drainage Area III. A minimum of 2 scuppers each a minimum 300 mm wide are to be installed 150 mm above the roof drains. Refer to architectural for exact locations and details. The roof is to be designed to carry the load of water having a 50 mm depth at the scuppers or 200 mm depth at the roof drains (refer to structural). (Refer to drawing C-3 and calculations Appendix C.)

	100-year	5-year
Maximum release rate:	3.49 L/s	2.55 L/s
Maximum ponding depth:	141 mm	103 mm
Maximum stored volume:	3.51 m^3	1.38 m^3

Drainage Area III (1,815 m^2):
An inlet control device (ICD) located at the outlet pipe of the stormwater detention areas will control the release of stormwater from the property. The ICD will restrict the flow and force the stormwater to back up into the detention areas. The ICD will discharge to the roadside ditch near the northeast corner of the property. The ICD shall be a plug

style with a round orifice design manufactured by Pedro Plastics (or approved equal) and each shall be sized by the manufacturer for a discharge rate of 12.67 L/s at 0.08 m head. It is calculated that an orifice area of 16,764 mm^2 ($\pm$146 mm diameter) and a discharge coefficient of 0.61 will restrict the outflow rate to 12.67 L/s at a head of 0.08 m. Based on this orifice the maximum outflow rate for the 5-year storm event is calculated to be 4.90 L/s at 0.01 m. (Refer to calculations Appendix C.)

	100-year	5-year
Maximum release rate:	12.67 L/s	4.90 L/s
Maximum ponding elevation:	118.10 m	118.03 m
Maximum ponding depth:	0.15 m	0.08 m
Maximum stored volume:	33.72 m^3	22.01 m^3

The Entire Site (refer to Appendix C.):

	100-year	5-year
Pre-development flow rate:	37.71 L/s	17.61 L/s
Maximum allowable release rate:	12.98 L/s	12.98 L/s
Maximum release rate:	12.98 L/s	5.04 L/s
Maximum stored volume:	37.23 m^3	23.39 m^3

Therefore, the maximum post-development release rate for the 100-year storm event is calculated to be equal to the maximum allowable; and 66% lower than the pre-development conditions. For the 5-year event the maximum post-development release rate is calculated to be 61% lower than the maximum allowable; and 71% lower than the pre-development conditions. Therefore, the proposed stormwater management quantity control measures are expected to have a positive impact on the downstream municipal infrastructure.

MINISTRY OF ENVIRONMENT, CONSERVATION AND PARKS (MECP) ENVIRONMENTAL COMPLIANCE APPROVAL (ECA):

It is expected that the MECP will consider the property “industrial lands” and a MECP ECA will be required for the proposed stormwater management facility.

CONCLUSIONS:

1. Since the total area of existing building and proposed addition is less than 600 m^2 in area it is expected that it will be exempt from requiring an on-site water supply for firefighting. It is understood that the proposed development is subject to the OBC on-site firefighting storage requirement.

2. An existing drilled well will provide an adequate domestic water supply for the existing building and proposed addition.

3. The existing private on-site septic system that services the existing development will be decommissioned; and a new on-site septic system is proposed.

4. An oil grit separator (OGS) has been sized to remove 80% TSS from the rainwater runoff.

5. The storage volume of the proposed infiltration trenches has been sized capture the entire runoff from greater than a 5 mm rainfall event. In Ottawa, rainfall in 65% of days with precipitation is less than 5 mm; therefore, the runoff from most rainfall events will infiltrate into the ground, an effective method for achieve temperature mitigation and groundwater recharge / water balance.

6. An erosion and sediment control plan has been developed to be implemented during construction.

7. The maximum post-development release rate for the 100-year storm event is calculated to be equal to the maximum allowable; and 66% lower than the pre-development conditions. For the 5-year event the maximum post-development release rate is calculated to be 61% lower than the maximum allowable; and 71% lower than the pre-development conditions. Therefore, the proposed stormwater management quantity control measures are expected to have a positive impact on the downstream municipal infrastructure.

Prepared by D.B. Gray Engineering Inc.

NOT VALID UNLESS
SIGNED & DATED

APPENDIX A

WATER SERVICING

Table 1					
Water Supply Coefficient - K					
Type of Construction	Classification by Group or Division in Accordance with Table 3.1.2.1. of the Building Code				
	A-2 B-1 B-2 B-3 C D	A-4 F-3	A-1 A-3	E F-2	F-1
Building is of noncombustible construction with fire separations and fire-resistance ratings provided in accordance with Subsection 3.2.2., including loadbearing walls, columns and arches.	10	12	14	17	23
Building is of noncombustible construction or of heavy timber construction conforming to Article 3.1.4.6. Floor assemblies are fire separations but with no fire-resistance rating. Roof assemblies, mezzanines, loadbearing walls, columns and arches do not have a fire-resistance rating.	16	19	22	27	37
Building is of combustible construction with fire separations and fire-resistance ratings provided in accordance with Subsection 3.2.2., including loadbearing walls, columns and arches. Noncombustible construction may be used in lieu of fire-resistance rating where permitted in Subsection 3.2.2.	18	22	25	31	41
Building is of combustible construction. Floor assemblies are fire separations but with no fire-resistance rating. Roof assemblies, mezzanines, loadbearing walls, columns and arches do not have a fire-resistance rating.	23	28	32	39	53
Column 1	2	3	4	5	6

Table 2	
Part 3 Buildings under the Building Code	Required Minimum Water Supply Flow Rate, L/min
One-storey building with building area not exceeding 600 m²	1 800
All other buildings	2 700 (if Q ≤ 108 000 L)(1) 3 600 (if Q > 108 000 L and ≤ 135 000 L)(1) 4 500 (if Q > 135 000 L and ≤ 162 000 L)(1) 5 400 (if Q > 162 000 L and ≤ 190 000 L)(1) 6 300 (if Q > 190 000 L and ≤ 270 000 L)(1) 9 000 (if Q > 270 000 L)(1)

Notes to Table 2:
(1) $Q = KVS_{tot}$ as referenced in Paragraph 3(a)

APPENDIX B

STORMWATER MANAGEMENT
(QUALITY CONTROL)

STORMWATER MANAGEMENT CALCULATIONS
(Quality Control)

Storage volume calculations for the infiltration trenches are based on the following formula:

$V = A \times d \times Void_{\%}$

where:

V = volume in m^3
A = area of infiltration trench in m^2
d = depth in meters infiltration trench
$Void_{\%}$ = percentage of voids in clear stone (typically 40%)

The above formula is derived from Equation 4.3, **Stormwater Management Planning and Design Manual**, March 2003, Ministry of the Environment.

The 'Time to Draw Down' for the infiltration trenches are based on the following formula:

$T = ((d \times 1000) / I_r) \times Void_{\%}$

where:

T = time to draw down in hours
d = depth in meters infiltration trench
I_r = design infiltration rate in mm/hr
$Void_{\%}$ = percentage of voids in clear stone (typically 40%)

The above formula is derived from **Low Impact Development Stormwater Planning and Design Guide** (Wiki Document) and **LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT PLANNING AND DESIGN GUIDE**, 2010 (TRCA/CVC, 2101, Version 1.0) (both referenced in CITY OF OTTAWA, Low Impact Development Technical Guidance Report):

Low Impact Development Stormwater Planning and Design Guide:

"To ensure that the water storage capacity of the facility is available at the onset of a storm event, it is recommended to size the storage reservoir depth, d_r, based on the depth of water that will drain via infiltration between storm events. So dr can be calculated as:

$$d_r = \frac{f' \times t}{n}$$

Where
f' = design infiltration rate of the native soil (m/h)
t = drainage time, based on local criteria or long-term average inter-event period for the location (e.g. 72 hr in southern Ontario).
n = Porosity of the stone bed aggregate material (typically 0.4 for 50 mm dia. clear stone)"

LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT PLANNING AND DESIGN GUIDE

"The depth of the soakaway or infiltration trench is dependent on the native soil infiltration rate, porosity (void space ratio) of the gravel storage layer media (i.e, aggregate material used in the stone reservoir) and the targeted time period to achieve complete drainage between storm events. The maximum allowable depth of the stone reservoir for designs without an underdrain can be calculated using the following equation:

$d_r\ max = i * t_s / Vr$
Where:
$d_r\ max$ *= Maximum stone reservoir depth (mm)*
i = Infiltration rate for native soils (mm/hr)
V_r *= Void space ratio for aggregate used (typically 0.4 for 50 mm clear stone)*
t_s *= Time to drain (design for 48 hour time to drain is recommended)".*

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD
BASED ON A FINE PARTICLE SIZE DISTRIBUTION

Project Name:	135 Cardevo Road	**Engineer:**	**D.B. Gray Engineering**
Location:	Ottawa, ON	**Contact:**	L. Brosseau
OGS #:	OGS	**Report Date:**	14-Nov-22

Area	0.2026	ha	**Rainfall Station #**	215	
Weighted C	0.51		**Particle Size Distribution**	FINE	
CDS Model	2015-4		**CDS Treatment Capacity**	20	l/s

Rainfall Intensity[1] (mm/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (l/s)	Treated Flowrate (l/s)	Operating Rate (%)	Removal Efficiency (%)	Incremental Removal (%)
0.5	9.2%	9.2%	0.1	0.1	0.7	98.6	9.0
1.0	10.6%	19.8%	0.3	0.3	1.4	98.4	10.5
1.5	9.9%	29.7%	0.4	0.4	2.2	98.2	9.7
2.0	8.4%	38.1%	0.6	0.6	2.9	98.0	8.2
2.5	7.7%	45.8%	0.7	0.7	3.6	97.8	7.5
3.0	5.9%	51.7%	0.9	0.9	4.3	97.6	5.8
3.5	4.4%	56.1%	1.0	1.0	5.1	97.4	4.2
4.0	4.7%	60.7%	1.1	1.1	5.8	97.2	4.5
4.5	3.3%	64.0%	1.3	1.3	6.5	97.0	3.2
5.0	3.0%	67.1%	1.4	1.4	7.2	96.8	2.9
6.0	5.4%	72.4%	1.7	1.7	8.7	96.4	5.2
7.0	4.4%	76.8%	2.0	2.0	10.1	95.9	4.2
8.0	3.5%	80.3%	2.3	2.3	11.6	95.5	3.4
9.0	2.8%	83.2%	2.6	2.6	13.0	95.1	2.7
10.0	2.2%	85.3%	2.9	2.9	14.5	94.7	2.1
15.0	7.0%	92.3%	4.3	4.3	21.7	92.6	6.5
20.0	4.5%	96.9%	5.7	5.7	29.0	90.6	4.1
25.0	1.4%	98.3%	7.2	7.2	36.2	88.5	1.3
30.0	0.7%	99.0%	8.6	8.6	43.5	86.4	0.6
35.0	0.5%	99.5%	10.1	10.1	50.7	84.3	0.4
40.0	0.5%	100.0%	11.5	11.5	58.0	82.2	0.4
45.0	0.0%	100.0%	12.9	12.9	65.2	80.2	0.0
50.0	0.0%	100.0%	14.4	14.4	72.4	78.1	0.0
							96.5

Removal Efficiency Adjustment[2] = 6.5%

Predicted Net Annual Load Removal Efficiency = 90.0%

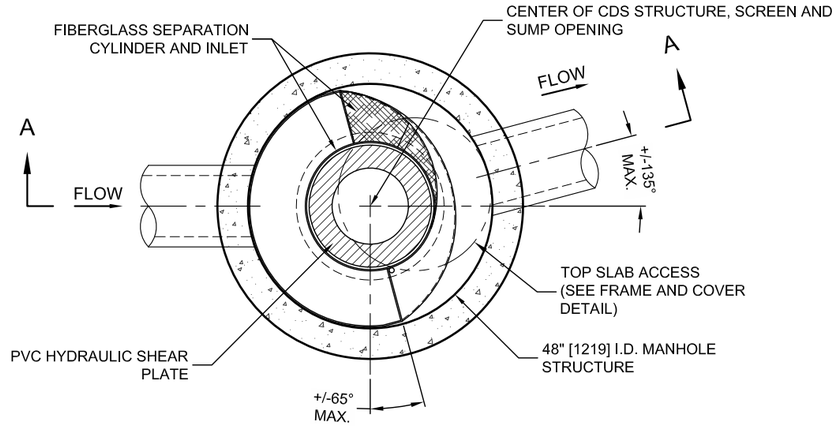
Predicted % Annual Rainfall Treated = 100.0%

1 - Based on 42 years of hourly rainfall data from Canadian Station 6105976, Ottawa ON

