D.B. Gray Engineering Inc.

Stormwater Management - Grading & Drainage - Storm & Sanitary Sewers - Watermains

700 Long Point Circle
Ottawa, Ontario K1T 4E9

613-425-8044
d.gray@dbgrayengineering.com

SITE SERVICING STUDY & STORMWATER MANAGEMENT REPORT

1353 COKER STREET
OTTAWA, ONTARIO

REPORT NO. 20127

MARCH 7, 2022
REVISED: JUNE 3, 2022
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LIST OF APPENDICES

1.0 INTRODUCTION

This report describes the servicing and stormwater management requirements for a proposed 1-storey, 310 sq.m. warehouse located at 1353 Coker Street in Ottawa, Ontario. The property is currently occupied by an existing 1-storey building. Refer to Pre-Application Consultation meeting notes in Appendix B.

This report forms part of the servicing and stormwater management design for the proposed development. Also refer to drawings C-1 to C-5, prepared by D.B. Gray Engineering Inc.

2.0 WATER SERVICE

2.1 WATER SUPPLY FOR FIREFIGHTING

As per OBC A-3.2.5.7. Table 2, the required water supply flow rate for firefighting for the proposed 1-storey 310 sq.m. 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. As per City of Ottawa Technical Bulletin ISTB-2021-03 the requirements for levels of fire protection on private property in rural areas is based on the Fire Underwriters Survey (FUS) method. However, as per the Ottawa Fire Service proposal (OFS Fireflow and Water Storage Calculation Proposal, dated June 17, 2024) the FUS calculation method is not used unless the fire flow using the OBC method is calculated to be 9,000 L/min. Refer to Appendix A. In the City of Ottawa buildings less than 600 sq.m. typically do not require an onsite water supply; therefore, an onsite water supply is not proposed. Allan Evans (Fire Protection Engineer, Prevention Division, Ottawa Fire Services) agrees, as he stated in an email dated January 12, 2023 *"… it is my opinion that the new building would not require on-site water storage at this time since it is non-combustible construction and <600 m2 area."* Although he also stated that he is not the Authority Having Jurisdiction: *"I am not an AHJ under the OBC, so the final determination will be theirs*." Refer to the email Appendix A.

As discussed in the October 26, 2024 meeting with City staff and confirmed in a follow up email: *"water storage … in accordance with Development Review guidelines, is not required on site, due to building size (less than 600 sq.m) and proposed non-combustible design, however the proposal might still be subject to Ontario Building Code and Building department requirements (beyond the Development Review considerations)."*

2.2 DOMESTIC WATER SUPPLY

The existing drilled well to the west of the existing building will provide the domestic water supply via an underground connection to the plumbing of the existing building. As per the Hydrogeological and Terrain Study, prepared by Paterson Group Inc.:

> *"The total volume of water pumped during the 8 hour pumping event was approximately 9,120 L. This is approximately three times the maximum total daily design volume of water required to support the development as part of the site plan application (approximately 3,600 L/day)."*

As per the Hydrogeological and Terrain Study the design volume of water is assumed to be equal to the design sewage flow of 3,600 L/day as calculated by Paterson (refer to Sanitary Service below).

3.0 SANITARY SERVICE

The existing on-site septic system will be decommissioned, and a new on-site septic system is proposed to service the existing and proposed buildings (refer to design by Paterson Group Inc.). As per the Hydrogeological and Terrain Study, prepared by Paterson Group Inc.:

> "Proposed Sewage System
>
> *Paterson has completed a replacement sewage system design for the proposed development. A septic flow value of 1,900 L/day was used for the existing building and a septic flow value of 1,700 L/day was calculated for the proposed building addition. This results in a total daily design sewage flow (TDDSF) of 3,600 L/day. Refer to the approved OSSO Septic Permit attached* [to the Paterson Report] *for more specific details. The septic flow values were calculated in accordance with the OBC and are as follows:*
>
> *Existing Building:*
> - *Factory (no showers) with 6 employees = 6 x 76 L/day = 450 L/day OR*
> - *Number of water closets = 2 x 950 L/day = 1,900 L/day*
>
> *Proposed Building Addition:*
> - *Warehouse with 5 bay door = 5 x 150 l/day = 750 L/day; AND*
> - *Number of water closets = 1 x 950 L/day = 950 L/day*
>
> *Proposed Building Addition:*
> - *Warehouse with 5 bay door = 5 x 150 l/day = 750 L/day; AND*
> - *Number of water closets = 1 x 950 L/day = 950 L/day*
>
> *Combined Existing Building and Proposed Building Addition:*
> - *Existing Building (1,900 L/day) + Proposed Building Addition (1,700 L/day) = 3,600 L/day."*