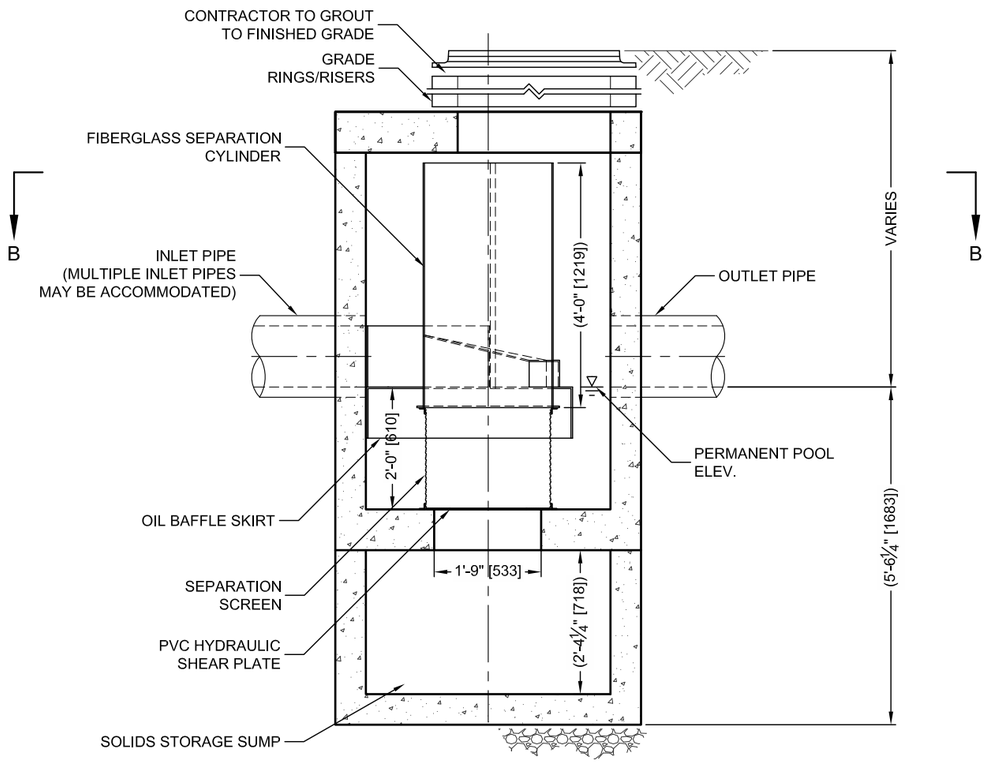
2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

3 - CDS Efficiency based on testing conducted at the University of Central Florida

4 - CDS design flowrate and scaling based on standard manufacturer model & product specifications



PLAN VIEW B-B
N.T.S.



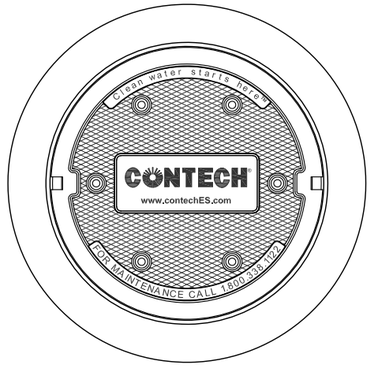
ELEVATION A-A
N.T.S.

THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 5,788,848; 6,641,720; 8,511,500; 6,581,783; RELATED FOREIGN PATENTS, OR OTHER PATENTS PENDING.

CDS PMSU2015-4-C DESIGN NOTES

THE STANDARD CDS PMSU2015-4-C CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION
GRATED INLET ONLY (NO INLET PIPE)
GRATED INLET WITH INLET PIPE OR PIPES
CURB INLET ONLY (NO INLET PIPE)
CURB INLET WITH INLET PIPE OR PIPES
CUSTOMIZABLE SUMP DEPTH AVAILABLE
ANTI-FLOTATION DESIGN AVAILABLE UPON REQUEST



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	
WATER QUALITY FLOW RATE (CFS OR L/s)	*
PEAK FLOW RATE (CFS OR L/s)	*
RETURN PERIOD OF PEAK FLOW (YRS)	*
SCREEN APERTURE (2400 OR 4700)	*

PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*

RIM ELEVATION	*

ANTI-FLOTATION BALLAST	WIDTH	HEIGHT
	*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.contechES.com
4. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS20 AND CASTINGS SHALL MEET HS20 (AASHTO M 306) LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION.
6. PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO ADD JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS, AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

CONTECH® ENGINEERED SOLUTIONS LLC
www.contechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CDS PMSU2015-4-C INLINE CDS STANDARD DETAIL

◆ Verification Statement ◆ Verification Statement ◆ Verification Statement ◆

VERIFICATION STATEMENT

GLOBE Performance Solutions

Verifies the performance of

CDS Hydrodynamic Separator®

Developed by CONTECH Engineered Solutions LLC
Scarborough, Maine, USA

Registration: GPS-ETV_VR2020-03-31_CDS

In accordance with

ISO 14034:2016

Environmental Management —
Environmental Technology Verification (ETV)

John D. Wiebe, PhD
Executive Chairman
GLOBE Performance Solutions

March 31, 2020
Vancouver, BC, Canada

Verification Body
GLOBE Performance Solutions
404 – 999 Canada Place | Vancouver, B.C | Canada |V6C 3E2

Technology description and application

The CDS® is a Stormwater treatment device designed to remove pollutants, including sediment, trash and hydrocarbons from Stormwater runoff. The CDS is typically comprised of a manhole that houses flow and screening controls that use a combination of swirl concentration and continuous deflective separation.

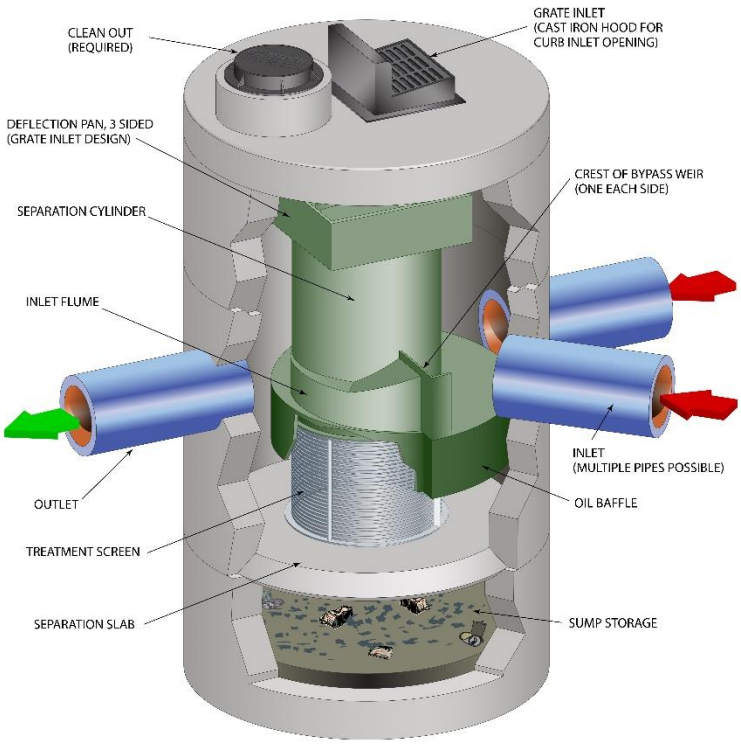


Figure 1. Graphic of typical inline CDS unit and core components.

When stormwater runoff enters the CDS unit's diversion chamber, the diversion pan guides the flow into the unit's separation chamber. The water and associated gross pollutants contained within the separation cylinder are kept in continuous circular motion by the energy generated from the incoming flow. This has the effect of a continuous deflective separation of the pollutants and their eventual deposition into the sump storage below. A perforated screen plate allows the filtered water to pass through to a volute return system and thence to the outlet pipe. The oil and other light liquids are retained within the oil baffle. Figure 1 shows a schematic representation of a typical CDS unit including critical components

Performance conditions

The data and results published in this Technology Fact Sheet were obtained from the testing program conducted on the Contech CDS-4 OGS device, in accordance with the Procedure for Laboratory Testing of Oil-Grit Separators (Version 3.0, June 2014). The Procedure was prepared by the Toronto and Region Conservation Authority (TRCA) for Environment Canada's Environmental Technology Verification (ETV) Program requirements. A copy of the Procedure may be accessed on the Canadian ETV website at www.etvcanada.ca.

Performance claim(s)

Capture test[1]:

During the sediment capture test, the Contech CDS OGS device with a false floor set to 50% of the manufacturer's recommended maximum sediment storage depth and a constant influent test sediment concentration of 200 mg/L, removed 74, 70, 63, 53, 45, 42, 32 and 23 percent of influent sediment by mass at surface loading rates of 40, 80, 200, 400, 600, 1000, 1400 and 1893 L/min/m^2, respectively.

Scour test[a]:

During the scour test, the Contech CDS OGS device with preloaded test sediment reaching 50% of the manufacturer's recommended maximum sediment storage depth, generated corrected effluent concentrations of 1.8, 6.5, 8.2, 11.2, and 309.3 mg/L during a test run[2] with approximately 5 minute duration surface loading rates of 200, 800, 1400, 2000, and 2600 L/min/m^2, respectively.

Light liquid re-entrainment test[a]:

During the light liquid re-entrainment test, the Contech CDS OGS device with surrogate low-density polyethylene beads preloaded within the oil collection skirt area, representing floating liquid to a volume equal to a depth of 50.8 mm over the sedimentation area, retained 100, 99.9, 98.6, 99.5, and 99.7 percent of loaded beads by volume during a test run[2] with 5 minutes duration surface loading rates of 200, 800, 1400, 2000, and 2600 L/min/m^2, respectively.

Performance results

The test sediment consisted of ground silica (1 – 1000 micron) with a specific gravity of 2.65, uniformly mixed to meet the particle size distribution specified in the testing procedure. The *Procedure for Laboratory Testing of Oil Grit Separators* requires that the three sample average of the test sediment particle size distribution (PSD) meet the specified PSD percent less than values within a boundary threshold of 6%. The comparison of the average test sediment PSD to the CETV specified PSD in Figure 2 indicates that the test sediment used for the capture and scour tests met this condition.

[1] The claim can be applied to other units smaller or larger than the tested unit as long as the untested units meet the scaling rule specified in the Procedure for Laboratory of Testing of Oil Grit Separators (Version 3.0, June 2014)
[2] See variance #1 in "Variances from testing procedure" section below.

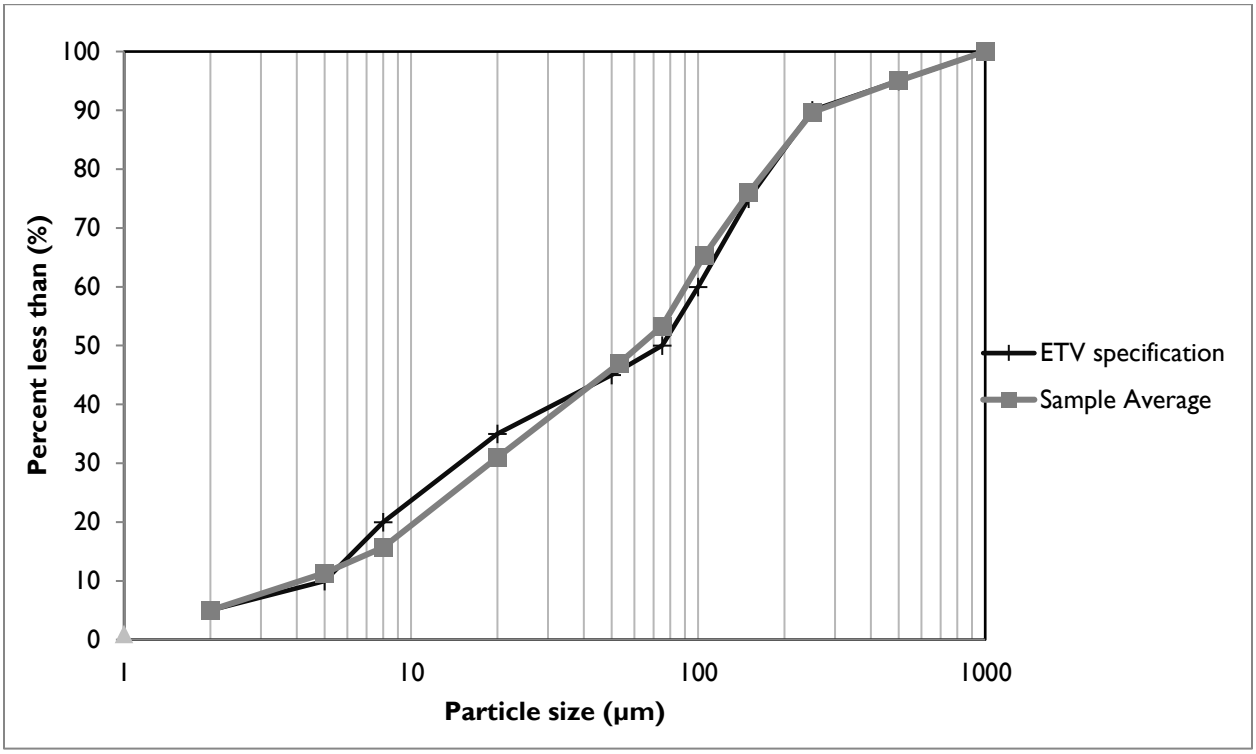


Figure 2. The three sample average particle size distribution (PSD) of the test sediment used for the capture and scour test compared to the specified PSD.

The capacity of the device to retain sediment was determined at eight surface loading rates using the modified mass balance method. This method involved measuring the mass and particle size distribution of the injected and retained sediment for each test run. Performance was evaluated with a false floor simulating the technology filled to 50% of the manufacturer's recommended maximum sediment storage depth. The test was carried out with clean water that maintained a sediment concentration below 20 mg/L. Based on these conditions, removal efficiencies for individual particle size classes and for the test sediment as a whole were determined for each of the tested surface loading rates (Table 1).

In some instances, the calculated removal efficiencies were above 100% for certain particle size fractions (marked with asterisks in Table 1). These discrepancies are not entirely avoidable and may be attributed to errors relating to the blending of sediment, collection of representative samples, and laboratory analysis of PSD. Due to these errors, caution should be exercised in applying the removal efficiencies by particle size fraction for the purposes of sizing the tested device (see Bulletin # CETV 2016-11-0001). The results for "all particle sizes by mass balance" in Table 1 are based on measurements of the total injected and retained sediment mass, and are therefore not subject to sampling or PSD analysis errors.

Table 1. Removal efficiencies (%) at specified surface loading rates.

Particle size fraction (µm)	Surface loading rate (L/min/m²)							
	40	80	200	400	600	1000	1400	1893
>500	100	100*	66	79	97	100*	84	77
250 - 500	100*	100*	85	95	100*	91	100*	75
150 - 250	99	100*	100*	97	100	75	68	37
105 - 150	100	100*	100*	74	47	45	30	27
75 - 105	90	91	100*	61	33	36	26	18
53 - 75	71	27	54	100	42	44	15	16
20 - 53	65	51	20	8	10	8	5	4
8 - 20	28	22	9	7	1	1	2	1
5 – 8	30	9	0	8	2	0	1	0
<5	11	8	16	2	6	5	2	2
All particle sizes by mass balance	**73.5**	**70.3**	**63.4**	**52.6**	**45.1**	**41.5**	**32.4**	**23.0**

* Removal efficiencies were calculated to be above 100%. Calculated values typically ranged between 101 and 175% (average 126%). Higher values were observed for the >500 µm and 150-250 µm size fractions during the 80 L/min/m² test run. See text and Bulletin # CETV 2016-11-0001 for more information.

Figure 3 compares the particle size distribution (PSD) of the three sample average of the test sediment to the PSD of the retained sediment at each of the tested surface loading rates. As expected, the capture efficiency for fine particles was generally found to decrease as surface loading rates increased.

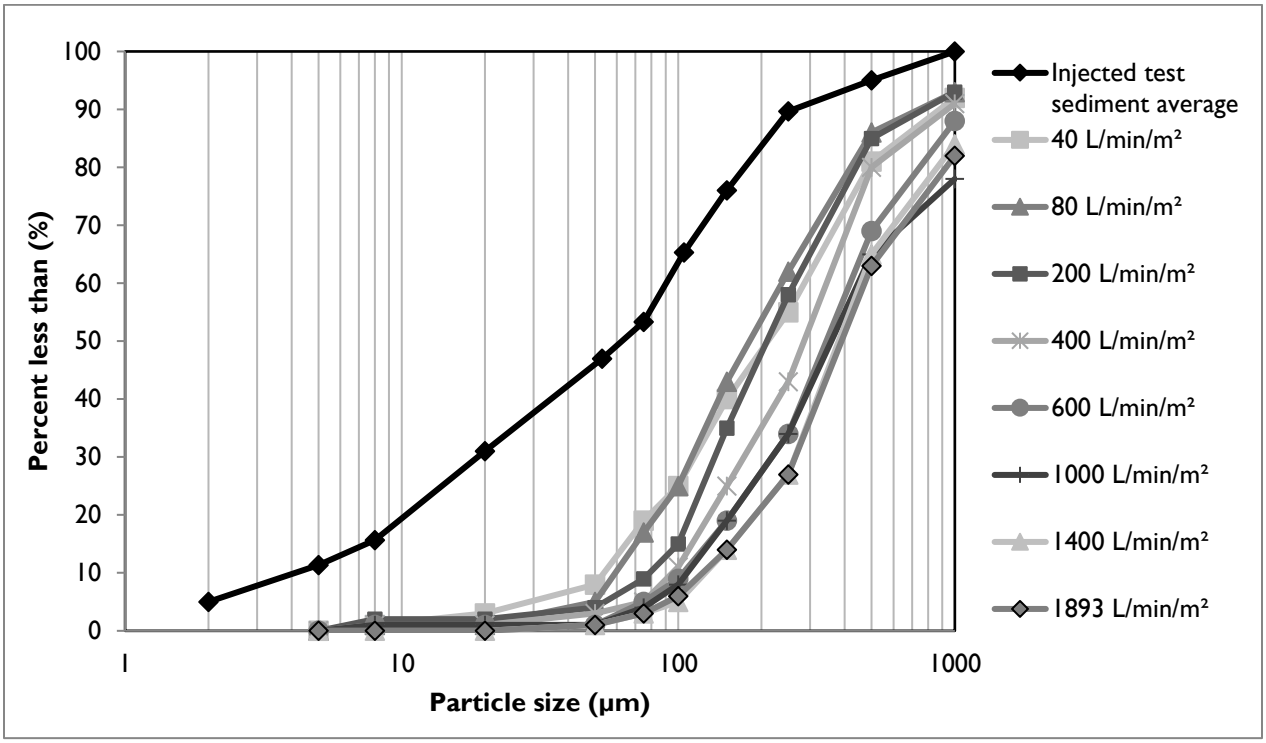


Figure 3. Particle size distribution of retained sediment in relation to the injected test sediment average.

Table 2 shows the results of the sediment scour and re-suspension test. This test involved preloading 10.2 cm of fresh test sediment into the sedimentation sump of the device. The sediment was placed on a false floor to mimic a device filled to 50% of the maximum recommended sediment storage depth. Sediment was also pre-loaded to the same depth on the separation slab (see Figure 1) since sediment was observed to have been deposited in this area during the sediment capture test. Clean water was run through the device at five surface loading rates over a 36 minute period. The test was stopped and started after the second flow rate in order to change flow meters. Each flow rate was maintained for 5 minutes with a one minute transition time between flow rates. Effluent samples were collected at one minute sampling intervals and analyzed for Suspended Sediment Concentration (SSC) and PSD by recognized methods. The effluent samples were subsequently adjusted based on the background concentration of the influent water and the smallest 5% of particles captured during the 40 L/min/m^2 sediment capture test, as per the method described in Bulletin # CETV 2016-09-0001.

Table 2. Scour test adjusted effluent sediment concentration.

Run	Surface loading rate (L/min/m^2)	Run time (min)	Background sample concentration (mg/L)	Adjusted effluent suspended sediment concentration (mg/L)[†]	Average (mg/L)
1	200	1.03	0.5	1.0	1.8
		2.03		1.6	
		3.03		1.8	
		4.03		1.8	
		5.03		2.6	
2	800	6.23	2.0	5.0	6.5
		7.23		6.7	
		8.23		9.4	
		9.23		5.4	
		10.23		5.9	
3	1400	11.43[‡]	2.0	3.1	8.2
		12.43		11.0	
		13.43		14.6	
		14.43		7.1	
		15.43		5.2	
4	2000	17.20	3.2	7.3	11.2
		18.20		22.8	
		19.20		6.9	
		20.20		6.8	
		21.20		12.1	
5	2600	22.40	8.5	248.5	309.3
		23.40		83.0	
		24.40		438.9	
		25.40		338.7	
		26.40		437.5	

[†] The adjusted effluent suspended sediment concentration represents the actual measured effluent concentration minus the smallest 5% of sediment particles (i.e. d5) removed during the 40 L/min/m^2 capture test, minus the background concentration. For more information see Bulletin # CETV 2016-09-0001.

[‡] See variance #1 in "Variances from testing procedure" section below.

The results of the light liquid re-entrainment test used to evaluate the unit's capacity to prevent re-entrainment of light liquids are reported in Table 3. The test involved preloading 58.3 L (corresponding to a 5 cm depth over the collection sump area of 1.17m^2) of surrogate low-density polyethylene beads within the oil collection skirt and running clean water through the device at five surface loading rates (200, 800, 1400, 2000, and 2600 L/min/m^2) over a 38 minute period. As with the sediment scour test, flow was stopped and started after the second flow rate to change flow meters. Each flow rate was maintained for 5 minutes with approximately 1 minute transition time between flow rates. The effluent flow was screened to capture all re-entrained pellets throughout the test.

Table 3. Light liquid re-entrainment test results.

Target Flow (L/min/m^2)	Time Stamp	Collected Volume (L)	Collected Mass (g)	Percent re-entrained by volume	Percent retained by volume
200	10:48:42	27 pellets	0.8	0.01	99.99
800	10:55:09	0.07	41	0.12	99.88
1400	11:06:59	0.8	439	1.37	98.63
2000	11:13:00	0.31	177	0.53	99.47
2600	11:19:00	0.18	98	0.31	99.69
Interim Collection Net		0.025	14.2	0.04	99.96
Total Loaded		58.3	33398	--	--
Total Re-entrained		1.385	770	--	--
Percent Re-entrained and retained		--	--	2.38	97.62

Variances from testing Procedure

The following minor deviations from the *Procedure for Laboratory Testing of Oil-Grit Separators* (Version 3.0, June 2014) have been noted:

1. It was necessary to change flow meters during the scour and light liquid re-entrainment test, as the required flows exceeded the minimum and/or maximum range of any single meter. After the loading rate of 800 L/min/m^2, the flow was gradually shut down and re-initiated through the larger meter immediately after closing the valve controlling flows to the small meter. The transition time of 1-minute for each target flow was followed, resulting in an elapsed time of 3 minutes to reach the next target flow of 1400 L/min/m^2. This procedure was approved by CETV prior to testing, in recognition that most particles susceptible to scour at low flows would not be in the sump at higher flows. Similarly, re-entrainment of the oil beads was not expected to be significantly affected by the flow meter change.

2. As part of the capture test, evaluation of the 40 L/min/m^2 surface loading rate was split into 3 parts due to the long duration needed to feed the required minimum of 11.3 kg of test sediment into the unit. At the end of the first and second parts of the test, the flow rates were gradually shutdown to prevent capture of particles that would have been washed out under normal circumstances. The amended procedure was reviewed and approved by the verifier prior to testing.

3. Inflow concentrations during the 40 L/min/m^2 surface loading rate varied from 162 mg/L to 246 mg/L, which is wider than specified ±25 mg/L range in the Procedure.

Verification

This verification was first completed in March 2017 and is considered valid for subsequent renewal periods every three (3) years thereafter, subject to review and confirmation of the original performance and performance claims. The original verification was completed by the Toronto and Region Conservation Authority of Mississauga, Ontario, Canada using the Canadian ETV Program's General Verification Protocol (June 2012) and taking into account ISO 14034:2016. This ETV renewal is considered to meet the equivalency of an ETV verification completed using the International Standard ***ISO 14034:2016 Environmental management -- Environmental technology verification (ETV)***.

Data and information provided by Contech Engineered Solutions to support the performance claim included the following: Performance test report prepared by Alden Research Laboratory, Inc of Holden, Massachusetts, USA and dated February 2015; the report is based on testing completed in accordance with the Procedure for Laboratory Testing of Oil-Grit Separators (Version 3.0, June 2014).

What is ISO14034:2016 Environmental management – Environmental technology verification (ETV)?

ISO 14034:2016 specifies principles, procedures and requirements for environmental technology verification (ETV) and was developed and published by the International Organization for Standardization (ISO). The objective of ETV is to provide credible, reliable and independent verification of the performance of environmental technologies. An environmental technology is a technology that either results in an environmental added value or measures parameters that indicate an environmental impact. Such technologies have an increasingly important role in addressing environmental challenges and achieving sustainable development.