4.0 STORMWATER MANAGEMENT

4.1 QUALITY CONTROL

The Shields Creek Subwatershed Study recommends a Normal Protection (a target of 70% suspended solids removal); however, James Holland with South Nation Conservation (SNC) has stated: *"There Is a water course on site needs quality protection … need update stormwater - from old site plan - 80% TSS post to pre quantity."*

To meet the water quality target of 80% total suspended solids (TSS) removal, surface runoff from the north portion of the property (previously undeveloped – prior to 2015) will drain through a proposed oil grit separator (OGS) manhole. A CDS Model PMSU2015-4 was selected by the manufacturer based on the provided description of the drainage area and the manufacturer's software. The CDS PMSU2015-4 is calculated to remove approximately 92% of the TSS. Refer to Appendix B. The OGS has an oil capacity of 232 L and a sediment capacity of 0.7 cu.m. The outlet invert of the OGS is 99.80 m, which is above the seasonal high groundwater elevation, since, as is stated in the geotechnical report the *"anticipated that the seasonal highwater level at the subject site will be below a geodetic elevation of 99.8m."*

The south (developed) portion of the property will remain virtually unchanged: There are no existing quality control measures, and none are proposed since the location of the existing building, septic system, and asphalted areas; and the shallow roadside ditch and high water table preclude opportunities for quality control.

In the pre-consultation meeting notes received from the City James Holland with the South Nation Conservation stated: *"Watercourses are likely low-flow, intermittent watercourses that likely are indirect fish habitat. Year-*

round use is unlikely due to flow and heavy vegetation. SNC recommends that DFO is consulted via a Request for Review when a project has the potential to cause a Harmful Alteration, Disruption, or Destruction (HADD) to fish and/or fish habitat. However, if a project can be completed following all of DFO's fish protection measures, a Request for Review is not needed. In this case, I think a piping/culverts of this watercourse can be done without a RFR provided all of the fish protection measures are followed." With reference to DFO's website *"Measures to protect fish and fish habitat"*; relevant measures have been incorporated into an Erosion & Sediment Control Plan that has been developed to be implemented during construction. Refer to drawing C-2 and notes 2.1 to 2.7 on drawing C-4.

4.2 QUANTITY CONTROL

Both the South Nation Conservation (SNC) and the City require that the stormwater management design needs to demonstrate post development flows are controlled to pre-development conditions. For water quantity the Shields Creek Subwatershed Study recommends:

"Water quantity targets are to be met include:

- *Infiltration - levels to be maintained at predevelopment rates as specified in Table 5.5.1*
- *Peak flow target – peak flow control for all design events (post to pre, 2 to 100 year events, inclusive)"*

Infiltration:

As per Figure 5.5.1 and Table 6.3.2 in the Shields Creek Subwatershed Study the subject property is in area of *"sand, reworked glaciofluvial"* with a target infiltration rate of 100 to 250 mm/yr. Based on the pre-development water balance and infiltration calculations; the annual infiltration of the 955 sq.m. north portion of the property (previously undeveloped forested area – prior to 2015) is 137 mm/year. Post development, permeable pavers with subdrains (see paragraph below) are proposed to be installed over about two thirds of this area. In eastern Ontario, on hard surfaces, approximately 150 mm of the 943 mm annual precipitation is lost to evapotranspiration (Eastern Ontario Water Resources Management Study (2001) & Carp River Watershed / Subwatershed Study). Permeable pavers have showed a 16% increase in evaporation rates relative impermeable pavements (Effects on Evaporation Rates from Different Water-Permeable Pavement Designs; P. Starke, P. Göbel & W. G. Coldewey). Therefore, assuming 174 mm (16% increase from 150 mm) of the 943 mm annual precipitation is lost to evaporation; 769 mm of the precipitation on permeable pavers is available for infiltration. Based on the water balance and infiltration calculations, with the installation of 663 sq.m. of permeable pavers (of which 607 sq.m. is located what was the pre-development area draining north), the post development the annual infiltration of the 955 sq.m. north portion of the property is 138 mm/year; slightly greater than the pre-development infiltration rate and within 100 to 250 mm/yr target infiltration rate. Refer to calculations in Appendix A.