For more information on the CDS Stormwater Treatment System please contact:

CONTECH Engineered Solutions LLC
71 US Route 1, Suite F
Scarborough, ME
04074 USA
Tel: 207-885-9830
info@conteches.com
www.conteches.com

For more information on ISO 14034:2016 / ETV please contact:

GLOBE Performance Solutions
404 – 999 Canada Place
Vancouver, BC
V6C 3E2 Canada
Tel: 604-695-5018 / Toll Free: 1-855-695-5018
etv@globeperformance.com
www.globeperformance.com

Date: August 20, 2024
File: PH4600-LET.02

PATERSON GROUP

Consulting Engineers
9 Auriga Drive
Ottawa, Ontario
K2E 7T9
Tel: (613) 226-7381

Geotechnical Engineering
Environmental Engineering
Hydrogeology
Materials Testing
Building Science
Rural Development Design
Temporary Shoring Design
Retaining Wall Design
Noise and Vibration Studies

patersongroup.ca

Premier Bus Lines Inc.
135 Cardevco Road
Ottawa, Ontario
K0A 1L0

Attention: **Eric Hochgeschurz**

Subject: **In-Situ Infiltration Testing**
Proposed Commercial Building Renovation
135 Cardevco Road – Ottawa, Ontario

Further to your request, Paterson Group (Paterson) conducted an in-situ infiltration testing investigation at 135 Cardevco Road for the proposed renovation of the existing commercial building. The purpose of the investigation is to provide unfactored estimated infiltration rates of the subsoils at the approximate invert elevation of the proposed infiltration system.

1.0 Proposed Development

It is our understanding that the proposed development will consist of a portion of the existing building being demolished and replaced with a new addition which will be smaller than the existing building. It is further expected that paved access lanes and parking areas will remain as part of the proposed development. It is anticipated that the proposed building will be serviced by a private well and septic system.

2.0 Field Observations

Surface Conditions

At the time of the current investigation, the site had a commercial building within the central portion of the site, paved areas within the eastern portion and landscaped areas within the western portion. The site is bordered to the east by Cardevco Road followed by commercial properties and to the south, west and north by commercial properties. Ground surface across the site is relatively flat. The north end of the site slopes down to the adjacent property. The site is at grade with the remaining adjacent properties.

Subsurface Conditions

Generally, the subsurface profile encountered in this current investigation at the subject site consisted of asphaltic concrete underlain by fill material overlying a glacial till deposit. The glacial till deposit consists of a brown silty sand matrix with varying amounts of gravel, cobbles and boulders.

Based on available geological mapping, the subject site is located in an area where the bedrock consists of limestone with minor shale of the Bobcaygeon Formation. The overburden drift thickness is estimated to be between 5 to 10 m.

Groundwater

At the time of the current investigation, groundwater infiltration was observed between 1.6 and 1.7 m bgs within the open test pits. However, it should be noted that groundwater levels are subject to seasonal fluctuations, therefore, the groundwater levels could vary at the time of construction.

3.0 Field Investigation

Field Program

The field program conducted for the current investigation was completed on July 9, 2024. At that time, two (2) test pits (TP1-24 and TP2-24) were excavated to a maximum depth of 1.7 m. All soils from the test pits were visually inspected and initially classified on site. The test pit locations were selected by Paterson and distributed in a manner to provide general coverage of the proposed infiltration systems taking into consideration site features and underground utilities. The test pit locations are presented in Drawing PG6018-1 – Test Hole Location Plan, attached to this report.

In-Situ Infiltration Testing

In-situ infiltration testing was conducted using a Pask Constant Head Well Permeameter to estimate infiltration rates of the unsaturated soils at the approximate invert elevation of the proposed infiltration system. The test pits were excavated to allow for safe entry into the pits, as well as infiltration testing to be conducted at different elevations.

At approximately 0.3 m above each testing elevation, an 83 mm auger hole was excavated to the desired testing elevation using a Riverside/Bucket auger. Soils from the auger flights were visually inspected and initially classified on-site. The tests were conducted by filling the permeameter reservoir with water and inverting it into the hole, ensuring it was relatively vertical and rested at the bottom of the hole. The water level of the reservoir was monitored at periodic intervals until the rate of fall out of the permeameter reached equilibrium, known

as quasi “steady state” flow rate. Quasi “steady state” flow can be considered to have been obtained after measuring 3 to 5 consecutive rate of fall readings with identical values. The values for the steady state rate of fall were recorded for each completed test.

4.0 In-Situ Infiltration Testing Results

Two (2) in-situ infiltration tests were conducted at each test pit location. The in-situ infiltration test locations were selected by Paterson in a manner to provide general coverage of the proposed infiltration systems. The field saturated hydraulic conductivity (K_{fs}) and estimated infiltration values for each completed test are presented in Table 1 below.

Field saturated hydraulic conductivity values (K_{fs}) were determined using Engineering Technologies Canada (ETC) Ltd. reference tables provided in the most recent ETC Pask Permeameter User Guide. The saturated hydraulic conductivity values can be converted to unfactored estimated infiltration rates using the approximate relationship described in Appendix C of the Credit Valley Conservation Authority and Toronto and Region Conservation Authority Low Impact Development Stormwater Management Planning and Design Guide (2011).

Table 1 - In-Situ Infiltration Testing Results

Test Pit ID	Permeameter Test ID	Testing Elevation (m asl)	Material	K_{fs} (m/sec)	Unfactored Infiltration Rate (mm/hr)
TP2-24	PT1-24	117.27	Glacial Till	1.8×10^{-5}	100
TP2-24	PT2-24	117.22	Glacial Till	1.9×10^{-5}	102

Based on Paterson’s in-situ infiltration testing investigation, K_{fs} values for the glacial till ranged from 1.8×10^{-5} to 1.9×10^{-5} m/sec, while estimated unfactored infiltration rates varied from 100 to 102 mm/hr. The above noted hydraulic conductivity values and estimated infiltration rates measured in the test holes are generally consistent with similar material Paterson has encountered on other sites as well as published values.

The two (2) tests conducted at TP1-24 were not able to reach completion (i.e. steady state flow) due to the fact that competent auger holes could not be maintained for a complete test due to the nature of the subsurface material. Preliminary results from the tests before the auger holes’ competency diminished were similar to the tests in TP2-24. Therefore, it is Paterson’s opinion that the infiltration rates at TP1-24 are similar to those estimated for TP2-24.

It is important to note that the estimated infiltration rates derived from the K_{fs} values are unfactored. Prior to use for design purposes, a safety correction factor will need to be applied to the above infiltration rates.

5.0 Statement of Limitations

The recommendations provided in this report are in accordance with Paterson's present understanding of the project.

The hydrogeological investigation is a limited sampling of the site. Should any conditions at the site be encountered which differ from those at the test locations, Paterson requests immediate notification to permit reassessment of the recommendations.

The present report applies only to the project described in the report. The use of the report for purposes other than those described herein or by person(s) other than Premier Bus Lines Inc. or their agents are not authorized without review by Paterson. We trust that his information satisfies your requirements.

Best Regards,

Paterson Group Inc.

Oliver Blume, P.Geo.

Zavian Buchanan, EIT

Attachments

- ❑ PH4600 – Soil Profile and Test Data
- ❑ Drawing PG6018-1 – Test Hole Location Plan

patersongroup Consulting Engineers

9 Auriga Drive, Ottawa, Ontario K2E 7T9

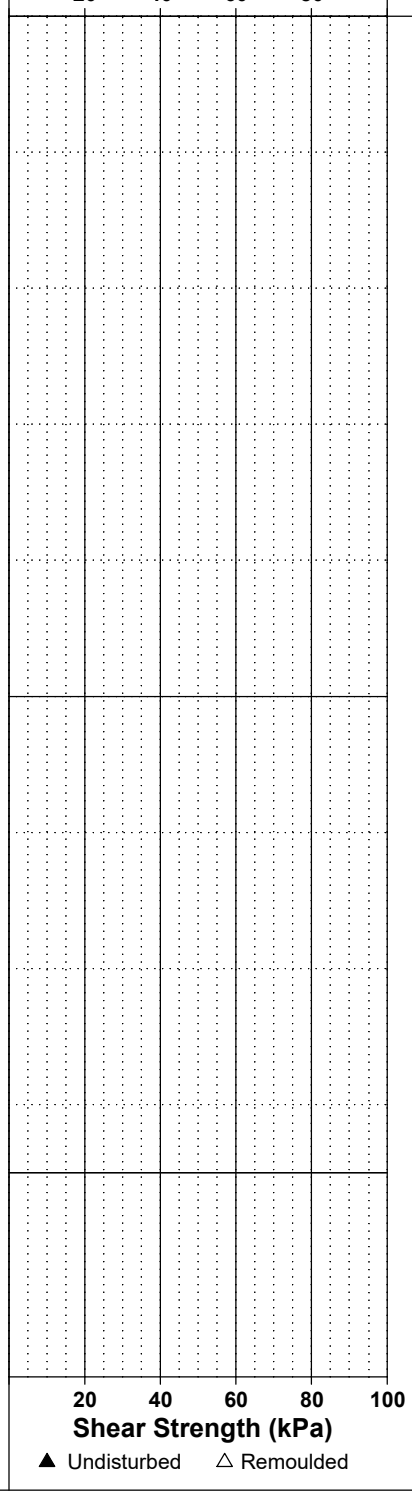
SOIL PROFILE AND TEST DATA

Infiltration Testing Program
135 Cardevco Road
Ottawa, Ontario

EASTING: 345715.269 **NORTHING:** 5017134.412 **ELEVATION:** 118.66
DATUM: Geodetic
REMARKS:
BORINGS BY: Backhoe **DATE:** July 9, 2024

FILE NO. PH4600
HOLE NO. TP 1-24

SAMPLE DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	PIEZOMETER CONSTRUCTION
Ground Surface									
ASPHALTIC CONCRETE 0.06						0	118.66		
FILL: Compact brown silty sand with gravel, some asphaltic concrete 0.24		G	1						
GLACIAL TILL: Dense to very dense brown silty sand with gravel, cobbles and boulders		G	2						
		G	3						
		G	4			1	117.66		
		G	5						
1.70 End of Test Pit									