The groundwater level is very high; however, as per the geotechnical report the 99.80 m seasonal high groundwater elevation is considered to be conservative. The report states: *"Paterson completed another site visit to collect groundwater information from the ditch located along the northern property boundary on May 5, 2023, following a prolonged period of rainfall (10 days of continuous rainfall). Based on our observations, the highest water level detected in the northern ditch was at a geodetic elevation of 99.6m and there were no signs of water ponding at ground surface. Based on the above discussion, and on observations made during our recent visit, it is anticipated that the seasonal highwater level at the subject site will be below a geodetic elevation of 99.8m."* The revised report also states: *"Proper drainage of the subgrade below the permeable pavers should be provided through site grading and through the use of perforated subdrains installed in the subgrade layer and directed towards a positive outlet (northern ditch, southern ditch, landscaped areas, …etc)."* (In addition, as per the 'Sustainable Technologies Evaluation Program Low Impact Development Stormwater Management Planning and Design Guide', (referenced in the 'City of Ottawa Low Impact Development Technical Guidance Report') in areas with high groundwater perforated subdrains located near the bottom of the aggregate sub-base should be used.) Therefore, subdrains are proposed in the permeable pavement structure. The subdrains slope towards and connects downstream of the OGS manhole at manhole MH-2 at an invert of 99.61. The MH-2 outlets to a 300 mm storm sewer having an invert elevation of 99.60 (the highest observed water elevation in the northern ditch) where it terminates in the northern ditch near the northeast corner of the property. The subdrains bypass the OGS so that the invert elevation of the OGS manhole can be above the seasonal high groundwater elevation. If the subdrains connected upstream of the OGS manhole the invert of the OGS would be 99.61, which, although it would be above the highest observed water elevation in the ditch, there would be an increased risk of water backing up into the OGS. Also, since the permeable pavement structure improves water quality by promoting TSS removal, water discharged from the subdrains would not benefit greatly by draining through the OGS.

Peak Flow Target:

As is explained below, the combination of constraints imposed on the subject property is unusual. At an October 26, 2023 meeting City staff recognized this and confirmed that an improvement of the existing conditions may be acceptable and requested that rationale and analysis possible solutions be provided.

As previously stated, the groundwater level is very high. However, this is a partially developed property with an existing building having a floor elevation of 100.53, which is only about 0.8 m to 0.9 m above the high groundwater elevation (lower than 99.80 but likely higher than 99.60). Also, the seasonal high groundwater is only about 0.2 m to 0.4 m below grade elevations at the lowest part of the property (at northeast corner). Since the existing building is to remain it is not possible to raise the grades significantly, and there is little opportunity for a stormwater management design that includes stormwater stored on the surface (and be the required 0.30 m below the floor elevation); and there is no opportunity to store stormwater underground.

All of the above makes subject property unusual and any proposed stormwater management design has to be innovative. As such, rather than using an ICD (inlet control device – an orifice) to control stormwater runoff and temporarily store it on the property, permeable pavement is proposed to reduce the runoff. However, given the high groundwater it has to be accepted that the 1 m clearance between the underside of the permeable pavement structure and groundwater (as recommended in the 'City of Ottawa Low Impact Development Technical Guidance Report') cannot be met, and the performance of the permeable pavement may be, at times, less than optimum.

The stormwater quantity control criterion is to control the post-development peak flow rates to the pre-development peak flow rates for the 2-year, 5-year and 100-year storm events. The pre-development topography of the property is such that 36% of the property currently drains north towards the northern ditch (previously undeveloped forested area – prior to 2015) and 64% of the property currently drains south towards the roadside ditch. Using the Rational Method with a time of concentration of 10 minutes, the pre-development 100-year flow rates were calculated to be 17.78 L/s draining north and 65.42 L/s draining south; the pre-development 5-year flow rates were calculated to be 8.30 L/s draining north and 33.74 L/s draining south; and the pre-development 2-year flow rates were calculated to be 6.12 L/s draining north and 24.87 L/s draining south. The overall pre-development flow rates draining off site were calculated to be 83.20 L/s during the 100-year event; 42.04 L/s during the 5-year event; and 30.99 L/s during the 2-year event. The Rational Method was used calculate the post-development flow rates and the Modified Rational Method was used to calculate the release rates and required storage volumes. The runoff coefficients for the 100-year event are increased by 25% to maximum 1.00. Refer to calculations in Appendix A.

Drainage Area I (Uncontrolled Flow Rate North – 604 sq.m)
The area to the north of the property will continue to drain uncontrolled north towards the watercourse (albeit reduced in area by 37%). As previously stated, permeable pavers with subdrains are proposed. As per the 'Sustainable Technologies Evaluation Program Low Impact Development Stormwater Management Planning

and Design Guide' (referenced in the 'City of Ottawa Low Impact Development Technical Guidance Report') permeable structures provides a volumetric runoff reduction of about 85%, and 45% with sub-drains. Since a runoff coefficient is used to calculate a flowrate (not volume) a runoff coefficient of 0.15 is appropriate without subdrains and 0.50 with subdrains (e.g. 45% reduction of a runoff coefficient for a hard surface of 0.90 is about 0.50). Based on a runoff coefficient of 0.50, the flow with subdrains is 3.33 times higher than without subdrains based on a runoff coefficient of 0.15; therefore, it can be assumed that about 70% (= ((0.50 - 0.15) / 0.50) x 100%) of the flow drains down through the permeable pavers and into the subdrains. As such, the time of concentration is greater with subdrains than without; therefore, since about 88% of Drainage Area I is permeable pavers with subdrains, the time of concentration for this drainage area is arbitrarily increased to 15 minutes to calculate the flow rates.

	100-Year Event	5-Year Event	2-Year Event
Maximum Flow Rate	15.70 L/s	7.39 L/s	5.46 L/s

Drainage Area II (Uncontrolled Flow Rate South – 1,757 sq.m)
The area to the south of the property will continue to drain uncontrolled south towards the roadside ditch. The flow rates are calculated at a time of concentration of 10 minutes.

	100-Year Event	5-Year Event	2-Year Event
Maximum Flow Rate	61.49 L/s	31.40 L/s	23.15 L/s

Drainage Area III (Proposed Roof – Drains South – 326 sq.m)
The two roof drains are to be fully closed adjustable flow control type roof drains which will restrict the flow of stormwater and cause it to pond on the roof. Roof drains shall be a fully closed adjustable flow control type each installed with a fixed weir cone and an adjustable upper weir cone; each roof drain shall release 5 USgpm. Opening at top of flow control weir shall be a minimum 50mm in diameter: Watts Roof Drain with Watts Adjustable Accutrol Weir RD-100-A1 or approved equal. A minimum of 3 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).

	100-Year Event	5-Year Event	2-Year Event
Maximum Release Rate	0.63 L/s	0.63 L/s	0.63 L/s
Maximum Depth at Roof Drain	146 mm	103 mm	87 mm
Maximum Volume Stored	16.92 cu.m.	7.41 cu.m.	4.97 cu.m.

Entire Site:

	100-Year Event	5-Year Event	2-Year Event
Pre-Development Flow Rate North	17.78 L/s	8.30 L/s	6.12 L/s
Pre-Development Flow Rate South	65.42 L/s	33.74 L/s	24.87 L/s
Overall Pre-Development Flow Rate	83.20 L/s	42.04 L/s	30.99 L/s
Post-Development Flow Rate North	15.70 L/s	7.39 L/s	5.46 L/s
Post-Development Flow Rate South	62.12 L/s	32.04 L/s	23.78 L/s
Overall Post-Development Flow Rate	77.82 L/s	39.43 L/s	29.24 L/s

The maximum post-development flow rate draining north (to a ditch that drains to the roadside ditch) is calculated to be 11% to 12% less than the pre-development flow rate. The maximum post-development flow rate draining south (to the roadside ditch) is calculated to be 4% to 5% less than the pre-development flowrate. The overall maximum post-development flow rate is calculated to be about 6% less. Therefore, the post-development flow rate is expected to have a positive impact on the existing infrastructure.

4.3 STORMWATER

The roof drains will drain to grade. Foundation drains are not required.

The 2-year flow rate in the last pipe segment is 31% of the pipe capacity. As previously mentioned, the sewer outlets to the northern ditch near the northeast corner of the property.

Based on a topographic survey prepared by IBW Surveyors, dated March 28, 2025, of the adjacent and downstream ditches and culvert, and based on a recent site visit; with the exception of the end of one culvert (located at the entrance to 1359 Coker Street) that is crushed and needs to be repaired the owner, these ditches provide continuity of downstream flow.

The Ministry of Environment, Conservation and Parks (MECP) is expected to consider the property "industrial lands"; therefore, an Environmental Compliance Approval (ECA) is expected to be required for the proposed stormwater management facility. A response to a Pre-Submission Consultation Request is required, from the Ottawa office of MECP, to confirm.

4.4 PERMEABLE PAVER MAINTENANCE

Based on the 'Sustainable Technologies Evaluation Program Low Impact Development Stormwater Management Planning and Design Guide', the following maintenance procedures and preventative measures should be incorporated into a maintenance plan:

Annual inspections of permeable pavement should be conducted in the spring. These inspections should check for evidence of spills and surface ponding (staining or sediment accumulation on pavement surface), damage and deterioration.

Keep the pavement surface free of organic material through regular sweeping and vacuuming.

Surface sweeping should occur once or twice a year with a commercial vacuum sweeping unit. Permeable pavement should not be washed with high pressure water systems or compressed air units, because they will push particles deeper into the pavement.