patersongroup Consulting Engineers

9 Auriga Drive, Ottawa, Ontario K2E 7T9

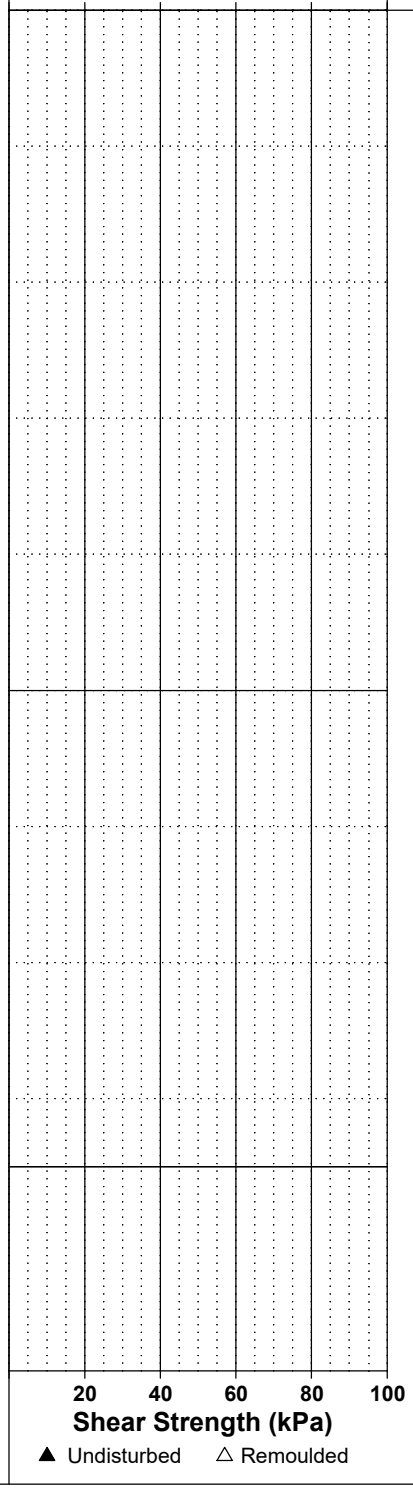
SOIL PROFILE AND TEST DATA

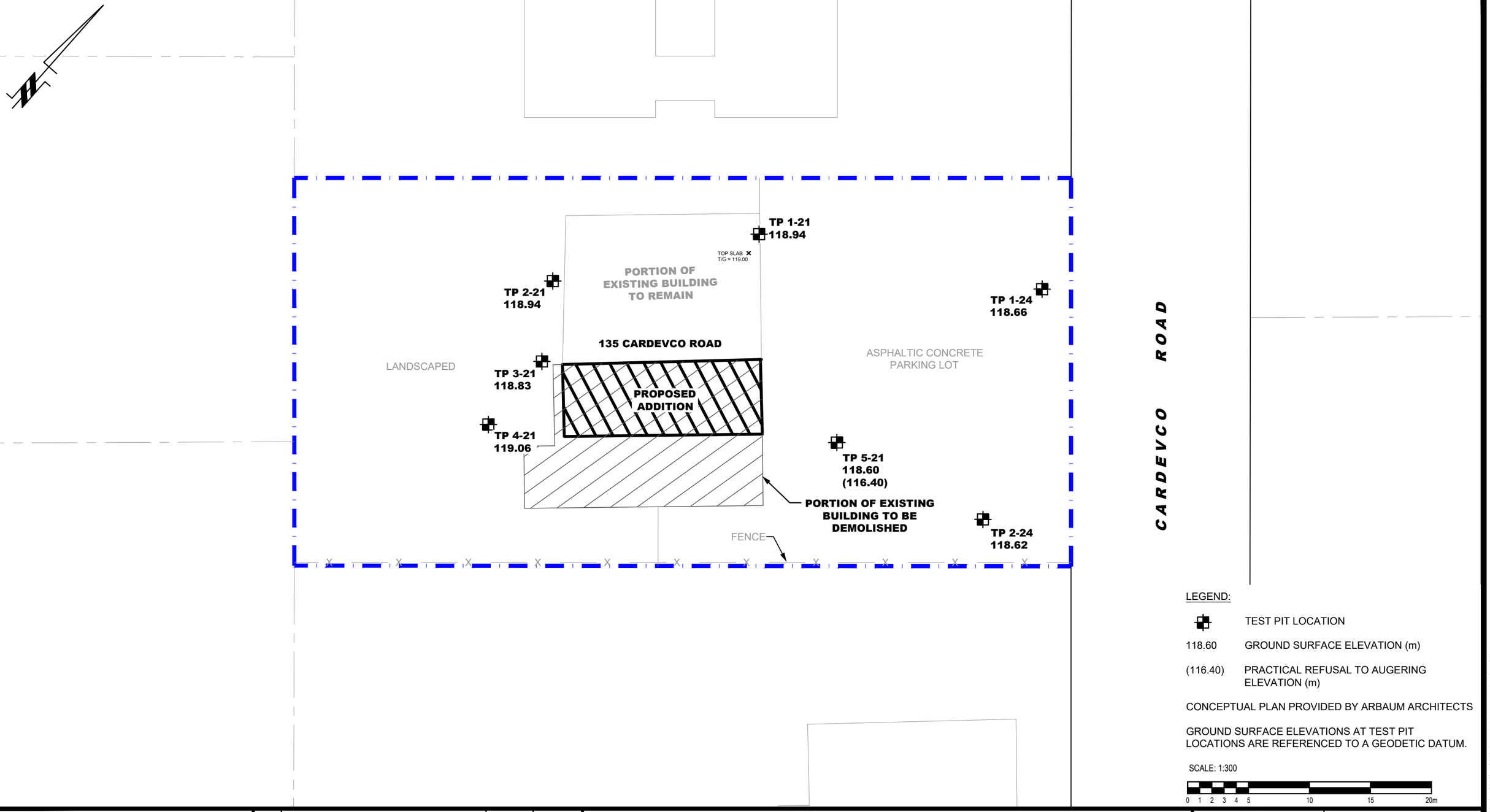
Infiltration Testing Program
135 Cardevco Road
Ottawa, Ontario

EASTING: 345724.169 **NORTHING:** 5017117.07 **ELEVATION:** 118.62
DATUM: Geodetic
REMARKS:
BORINGS BY: Backhoe **DATE:** July 9, 2024

FILE NO. PH4600
HOLE NO. TP 2-24

SAMPLE DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	PIEZOMETER CONSTRUCTION
Ground Surface									
ASPHALTIC CONCRETE 0.05						0	118.62		
FILL: Compact brown silty sand with gravel, some asphaltic concrete, trace clay 0.24		G	1						
GLACIAL TILL: Compact to very dense brown silty sand with gravel, cobbles and boulders		G	2						
- Boulder content increasing with depth		G	3			1	117.62		
		G	4						
1.70 End of Test Pit									





LEGEND:

⊕	TEST PIT LOCATION
118.60	GROUND SURFACE ELEVATION (m)
(116.40)	PRACTICAL REFUSAL TO AUGERING ELEVATION (m)

CONCEPTUAL PLAN PROVIDED BY ARBAUM ARCHITECTS

GROUND SURFACE ELEVATIONS AT TEST PIT LOCATIONS ARE REFERENCED TO A GEODETIC DATUM.

SCALE: 1:300

0 1 2 3 4 5 10 15 20m

PATERSON GROUP
9 AURIGA DRIVE
OTTAWA, ON
K2E 7T9
TEL: (613) 226-7381

NO.	REVISIONS	DATE	INITIAL
1	ADDED 2024 TEST PITS	10/07/2024	OB

PREMIER BUS LINES INC.

GEOTECHNICAL INVESTIGATION
PROPOSED INDUSTRIAL REDEVELOPMENT
135 CARDEVCO ROAD
OTTAWA (CARP), ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:300	Date: 11/2021
Drawn by: JM	Report No.: PE6018-1
Checked by: MS	Dwg. No.: PG6018-1
Approved by: DJG	Revision No.: 1

p:\autocad drawings\geotechnical\pg60xx\pg6018\pg6018-1-test hole location plan (rev.01).dwg

11x17

18-Nov-22
REVISED 05-Jun-23
REVISED 28-Apr-24
REVISED 10-Oct-24

135 Cardevco Road
Ottawa, Ontario

INFILTRATION CALCULATIONS
(for Temperature Mitigation)

DRAINAGE AREA II + III

			C
Roof Area:	281	sq.m.	0.90
Asphalt/Concrete Area:	628	sq.m.	0.90
Stormwater Detention Area:	130	sq.m.	1.00
Landscaped:	962	sq.m.	0.20
Total Catchment Area	2001	sq.m.	0.57

Required Volume Required to Capture: 5 mm rain event: 5.7 cu.m.

65% of days with preciptation are less than 5mm *

* Government of Canada, Environment and Natural Resources, Ottawa (Airport) (1991-2020)

Infiltration Trench

	Depth m	Area sq.m.	Total Volume cu.m.	Void Volume 40% cu.m.
Area A	0.20	55	11.0	4.4
Area B	0.20	75	14.9	6.0
		130		10.4

Glacial Till (silty sand with gravel, cobbles and boulders)

Infiltration Rate
100 mm/hr

(as per Paterson Group 'In-Situ Infiltration Testing Results'

Design Infiltration Rate (2.5 safety factor)
40 mm/hr

Time to Draw Down: 2.0 Hours

Ottawa Rainfall
May to July, 2024

	Ottawa (Airport)			Ottawa (Airport)		
	Average (1991-2020) mm	2024 mm	Percent of Average	Average (1991-2020) mm	2024 mm	Percent of Average
May	74.8	98.1	131%			
June	96.8	149.5	154%	260.1	401.6	154%
July	88.5	154.0	174%			

Ottawa Rainfall
May 1st to July 8th, 2024

	Ottawa (Airport)			Ottawa (Airport)		
	Average (1991-2020) mm	2024 mm	Percent of Average	Average (1991-2020) mm	2024 mm	Percent of Average
May	74.8	98.1	131%			
June	96.8	149.5	154%	194.4	301.2	155%
July 1st-8th (26% of month)	22.8	53.6	235%			

10-Sep-22
REVISED 05-Jun-23
REVISED 10-Oct-24

135 Cardevco Road

Ottawa, Ontario

Water Balance and Infiltration Calculations

Water Balance is based on the equation: Mean Annual Precipitation - Change in Groundwater Storage - Evapotranspiration = Runoff + Infiltration

Where: Long term changes to groundwater storage are assumed to be negligible
and
Short term or seasonal changes to groundwater are assumed to balance out over the year.

Therefore: Mean Annual Precipitation - Evapotranspiration = Runoff + Infiltration

Infiltration is based on the equations: Surplus (available for infiltration) = Mean Annual Precipitation - Evapotranspiration
and
Infiltration = Surplus x Infiltration Coefficient
and
Infiltration Coefficient = Topography Factor + Soil Factor + Vegetation Factor
(as per the MOE SWM Planning & Design Manual, 2003 - see below)

Pre Development

	Area (sq.m.)	Precipitation + (mm/yr)	Evapo-transpiration ++ (mm/yr)	Surplus (mm/yr)	Topography Factor *	Soil Factor **	Vegetation Factor ***	Infiltration Coefficient	Infiltration (mm/yr)
"Meadows"	2026	943	577	366	0.10	0.15	0.1	0.35	128
Total:	2026							Weighted Average:	128

Post Development

	Area (sq.m.)	Precipitation + (mm/yr)	Evapo-transpiration ++ (mm/yr)	Surplus (mm/yr)	Topography Factor *	Soil Factor **	Vegetation Factor ***	Infiltration Coefficient	Infiltration (mm/yr)	Volume Including Infiltration Trench (cu.m.)	Infiltration (mm/yr)
Landscaped	1117	943	577	366	0.10	0.15	0.10	0.35	128	143	128
Hard Surfaces	909	943	150	793				0.00	0	221	243
Total:	2026									364	
								Weighted Average:	71		179

	mm	Days with Precipitation +	Hard Surfaces Surplus / Precipitation	Hard Surfaces Area (sq.m.)	Hard Surfaces Available Annual Volume (cu.m.)	Hard Surfaces Annual Percentage Captured	Hard Surfaces Annual Volume Captured (cu.m.)	Required Volume of Infiltration Trench (cu.m.)
>=	0.2	162.7	0.84	909	25	100%	25	0.2
>=	1	118.4	0.84	909	91	100%	91	0.8
>=	5	57.7	0.84	909	221	100%	221	3.8
>=	10	29.6	0.84	909	226	100%	226	7.6
>=	25	5.0	0.84	909	96	100%	96	19.1
>=	50	0.46	0.84	909	18	100%	18	38.2
>=	100	0.04	0.84	909	3	100%	3	76.4

+ Government of Canada, Environment and Natural Resources, Ottawa (Airport) (1991-2020)
++ Eastern Ontario Water Resources Management Study (2001) & Carp River Watershed / Subwatershed Study

		Factor	Subject Property
* Topography:	Flat Land, average slope < 0.6m/km (<.06%)	0.3	
	Rolling Land, average slope 2.8 to 3.8m/km (0.28% to 0.38%)	0.2	
	Hilly Land, average slope 28 to 47m/km (2.8 to 4.7%)	0.1	
** Soil:	Tight impervious clay	0.1	= 0.15 for sily sand / glacial till
	Medium combination of clay and loam	0.2	
	Open sandy loam	0.4	
*** Cover:	Cultivated Lands	0.1	
	Woodland	0.2	

As per MOE SWM Planning & Design Manual, 2003

APPENDIX C

STORMWATER MANAGEMENT
(QUANTITY CONTROL)

STORMWATER MANAGEMENT CALCULATIONS
(Quantity Control)

Storage volume calculations for the infiltration trenches are based on the following formula:

$$V = A \times d \times Void_{\%}$$

where:

V = volume in m^3
A = area of infiltration trench in m^2
d = depth in meters infiltration trench
$Void_{\%}$ = percentage of voids in clear stone (typically 40%)

The orifice calculations are based on the following formula:

$$Q = C_d \times A_o \sqrt{2gh} \times 1000$$

where:

Q = flowrate in litres per second
C_d = coefficient of discharge
A_o = orifice area in sq.m.
g = 9.81 m/s^2
h = head above orifice in meters

Flow control roof drain calculations are based on the following formula:

$$Q = N \times S \times d \times F$$

where:

Q = flowrate in litres per second
N = number of roof drains
S = slots per weir
d = pond depth at roof drain in mm
F = flowrate through each slot

Storage volume calculations for the roof are based on the following formula for volume of a cone:

$$V = (A \times d)/3$$

where:

V = volume in m^3
A = ponding area in m^2
d = ponding depth in meters

Storage volume calculations for the stormwater detention areas are based on the following formula:

$$V = A \times d$$

where:

V = volume in m^3
A = area of detention area in m^2
d = ponding depth in meters

Summary Tables

ONE HUNDRED-YEAR EVENT					
Drainage Area	Pre-development Flow Rate (L/s)	Maximum Allowable Release Rate (L/s)	Maximum Release Rate (L/s)	Maximum Volume Required (cu.m)	Maximum Volume Stored (cu.m)
AREA I (Uncontrolled Flow Off Site)	-	-	0.31	-	-
AREA II (Addition Roof - Drains to Drainage Area III)	-	-	3.49	3.51	3.51
AREA III	-	-	12.67	33.72	33.72
TOTAL	37.71	12.98	12.98	37.23	37.23

FIVE YEAR-EVENT					
Drainage Area	Pre-development Flow Rate (L/s)	Maximum Allowable Release Rate (L/s)	Maximum Release Rate (L/s)	Maximum Volume Required (cu.m)	Maximum Volume Stored (cu.m)
AREA I (Uncontrolled Flow Off Site)	-	-	0.14	-	-
AREA II (Addition Roof - Drains to Drainage Area III)	-	-	2.55	1.38	1.38
AREA II	-	-	4.90	22.01	22.01
TOTAL	17.61	12.98	5.04	23.39	23.39

November 14, 2022
REVISED June 5, 2023
REVISED April 28, 2024
REVISED October 10, 2024

135 Cardevco Road

Ottawa, Ontario

STORMWATER MANAGEMENT CALCULATIONS
Rational Method

PRE-DEVELOPMENT CONDITIONS

100-Year Flow Rate

			C	
Roof Area:	0	sq.m	1.00	1.25 x Woodland or Pasture - Flat - Clay and Silt Loam as per Table 5.7 Ottawa Sewer Design Guidelines
Asphalt/Concrete Area:	0	sq.m	1.00	
Existing Conditions:	2026	sq.m	0.375	
Landscaped Area:	0	sq.m	0.25	
Total Catchment Area:	2026	sq.m	0.375	

Bransby William Formula

$$Tc = \frac{0.057 \bullet L}{Sw^{0.2} \bullet A^{0.1}} \text{ min}$$

Sheet Flow Distance (L):	65	m
Slope of Land (Sw):	5.0	%
Area (A):	0.2026	ha
Time of Concentration (Sheet Flow):	3	min
Time of Concentration:	10	min
Rainfall Intensity (i):	179	mm/hr
100-Year Pre-Development Flow Rate (2.78AiC):	37.71	L/s

5-Year Flow Rate

			C	
Roof Area:	0	sq.m	0.90	Woodland or Pasture - Flat - Clay and Silt Loam as per Table 5.7 Ottawa Sewer Design Guidelines
Asphalt/Concrete Area:	0	sq.m	0.90	
Existing Conditions:	2026	sq.m	0.30	
Landscaped Area:	0	sq.m	0.20	
Total Catchment Area:	2026	sq.m	0.30	

Time of Concentration:	10	min
Rainfall Intensity (i):	104	mm/hr
5-Year Pre-Development Flow Rate (2.78AiC):	17.61	L/s

2-Year Flow Rate & Maximum Allowable Release Rate

			C	
Roof Area:	0	sq.m	0.90	Woodland or Pasture - Flat - Clay and Silt Loam as per Table 5.7 Ottawa Sewer Design Guidelines
Asphalt/Concrete Area:	0	sq.m	0.90	
Existing Conditions:	2026	sq.m	0.30	
Total Catchment Area:	2026	sq.m	0.30	

Time of Concentration:	10	min
Rainfall Intensity (i):	77	mm/hr
2-Year Pre-Development Flow Rate (2.78AiC): (Maximum Allowable Release Rate)	12.98	L/s

ONE HUNDRED YEAR EVENT

DRAINAGE AREA I (Uncontrolled Flow Off Site)

(ONE HUNDRED-YEAR EVENT)

			C	
Roof Area:	0	sq.m	1.00	1.25 x Woodland or Pasture - Flat - Clay and Silt Loam as per Table 5.7 Ottawa Sewer Design Guidelines
Asphalt/Concrete Area:	0	sq.m	1.00	
Existing Conditions:	0	sq.m	0.375	
Landscaped Area:	25	sq.m	0.25	
Total Catchment Area:	25	sq.m	0.25	
Area (A):	25	sq.m		
Time of Concentration:	10	min		
Rainfall Intensity (i):	179	mm/hr		
Runoff Coeficient (C):	0.25			
Release Rate (2.78AiC):	0.31	L/s		

DRAINAGE AREA II (Addition Roof - includes 1/2 of existing roof)

(ONE-HUNDRED-YEAR EVENT)

			C
Total Catchment Area:	186	sq.m	1.00

No. of Roof Drains:	2				
Slots per Wier:	1	0.0124 L/s/mm/slot (5 USGPM/in/slot)			
Depth at Roof Drain:	141	mm	Pond Area:	75	sq.m
Maximum Release Rate:	3.49	L/s	Achieved Volume:	3.51	cu.m
			Maximum Volume Required:	3.51	cu.m

Time (min)	i (mm/hr)	2.78AiC (L/s)	Release Rate (L/s)	Stored Rate (L/s)	Stored Volume (cu.m)
10	179	9.23	3.49	5.74	3.45
15	143	7.39	3.49	3.90	3.51
20	120	6.20	3.49	2.71	3.26
25	104	5.37	3.49	1.88	2.82
30	92	4.75	3.49	1.26	2.27
35	83	4.27	3.49	0.78	1.64
40	75	3.89	3.49	0.40	0.95
45	69	3.57	3.49	0.08	0.22
50	64	3.31	3.31	0.00	0.00
55	60	3.08	3.08	0.00	0.00
60	56	2.89	2.89	0.00	0.00
90	41	2.13	2.13	0.00	0.00
120	33	1.70	1.70	0.00	0.00
150	28	1.43	1.43	0.00	0.00
180	24	1.24	1.24	0.00	0.00

DRAINAGE AREA III

(ONE HUNDRED-YEAR EVENT)

			C
Roof Area:	95	sq.m	1.00
Asphalt/Concrete Area:	628	sq.m	1.00
Stormwater Detention Area:	130	sq.m	1.00
Landscaped Area:	962	sq.m	0.25
Total Catchment Area:	1815	sq.m	0.60

Water Elevation:	118.10	m
Invert of Inlet of Culvert	117.95	m
Centroid of ICD Orifice:	118.02	m
(ICD in Inlet of Outlet Pipe)		
Head:	0.08	m

Infiltration Trench

	Depth	Area	Total Volume	Void Volume 40%
	m	sq.m.	cu.m.	cu.m.
Area A	0.20	55	11.0	4.4
Area B	0.20	75	14.9	6.0
		130		10.4

Orifice Diameter:	146	mm
Orifice Area:	16764	sq.mm
Coefficient of Discharge:	0.61	
Maximum Release Rate:	12.67	L/s

Detention Area

	Length (sq.m)	Width (sq.m)	Average Depth (m)	Volume	
Area A	11.0	5.0	0.15	8.32	cu.m
Area B	13.5	5.5	0.15	11.29	cu.m
				19.61	

CB/MH	Top Area (sq.m)	Depth (m)	Volume	
CB-1	74	0.15	3.75	cu.m

Achieved Volume:	33.72	cu.m
Maximum Volume Required:	33.72	cu.m

Time (min)	i (mm/hr)	2.78AiC (L/s)	Roof Release Rate (L/s)	Total Inflow (L/s)	Release Rate (L/s)	Stored Rate (L/s)	Stored Volume (cu.m)
10	179	54.26	3.49	57.75	12.67	45.08	27.05
15	143	43.42	3.49	46.91	12.67	34.24	30.82
20	120	36.45	3.49	39.94	12.67	27.27	32.72
25	104	31.56	3.49	35.05	12.67	22.38	33.56
30	92	27.92	3.49	31.41	12.67	18.73	33.72
35	83	25.09	3.49	28.58	12.67	15.91	33.42
40	75	22.84	3.49	26.32	12.67	13.65	32.77
45	69	20.98	3.49	24.47	12.67	11.80	31.86
50	64	19.43	3.31	22.74	12.67	10.07	30.21
55	60	18.12	3.08	21.20	12.67	8.53	28.15
60	56	16.99	2.89	19.88	12.67	7.20	25.94
90	41	12.49	2.13	14.62	12.67	1.95	10.52
120	33	10.00	1.70	11.70	11.70	0.00	0.00
150	28	8.39	1.43	9.82	9.82	0.00	0.00
180	24	7.26	1.24	8.50	8.50	0.00	0.00

FIVE-YEAR EVENT

DRAINAGE AREA I (Uncontrolled Flow Off Site)

(FIVE-YEAR EVENT)

			C	
Roof Area:	0	sq.m	0.90	Woodland or Pasture - Flat - Clay and Silt Loam as per Table 5.7 Ottawa Sewer Design Guidelines
Asphalt/Concrete Area:	0	sq.m	0.90	
Existing Conditions:	0	sq.m	0.30	
Landscaped Area:	25	sq.m	0.20	
Total Catchment Area:	25	sq.m	0.20	
Area (A):	25	sq.m		
Time of Concentration:	10	min		
Rainfall Intensity (i):	104	mm/hr		
Runoff Coeficient (C):	0.20			
Release Rate (2.78AiC):	0.14	L/s		

DRAINAGE AREA II (Addition Roof - includes 1/2 of existing roof)

(FIVE-YEAR EVENT)

			C	
Total Catchment Area:	186	sq.m	0.90	
No. of Roof Drains:	2			
Slots per Wier:	1	0.0124 L/s/mm/slot (5 USGPM/in/slot)		
Depth at Roof Drain:	103	mm	Pond Area:	40 sq.m
Maximum Release Rate:	2.55	L/s	Achieved Volume:	1.38 cu.m
			Maximum Volume Required:	1.38 cu.m

Time (min)	i (mm/hr)	2.78AiC (L/s)	Release Rate (L/s)	Stored Rate (L/s)	Stored Volume (cu.m)
10	104	4.85	2.55	2.29	1.38
15	84	3.89	2.55	1.33	1.20
20	70	3.27	2.55	0.72	0.86
25	61	2.83	2.55	0.28	0.42
30	54	2.51	2.51	0.00	0.00
35	49	2.26	2.26	0.00	0.00
40	44	2.06	2.06	0.00	0.00
45	41	1.89	1.89	0.00	0.00
50	38	1.75	1.75	0.00	0.00
55	35	1.63	1.63	0.00	0.00
60	33	1.53	1.53	0.00	0.00
90	24	1.13	1.13	0.00	0.00
120	19	0.91	0.91	0.00	0.00
150	16	0.76	0.76	0.00	0.00
180	14	0.66	0.66	0.00	0.00

DRAINAGE AREA III

(FIVE-YEAR EVENT)

			C
Roof Area:	95	sq.m	0.90
Asphalt/Concrete Area:	628	sq.m	0.90
Stormwater Detention Area:	130	sq.m	1.00
Landscaped Area:	962	sq.m	0.20
Total Catchment Area:	1815	sq.m	0.54

Water Elevation:	118.03	m
Invert of Inlet of Culvert	117.95	m
Centroid of ICD Orifice:	118.02	m
(ICD in Inlet of Outlet Pipe)		
Head:	0.01	m
Orifice Diameter:	146	mm
Orifice Area:	16764	sq.mm
Coefficient of Discharge:	0.61	
Maximum Release Rate:	4.90	L/s

Infiltration Trench

	Depth	Area	Total Volume	Void Volume 40%	
	m	sq.m.	cu.m.	cu.m.	
Area A	0.20	55	11.0	4.4	
Area B	0.20	75	14.9	6.0	
		130		10.4	

Detention Area

	Length (sq.m)	Width (sq.m)	Depth (m)	Volume	
Area A	11.0	5.0	0.08	4.66	cu.m
Area B	13.5	5.5	0.08	6.32	cu.m
				10.98	

CB/MH	Top Area (sq.m)	Depth (m)	Volume	
CB-1	23	0.08	0.66	cu.m

Achieved Volume: 22.01 cu.m

Maximum Volume Required: 22.01 cu.m

Time (min)	i (mm/hr)	2.78AiC (L/s)	Roof Release Rate (L/s)	Total Inflow (L/s)	Release Rate (L/s)	Stored Rate (L/s)	Stored Volume (cu.m)
10	104	28.17	2.55	30.73	4.90	25.83	15.50
15	84	22.59	2.55	25.15	4.90	20.25	18.23
20	70	19.00	2.55	21.55	4.90	16.65	19.98
25	61	16.47	2.55	19.02	4.90	14.12	21.19
30	54	14.58	2.51	17.09	4.90	12.19	21.95
35	49	13.12	2.26	15.38	4.90	10.48	22.01
40	44	11.95	2.06	14.00	4.90	9.11	21.86
45	41	10.99	1.89	12.88	4.90	7.98	21.55
50	38	10.18	1.75	11.93	4.90	7.04	21.11
55	35	9.50	1.63	11.13	4.90	6.23	20.58
60	33	8.91	1.53	10.44	4.90	5.54	19.96
90	24	6.57	1.13	7.70	4.90	2.80	15.12
120	19	5.26	0.91	6.17	4.90	1.27	9.16
150	16	4.42	0.76	5.19	4.90	0.29	2.60
180	14	3.83	0.66	4.49	4.49	0.00	0.00

APPENDIX D

PRE-CONSULTATION MEETING NOTES & CITY OF OTTAWA SERVICING STUDY CHECKLIST

Site Plan Pre-Application Consultation

135 Cardevco Road **Meeting Date: July 7, 2022**
PC2022-0041

Applicant: Arbaum Architects Inc.