Vacuuming of the surface should occur on an annual basis.

Seal coats should never be applied to permeable pavements.

An uneven paver surface can be repaired by pulling up the pavers, redistributing the bedding course, and then placing the pavers back. New joint filling will need to be swept into the replaced pavers. A set of replacement pavers should be kept onsite for making future repairs.

Winter Maintenance:

Sand should not be spread on permeable pavement as it can quickly lead to clogging.
Deicers should only be used in moderation and only when needed.
Snow should not be stored on top of permeable pavements

5.0 CONCLUSIONS

1. As per OBC method the required water supply flow rate for firefighting for the proposed building is 1,800 L/min, which calculated to be a 54,000 L volume for 30-minute water supply; but since the building is less than 600 sq.m. it is expected that an onsite water supply will not be required. However, the proposal might still be subject to Ontario Building Code and Building department requirements.

2. The existing drilled well to the west of the existing building will provide the domestic water supply via an underground connection to the plumbing of the existing building. As per the Hydrogeological and Terrain Study, prepared by Paterson Group Inc. *"The total volume of water pumped during the 8 hour pumping event was approximately 9,120 L. This is approximately three times the maximum total daily design volume of water required to support the development …"*

3. The existing on-site septic system will be decommissioned, and a new on-site septic system is proposed to service the existing and proposed buildings (refer to design by Paterson Group Inc.).

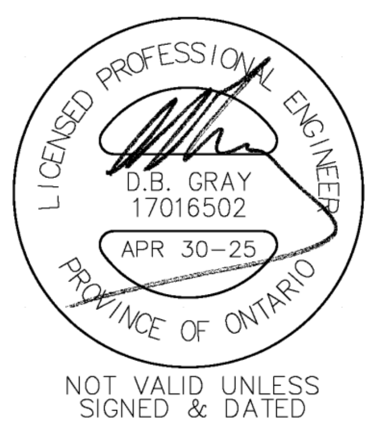
4. To meet the water quality target of 80% total suspended solids (TSS) removal, runoff from the north portion of the property (previously undeveloped – prior to 2015) will drain through a proposed oil grit separator (OGS) manhole.

5. With the installation of permeable pavers, the post development the annual infiltration of the north portion of the property is greater than the pre-development infiltration rate and within 100 to 250 mm/yr target infiltration rate.

6. The maximum post-development flow rate draining north (to a ditch that drains to the roadside ditch) is calculated to be 11% to 12% less than the pre-development flow rate. The maximum post-development flow rate draining south (to the roadside ditch) is calculated to be 4% to 5% less than the pre-development flowrate. The overall maximum post-development flow rate is calculated to be about 6% less. Therefore, the post-development flow rate is expected to have a positive impact on the existing infrastructure.

7. It is expected that an Environmental Compliance Approval (ECA) from the Ministry of the Environment, Conservation and Parks (MECP) will be required.

Prepared by D.B. Gray Engineering Inc.



APPENDIX A

WATER SERVICING

OFS Fireflow and Water Storage Calculation Proposal

OFS is making no recommendations for changes around using FUS for watermain sizing. For fireflow and water storage calculations, we are proposing the following:

Urban

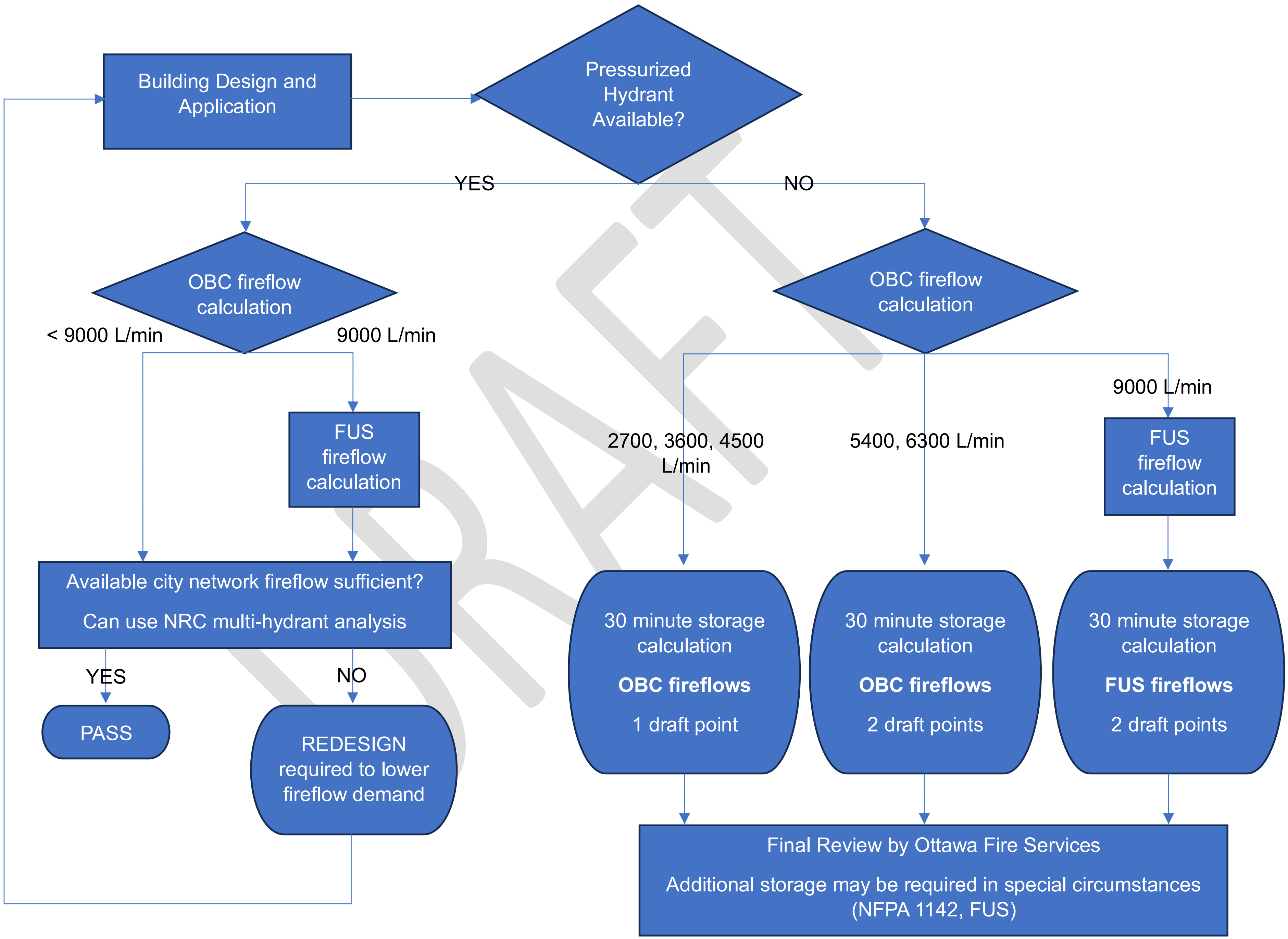
- For the sake of fireflow calculations only, OFS will define **urban** to solely mean pressurized hydrant system available for firefighting that meets OBC requirements
    - This is independent of location within the city as it pertains to firefighting force (ie: full-time vs paid on-call are equivalent)
- OBC method for fireflows permitted until it reaches OBC maximum fireflow of 9000 L/min
- Once OBC maximum reached, applicant is to switch to FUS method for fireflow calculation
- Multi-hydrant approach as per the NRC method up to 150m (contained within the technical bulletin currently) is permitted to achieve required fire flows for both OBC or FUS method as required
    - Confirmation that the water network is CAPABLE of delivering the required fireflows must be provided

Rural

- For the sake of fireflow calculations only, OFS will define **rural** to solely mean that there is no pressurized hydrant system available for firefighting
    - This is independent of location within the city as it pertains to firefighting force
- OBC method for fireflows permitted for all fireflows <9000 L/min
- If calculated fireflow = 9000 L/min, applicant is to switch to FUS method for fireflow calculation
- For OBC calculated flows < 9000 L/min – standard storage volume calculation per OBC method (minimum 30 minutes) to be used
- For OBC calculated flows = 9000 L/min – FUS fire flows x 30 min to be used for storage volume calculation
- Total water storage volume for both methods are independent of the sprinkler system required water storage per OBC calculation (ie: sprinkler water volume will be added to the other storage volume required)
- Minimum storage volume permitted for firefighting is 10000 gallons
- OFS maximum flow rate from a single draft point is approximately 4500 L/min
    - OBC flow rates = 2700, 3600, 4500 L/min – one draft point required
    - OBC flow rates = 5400, 6300 L/min – two draft points, common storage
    - OBC flow rates = 9000 L/min -> FUS flow rates – two draft points, common storage
        - Specifications and locations to be coordinated with OFS Engineer
- OFS may require additional water storage in excess of OBC calculation in special circumstances – expected to be <10% of applications

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)

OFS Fireflow and Water Storage Calculation Proposal



D.B. Gray Engineering Inc.