Ward 5- West Carleton - March

Proposal Summary: Construct 44m^2 dwelling on property, requires removal of hold

Attendees:

Sean Harrigan, File Lead, City of Ottawa

Derek Kulyk, Infrastructure Project Manager, City of Ottawa

Mark Elliot, Environmental Planner, City of Ottawa

Erica Ogden, Mississippi Valley Conservation Authority

Jasdeep Brar, Planning Student, City of Ottawa

Consultation Team

Mariana Palos

Andrea Buchsbaum

Douglas Gray

Erik Ardley

Hendrik Van de Glind

Maha Saleh

Regrets

Mike Giampa, Transportation Project Manager, City of Ottawa

Meeting Minutes

Proposal Details

- Regularization of an existing building used for repairing buses and the addition of a small office building.
- Small office building will replace existing portables.
- Connecting to existing septic system and well.

Planning Comments

Provided by Sean Harrigan

- The subject site is designated Rural Industrial and Logistics by Schedule B9 of the new Official Plan. As per Official Plan section 9.3, the proposed development is permitted. However, development within this designation shall consider the provisions within policy 9.3.1(2), particularly subpoint (b) that requires appropriate screening from public roads and adjacent properties should be implemented using natural vegetation. To this regard, I strongly recommend considering possible minor modifications to the parking/gravel area directly along front lot line to help create space for vegetation planting.
- The site is further designated Light Industrial by Schedule 8.A – Designation Plan, Volume 2C: Area-Specific Policies, Official Plan.
- The subject site is zoned Rural General Industrial Zone, subzone 4 (RG4). The current heavy equipment and vehicle service for bus repairs is permitted. An office is permitted as a condition use provided it is on the same lot as a primary permitted use.
- This property is part of the Cardevco Industrial Park subdivision; the proposed development and Site Plan Approval will need to comply with the conditions listed in this subdivision agreement. Please provide staff with a copy of this agreement to confirm there are no restrictions that prevent construction.
- A **Planning Justification Report** will be required. This report must discuss how the proposed uses meet the Official Plan and Zoning By-law.
- A **Site Plan** is required and must show the property boundaries, dimensions of existing and proposed structures, zoning table, and other requirements listed in the Site Plan section within the Guide to preparing studies and plans | City of Ottawa.
- As per Zoning By-law Section 101, the parking requirements are:
    - 0.75 spots per 100m^2 of heavy equipment/vehicle service space.
    - 2.4 spots per 100m^2 of office space.

  Please ensure the **Site Plan** lists the required and provided parking spaces per land use and that the parking/storage area for buses awaiting service or pickup after service is clearly shown.
- Official Plan policy 4.7.2(9) provides guidance that new development that relies upon private sewage system should maintain a minimum area of 800m^2 of undeveloped

land for the sewage system. Please ensure the **Site Plan** illustrates the total undeveloped land maintained for the sewage system. The Hydrogeological Report should provide justification if the proposed development does not achieve the 800m^2.

- A **Landscape Plan** is required and should clearly illustrate the location and details of any vegetation planting. This plan may be combined with the **Tree Conservation Report** provided the details are clearly visible.

Engineering Comments

Provided by Derek Kulyk

1) Survey

- A topographic survey needs to identify all representative elevation points, currently existing features (outline of existing septic bed/s, water wells, structures, etc.), including all property lines, bodies of water, vegetation, easements etc. It needs to provide a note that references the horizontal and vertical datums that were used and tied into to complete the project. Site benchmark/s also need/s to be provided. The survey should also show the existing municipal road ROW.

2) Water Service

- It is an existing site and it is understood that there are no municipal water pipes near the application. A hydrogeological and terrain study report is required to be submitted to the City, to show that there is a sufficient quantity and quality of aquifer water for the existing and the proposed development. The site is within Mississippi Valley Source Water Protection and Significant Groundwater Recharge area with a highly vulnerable aquifer. All these critical elements should be considered in the investigation.
- The investigation will require the “subdivision suite” of parameters to be tested (known to local consultants and laboratories) and also trace metals and Volatile Organic Compounds.
- The address is predicted to have groundwater of acceptable yield but variable quality.
- The existing and the proposed well/wells need to be shown on the proposed site servicing plan and they need to be established in agreement with the findings of the hydrogeological and terrain analysis report and to assure that they can provide water supply in excess of the design demand (for the existing and the proposed usage) and to comply with the latest water quality requirements.
- The location of the existing well/s will need to be shown on the plans. Existing Well Inspection report will be required.

- It is the responsibility of the owner to ensure that adequate water supply for fire-fighting is provided. The applicant must contact Allan Evans (Allan.Evans@ottawa.ca) with Ottawa Fire Services to determine any water supply requirements (potentially water storage tanks) for fire fighting, if building footprint is larger that 600 m2.

3) Sanitary Service

- There are no municipal sanitary sewers adjacent the proposed development. A hydrogeological and terrain analysis study is required to show that a sufficient septic treatment system, or systems, will work for the development, especially considering that a highly vulnerable aquifer was identified on the site and the treatment system might need to be designed the way that infiltration is controlled to prevent possibility of groundwater contamination; Impact Risk Assessment will be required. Enhanced septic design might be required.
- Thin soils exist in the area and an analysis of the existing septic bed is required to identify its current parameters and how they relate to the proposed development. New septic bed might be required.
- If the design sanitary flow is less than 10,000 l/day, as anticipated, OSSO approval is required and this is needed prior to site plan approval being given.
- If the design flow is greater than 10,000 L/d, the septic system(s) is regulated by the Ministry of the Environment, Conservation and Parks (MECP) and requires a direct submission Environmental
- Compliance Approval (ECA) application. Note that the site-wide daily design flow refers to the total design flow produced on one lot or parcel of land.
- Minimum Septic Field Setback from property lines is 3 metres & 5 metres from buildings. Note: if the septic fields are raised beds, then these separations distances increase (they increase by 2x the grade raise) – please see Ottawa Septic System Office guidelines for details.

4) Servicing Report

- A servicing report will need to be submitted and it needs to comprehensively address the water quality and quantity, including the required projected water demand and the expected well capacity considerations and sanitary servicing needs of the existing and the proposed site conditions. All references need to be made to the proposed Site Plan features, including the existing structures that are to remain.
- It is not clear if there is an existing water well on site. If it is and it is planned to service the existing and the proposed development, these considerations must be included on the site plan and in the report.
- It also needs to include any plans for decommissioning of the existing septic bed, if such actions are considered. The existing well test will be required, and adequate well capacity needs to be confirmed (references to hydrogeological studies must be

made to confirm the groundwater conditions), if it is to remain. If a new well is planned, then it needs to be addressed in the report. Any potential well decommissioning plans need also be included in the report, as well.

- Fire-fighting considerations must also be included (specific firefighting flows, supported by calculations) and the applicant must contact Allan Evans (Allan.Evans@ottawa.ca) with Ottawa Fire Services to determine any water supply requirements (potentially water storage tanks) for fire fighting purpose. The communication record needs to be included in the report.
- The report needs to include enhanced investigation and mitigation of the thin soils condition and presence of highly vulnerable aquifer.
- Proposed septic bed sizing needs to be provided, to assure that it will be able to accommodate the generated flows. It should also contain comprehensive rationale that will allow to conclude that the existing hydrogeological and geotechnical conditions were considered, in order to protect the groundwater, as per latest guidelines and legal requirements.
- Water pumping testing might be required to assure the industrial or normal operating conditions water demands can be met.

5) Groundwater

- Groundwater level is to be investigated in the Hydrogeological Report and Terrain analysis and the level is to be derived from spring-time investigation. Report needs to be submitted to the City for review.
- The proposed well on-site needs to follow the determinations of the Hydrogeological report and needs to assure that adequate water supply is provided which exceeds the determined design requirements.
- The proposed development falls within the jurisdiction of Mississippi Valley Conservation Authority and is within Mississippi-Rideau source water protection area and Carp River watershed/sub-watershed. It is also identified to be within highly vulnerable aquifer and significant groundwater recharge area.
- Theses fact needs to be considered in the hydrogeological and terrain analysis and they also pertain to SWM considerations and the Septic bed considerations for the proposed development.

6) Storm Sewers

- There are no municipal storm sewers adjacent the proposed development. A retained consultant will need to review the existing downstream ditch network for capacity and prepare a SWM plan and report that will assure that the post development surface run-off will not adversely affect the downstream drainage system, including culverts, point of proposed site storm sewer system outlet location and the adjacent properties during construction and in the post-construction condition.

- Currently the site (including its asphalted surface) drains directly overland to the swale on the adjacent property to the north-west. This condition must be corrected. Also, if current drainage allows for adjacent properties draining towards the site under consideration, this condition needs to be maintained.
- Consultant will need to show Legal and sufficient storm outlet from site for both release rate and volume. If the plan is to try to discharge Stromwater to the roadside ditch you will need to check with the City R.O.W. department, to see that there is capacity and that they agree to accept the additional runoff from the site.
- Snow Storage area should be shown on thew site plan and should be separated from the septic field locations, so there is no snow melt impacting the septic field. In addition, the snow storage areas should drain into the SWM system for discharge from the site.
- Additional controls might need to be implemented, to prevent contaminates (salts and other) infiltration into the ground, due to sensitive hydrogeological conditions such as highly vulnerable aquifer on site.
- A direct submission ECA application to the MECP for an ECA will likely be required for any proposed stormwater management systems since this is an industrial-zoned site.

7) Storm Water Management (SWM)

- LID is required, as per the memo from the former MOECC (now MECP). Efforts are required to provide low flow runoff in the summer. Any existing stormwater runoff from adjacent site(s) that crosses the property must be accommodated by the proposed stormwater management design. No adverse effect can be created to the surrounding properties.
- SWM report will be required. The SWM Report needs to reference soil hydrogeological and geotechnical conditions and its infiltration capacity clearly and what, if any, surface run-off water treatment measures are being applied to protect the vulnerable aquifer. Mississippi Valley Conservation Authority needs to be contacted in this matter and its requirements will also need to be included in this report.
- The entire site needs to be controlled via on-site control measures, considering post-construction 100-year storm run-off flows that might have to be directed to the SWM pond.
- 100 year post development flow must be controlled to the 2-year pre-development return period storm level (pre-development condition needs to be considered as greenfield area). If this is not attainable, SWM pond might be required.
- All stormwater management determinations shall have supporting rationale.
- The stormwater management shall itemize concurrence with the content of the CRWSS.

a. Storage shall be the greater of Table 8.3.10 of the CRWSS and that required for 80% TSS removal
b. Efforts are required to provide low flow runoff in summer
c. 104 mm/yr infiltration (p.196)
d. Runoff shall be provided to achieve temperature mitigation thermal regime (p. 159)

- The location is within the area covered by the Carp River Watershed/Subwatershed Study, project no. 00056, December 2004, prepared by Robinson Consultants Inc., Aquafor Beech Ltd., Lloyd Phillips and Associates, and Daniel Brunton Consulting Services. The report suggests (following sufficient/satisfactory treatment) methods promoting infiltration. The Stormwater Management Report must address the applicable requirements of the Carp River Watershed/Subwatershed Study.
- Detailed surface run-off calculations need to be included in the new report and all types of existing and proposed surfaces should be individually considered in the analysis. Gravel run-off coefficient should be 0.8.
- The pre-development condition will be determined using the smaller of a run-off coefficient of:
    - 0.5
    - actual existing approved site runoff coefficient
    - previously agreed in the existing Subdivision Agreement (if one can be found)

8) Geotechnical Investigation

- Please note that thin soils, sensitive marine clays and potential karst topography are anticipated in the area of the proposal and enhanced geotechnical investigation and exhaustive analysis will be necessary. Investigation of clays should be undertaken with vane shear testing, Atterberg limits testing (from a number of depths in each column), shrinkage, grain size, grade raise restriction, consolidation, compaction sensitivity, remolded strength and liquefaction analysis- amongst others. Earthquake analysis is now required to be provided in the report.
- It should also include infiltration/percolation testing for SWM & septic field design due to a highly vulnerable aquifer present on site within Mississippi-Rideau source water protection and groundwater recharge area. Infiltration here might be of concern.
- The groundwater level is to be investigated and the level is to be derived from spring-time investigation.