Ryan Faith <r.faith@dbgrayengineering.com>

RE: 1353 Coker Street

1 message

Evans, Allan <Allan.Evans@ottawa.ca> Thu, Jan 12, 2023 at 1:22 PM
To: Ryan Faith <r.faith@dbgrayengineering.com>
Cc: Douglas Gray <d.gray@dbgrayengineering.com>, Andrea Buchsbaum <andreabuchsbaum@arbaum.com>, "Whittaker, Damien" <Damien.Whittaker@ottawa.ca>, Mariana Palos <marianapalos@arbaum.com>

Hi Ryan – based upon our previous discussions around the interpretation of the new(ish) 2020 FUS and the provided letter, it is my opinion that the new building would not require on-site water storage at this time since it is non-combustible construction and <600 m2 area. I am not an AHJ under the OBC, so the final determination will be theirs.

Please be advised that our interpretation of the FUS 2020 and the changes within it are evolving and will be the subject of ongoing meetings within our internal groups. As such, this situation and my recommendation at this time is not to be considered as applicable for any other applications unless expressly stated as such. We should have a more solid policy around this in the future.

Damien – any objections or other comments?

Regards,

Allan Evans

Fire Protection Engineer / Ingénieur de Protection d'Incendies

Prevention Division / Prévention des Incendies

Ottawa Fire Services / Service des Incendies d'Ottawa

1445 Carling Avenue / 1445 Avenue Carling

Ottawa, ON K1Z 7L9

Allan.Evans@Ottawa.ca

☎ (613) 913-2747 | ☎ (613) 580-2424 x24119 | 🖷 (613) 580-2866 | Mail Code: 25-102 | @OFSFPE

OTTAWA FIRE SERVICES
SERVICE DES INCENDIES D'OTTAWA
Protecting Our Nation's Capital With Pride
Protéger notre capitale nationale avec fierté
CFAI
An internationally accredited agency 2014-2019

January 9, 2023

Allan Evans
Fire Protection Engineer / Ingénieur de Protection d'Incendies
Prevention Division / Prévention des Incendies
Ottawa Fire Services / Service des Incendies d'Ottawa
1445 Carling Avenue / 1445 Avenue Carling
Ottawa, ON K1Z 7L9

Subject: 1353 Coker St. Building Construction.

As requested, this is to inform that the 1353 Coker Street Additional Building, submitted to Building Permit under the application number A22-004931, is of Noncombustible Construction according to the definition bellow.

Noncombustible Construction (Type II)
A building is considered to be of Noncombustible construction (Type II) when all structural elements, walls, arches, floors, and roofs are constructed with a minimum 1-hour fire resistance rating and are constructed with noncombustible materials.

Should you have any comments or questions, please do not hesitate to contact us.
Kindly,

ONTARIO ASSOCIATION OF ARCHITECTS
ANDREA R. BUCHSBAUM
LICENCE
7996

Andrea Buchsbaum
OAA, RAIC, AIA, LEED Green Assoc., EDAC
Arbaum Architects Inc.

102-535 Legget Drive, Ottawa,ON K2K3B8 ph: (613)-435-7148 www.arbaum.com

APPENDIX B

STORMWATER MANAGEMENT

D.B. Gray Engineering Inc. **Douglas Gray <d.gray@dbgrayengineering.com>**

RE: CDS Sizing - 1353 Coker St, Ottawa

1 message

Natalie W <natalie@echelonenvironmental.ca> Tue, Feb 7, 2023 at 8:52 AM
To: Douglas Gray <d.gray@dbgrayengineering.com>
Cc: Ryan Faith <r.faith@dbgrayengineering.com>

Good Morning Doug,

Thank you for the sizing request! The selected CDS model is a PMSU2015-4. Please find attached our sizing calculations with a sample cut sheet drawing included for your files. If you have any questions, please feel free to contact our office at your convenience.

Best Regards,

Natalie

Natalie Wong, P.Eng.

Echelon Environmental Inc.

Office Address	Mailing Address
55 Albert Street – Suite 200	5694 Hwy #7 East - Suite 354
Markham, ON	Markham, ON
L3P 2T4	L3P 0E3

PH: 905-948-0000

MOBILE: 416-476-8936

EMAIL: Natalie@echelonenvironmental.ca

From: Douglas Gray <d.gray@dbgrayengineering.com>
Sent: February-07-23 8:41 AM
To: Natalie W <natalie@echelonenvironmental.ca>
Cc: Ryan Faith <r.faith@dbgrayengineering.com>
Subject: CDS Sizing - 1353 Coker St, Ottawa

Hi Natalie

We are working on a project at 1353 Coker St in Ottawa, Ontario. Please size the required CDS for 80% TSS removal for the following drainage area.

Landscaped Area: 23 sq.m. C = 0.20
Permeable Pavers Area: 595 sq.m. C = 0.30
Total Catchment Area: 618 sq.m.