9) Roads:

- Please refer to the City of Ottawa Private Approach By-Law 2003-447 for the entrance design.
- Cardevco Road – in Rural Road Network, as a local road and a ROW protection of 20 m is required

- Topographic survey needs to confirm the ROW width of 20 m (if it is determined to be less, ROW widening will be required to match the requirement)

10) Energy conservation

- Energy conservation is required to be demonstrated throughout design as per section 2.2.3 of the Official Plan (reduction of urban heat, renewable energy, mitigation of climate change impacts and others).

11) Subdivision agreement

- The subject property is part of the Cardevco Industrial Park which was approved under Subdivision Agreement 4M-356, registered in 1982. The Site Plan application must comply with the terms and conditions of the Subdivision Agreement.

12) Permits and Approvals

- Please contact the Mississippi Valley Conservation Authority (MVCA), amongst other federal and provincial departments/agencies, to identify all the necessary permits and approvals required to facilitate the development: responsibility rests with the developer and their consultant for determining which approvals are needed and for obtaining all external agency approvals. The address shall be in good standing with all approval agencies, for example MVCA, prior to approval. Copies of confirmation of correspondence will be required by the City of Ottawa from all approval agencies that a form of assent is given. Please note that a stormwater program for multiple lots is understood to be the expanded type of Environmental Compliance Approval (ECA) application with the MECP; please speak with your engineering consultant to understand the impact this has on the application.
- Please note that OSSO approval is required prior to site plan approval being given.
- An MECP ECA application is not submitted until after City of Ottawa engineering is satisfied that components directly or indirectly aligned with the ECA process concur with standards, directives, and guidelines of the MECP.
- No construction shall commence until after a commence work notification is given by Development Review
- Ministry of the Environment, Conservation and Parks contact information: Jena Lavoy – water inspector; (613)521-3450 x 236; Jena.Leavoy@ontario.ca
- Mississippi Valley Conservation Authority information: Erica Ogden; eogden@mvc.on.ca

13) Engineering Submission Requirements:

<u>Plans</u>

- Site Servicing Plan*
- Grading and Drainage Area Plan
- Erosion and Sediment Control Plan*
- Lighting Plan (not required at submission, but for registration)

*All identified required plans are to be submitted on standard A1 size sheets as per City of Ottawa Servicing and Grading Plan Requirements and shall note the survey monument used to establish datum on the plans with sufficient information to enable a layperson to locate the monument.

Reports

- Site Servicing Study/Report (include firefighting considerations) (Water & Sanitary)
- Storm Water Management Report and Plan
- Hydrogeological and terrain analysis report
- Geotechnical Investigation Report (The geotechnical consultant will need to provide full copies of any published and peer reviewed papers relied on to determine results and conclusions)
    - Earthquake analysis is now required to be provided in the report.
- Erosion and Sediment Control Measures (Plan is also required)

Guide to preparing City of Ottawa Studies and Plans: Guide to preparing studies and plans | City of Ottawa

To request City of Ottawa plan(s) or report information please contact the ISD Information Centre: Information Centre(613) 580-2424 ext. 44455

Environmental Comments

Provided by Mark Elliot

- A **Tree Conservation Report (TCR)** will be required for the site as per By-law 2001-451. As part of this report, the critical root zone of the existing trees must be identified and protected during construction pursuant to Tree Conservation Report Guidelines.
- The primary focus of the report should be the protection of existing trees (none of which are slated to be removed in the current plan) and also to find opportunities for additional plantings to help meet the forestry canopy targets identified in the general forest canopy goals in section 2.2.3.7, 4.8.2, 11.1.3, and 9.3.1 of the new Official Plan.
- Section 9.3.1 gives two broad goals that should be considered when choosing the planting sites:

    - b) Appropriate screening from public raods and adjacent properties using natural vegetation, preferably existing vegetation where possible; and
    - c) Outdoor amenity areas for employees and landscaping that supports the City's tree canopy targets.
- Screening from the road may be difficult in this case, but it may be possible if minor modifications are made to the parking/gravel area. Failing this, the rear of the lot offers space to achieve a large number of tree plantings that also would offer an amenity space for employees. Caution should be taken to ensure that the proposed plantings to not interfere with the septic system on site.

Mississippi Valley Conservation Authority Comments

Provided by Erica Ogden

- The subject property is not regulated by MVCA under Ontario Regulation 153/06
- The stormwater quality requirement is an enhanced level of protection, 80% total suspended solids removal.
- The property is within the Carp River Watershed Subwatershed Study area and a part of the Huntley Creek Subwatershed which is a cool water system. Temperature mitigation will be an important consideration in the stormwater design.

To request City of Ottawa plan(s) or report information please contact the City of Ottawa Information Centre:
informationcentre@ottawa.ca OR (613) 580-2424 ext. 44455

As per section 53 of the Professional Engineers Act, O.Reg. 941/40, R.S.O. 1990, all documents prepared by engineers must be signed and dated on the seal.

Application Submission Information

Application Type**: Site Plan Control – Rural Small**

For information on Site Plan Control Applications, including fees, please visit: https://ottawa.ca/en/city-hall/planning-and-development/information-developers/development-application-review-process/development-application-submission/fees-and-funding-programs/development-application-fees

The application processing timeline generally depends on the quality of the submission. For more information on standard processing timelines, please visit: https://ottawa.ca/en/city-hall/planning-and-development/information-developers/development-application-review-process/development-application-submission/development-application-forms#site-plan-control

Prior to submitting a formal application, it is recommended that you pre-consult with the Ward Councillor.

Application Submission Requirements

For information on the preparation of Studies and Plans and the City's requirements, please visit: https://ottawa.ca/en/city-hall/planning-and-development/information-developers/development-application-review-process/development-application-submission/guide-preparing-studies-and-plans

Please provide electronic copy (PDF) of all plans and studies required.

All identified required plans are to be submitted on standards A1 size sheets and use an appropriate metric scale as per City of Ottawa Servicing and Grading Plan Requirements**, and shall note the survey monument used to establish datum (beyond the local benchmark) on the plans with sufficient information to enable a layperson to locate the document.**

Note that many of the plans and studies collected with this application must be signed, sealed and dated by a qualified engineer, architect, surveyor, planner or designated specialist.

City of Ottawa Servicing Study Checklist

General Content

Executive Summary (for large reports only): not applicable

Date and revision number of the report: see page 1 of Servicing Brief and Stormwater Management Report

Location map and plan showing municipal address, boundary, and layout of proposed development: see drawings C-1 to C-4

Plan showing the site and location of all existing services: see drawings C-1 to C-4

Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to which individual developments must adhere: not applicable

Summary of Pre-consultation Meetings with City and other approval agencies: not available

Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defendable design criteria: not applicable

Statement of objectives and servicing criteria: see page 2 of Servicing Brief and Stormwater Management Report

Identification of existing and proposed infrastructure available in the immediate area: see drawings C-1 to C-4

Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available). see drawings C-1 to C-4

Concept level master grading plan to confirm existing and proposed grades in the development and drainage, soil removal and fill constraints, and potential impacts to neighbouring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths: not applicable

Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts: not applicable

Proposed phasing of the development, if applicable: not applicable

Reference to geotechnical studies and recommendations concerning servicing: see note 1.5 on drawing C-2

All preliminary and formal site plan submissions should have the following information:

- **Metric scale:** included
- **North arrow:** included
    - **(including construction North):** not included
- **Key Plan:** included

- **Name and contact information of applicant and property owner:** not available
- **Property limits**: included
    - **including bearings and dimensions:** not included
- **Existing and proposed structures and parking areas:** included
- **Easements, road widening and rights-of-way:** included
- **Adjacent street names:** included

Development Servicing Report: Water

Confirm consistency with Master Servicing Study, if available: not applicable

Availability of public infrastructure to service proposed development: not applicable

Identification of system constraints: not applicable

Confirmation of adequate domestic supply and pressure: not applicable

Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow locations throughout the development: not applicable

Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves: not applicable

Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design: not applicable

Address reliability requirements such as appropriate location of shut-off valves: not applicable

Check on the necessity of a pressure zone boundary modification:. not applicable

Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range: not applicable

Description of the proposed water distribution network, including locations of proposed connections to the existing systems, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions: not applicable

Description of off-site required feedermains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation: not applicable

Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines: not applicable

Provision of a model schematic showing the boundary conditions locations, streets , parcels, and building locations for reference: not applicable

Development Servicing Report: Wastewater

Summary of proposed design criteria: see page 2 of Servicing Brief

(Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitored flow data from relatively new infrastructure cannot be used to justify capacity requirements for proposed infrastructure): not applicable

Confirm consistency with Master Servicing Study and /or justification for deviations: not applicable

Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the guidelines. This includes groundwater and soil conditions, and age and conditions of sewers: not applicable

Descriptions of existing sanitary sewer available for discharge of wastewater from proposed development: see page 2 of Servicing Brief

Verify available capacity in downstream sanitary sewer and / or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable): not applicable

Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix C) format. not applicable

Description of proposed sewer network including sewers, pumping stations, and forcemains: see not applicable

Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality): not applicable

Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development: not applicable

Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity: not applicable

Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding: not applicable

Special considerations such as contamination, corrosive environment etc: not applicable

Development Servicing Report: Stormwater Checklist

Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property): see page 4 of Servicing Brief and Stormwater Management Report

Analysis of available capacity in existing public infrastructure. not applicable

A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern: see drawing C-1 to C-4

Water quality control objective (e/g/ controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5 year event (dependent on the receiving sewer design) to 100 year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking

into account long-term cumulative effects: see Stormwater Management Report Servicing Brief and Stormwater Management Report

Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements: Servicing Brief and Stormwater Management Report

Descriptions of the references and supporting information.
Set-back from private sewage disposal systems. not applicable

Watercourse and hazard lands setbacks: not applicable

Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed: the pre-application consultation record has not been issued

Confirm consistency with sub-waterched and Master Servicing Study, if applicable study exists: not applicable

Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period). see drawings C-1 to C-4 and Servicing Brief and Stormwater Management Report

Identification of watercourses within the proposed development and how watercourses will be protected, or , if necessary, altered by the proposed development with applicable approvals. see drawings C-1 to C-4 and Servicing Brief and Stormwater Management Report

Calculate pre and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions: see Servicing Brief and Stormwater Management Report

Any proposed diversion of drainage catchment areas from one outlet to another. : not applicable

Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities. : not applicable

If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100-year return period storm event: not applicable

Identification of potential impacts to receiving watercourses: Servicing Brief and Stormwater Management Report

Identification of municipal drains and related approval requirements. : not applicable

Descriptions of how the conveyance and storage capacity will be achieved for the development: see page 3 of Servicing Brief and Stormwater Management Report

100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading:

Inclusion of hydraulic analysis including hydraulic grade line elevations. : not applicable

Description of approach to erosion and sediment control during construction for the protection of receiving watercourses of drainage corridors: see notes 2.1 to 2.6 on drawing C-2

Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplains elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current: not applicable

Identification of fill constraints related to floodplain and geotechnical investigation. : not applicable

Approval and Permit Requirements: Checklist

The Servicing Study shall provide a list of applicable permits and regulatory approvals necessary for the proposed development as well as the relevant issues affecting each approval. The approval and permitting shall include but not be limited to the following:

Conservation Authority as the designated approval agency for modification of floodplain, potential impact on fish habitat, proposed works in or adjacent to a watercourse, cut/fill permits and Approval under Lakes and Rivers Improvement Act. The Conservation Authority is not approval authority for the Lakes and Rivers Improvement Act. Where there are Conservation Authority regulations in place, approval under the Lakes and Rivers Improvement Act is not required, except in cases of dams as defined in the Act: see page 19 of Servicing Brief and Stormwater Management Report

Application for Certificate of Approval (CofA) under the Ontario Water Resources Act:

Changes to Municipal Drains. : not applicable

Other permits (National Capital commission, Parks Canada, public Works and Government Services Canada, Ministry of transportation etc.) : not applicable

Conclusion Checklist

Clearly stated conclusions and recommendations: see page 7 of Servicing Brief

Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency.

All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario: included