Thanks, Doug

D.B. Gray Engineering Inc.

Stormwater Management - Grading & Drainage - Storm & Sanitary Sewers - Watermains

700 Long Point Circle Tel: 613-425-8044

Ottawa, Ontario K1T 4E9 d.gray@dbgrayengineering.com

1353 Coker St - CDS TSSR (07-Feb-23).pdf
510K

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

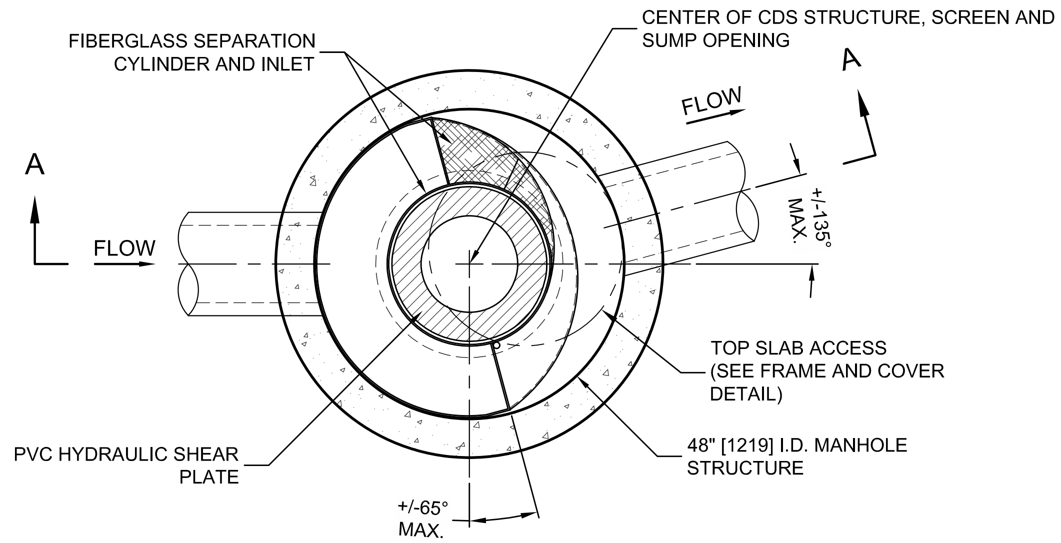
Project Name:	1353 Coker Street	**Engineer:**	**D.B. Gray Engineering**
Location:	Ottawa, ON	**Contact:**	D. Gray, P.Eng.
OGS #:	OGS	**Report Date:**	7-Feb-23

Area	0.0618	ha	**Rainfall Station #**	215	
Weighted C	0.3		**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%	0.0	0.0	0.1	98.8	9.1
1.0	10.6%	19.8%	0.1	0.1	0.3	98.8	10.5
1.5	9.9%	29.7%	0.1	0.1	0.4	98.7	9.8
2.0	8.4%	38.1%	0.1	0.1	0.5	98.7	8.3
2.5	7.7%	45.8%	0.1	0.1	0.6	98.7	7.6
3.0	5.9%	51.7%	0.2	0.2	0.8	98.6	5.9
3.5	4.4%	56.1%	0.2	0.2	0.9	98.6	4.3
4.0	4.7%	60.7%	0.2	0.2	1.0	98.6	4.6
4.5	3.3%	64.0%	0.2	0.2	1.2	98.5	3.3
5.0	3.0%	67.1%	0.3	0.3	1.3	98.5	3.0
6.0	5.4%	72.4%	0.3	0.3	1.6	98.4	5.3
7.0	4.4%	76.8%	0.4	0.4	1.8	98.3	4.3
8.0	3.5%	80.3%	0.4	0.4	2.1	98.3	3.5
9.0	2.8%	83.2%	0.5	0.5	2.3	98.2	2.8
10.0	2.2%	85.3%	0.5	0.5	2.6	98.1	2.1
15.0	7.0%	92.3%	0.8	0.8	3.9	97.7	6.8
20.0	4.5%	96.9%	1.0	1.0	5.2	97.4	4.4
25.0	1.4%	98.3%	1.3	1.3	6.5	97.0	1.4
30.0	0.7%	99.0%	1.5	1.5	7.8	96.6	0.6
35.0	0.5%	99.5%	1.8	1.8	9.1	96.2	0.5
40.0	0.5%	100.0%	2.1	2.1	10.4	95.9	0.5
45.0	0.0%	100.0%	2.3	2.3	11.7	95.5	0.0
50.0	0.0%	100.0%	2.6	2.6	13.0	95.1	0.0
							98.4

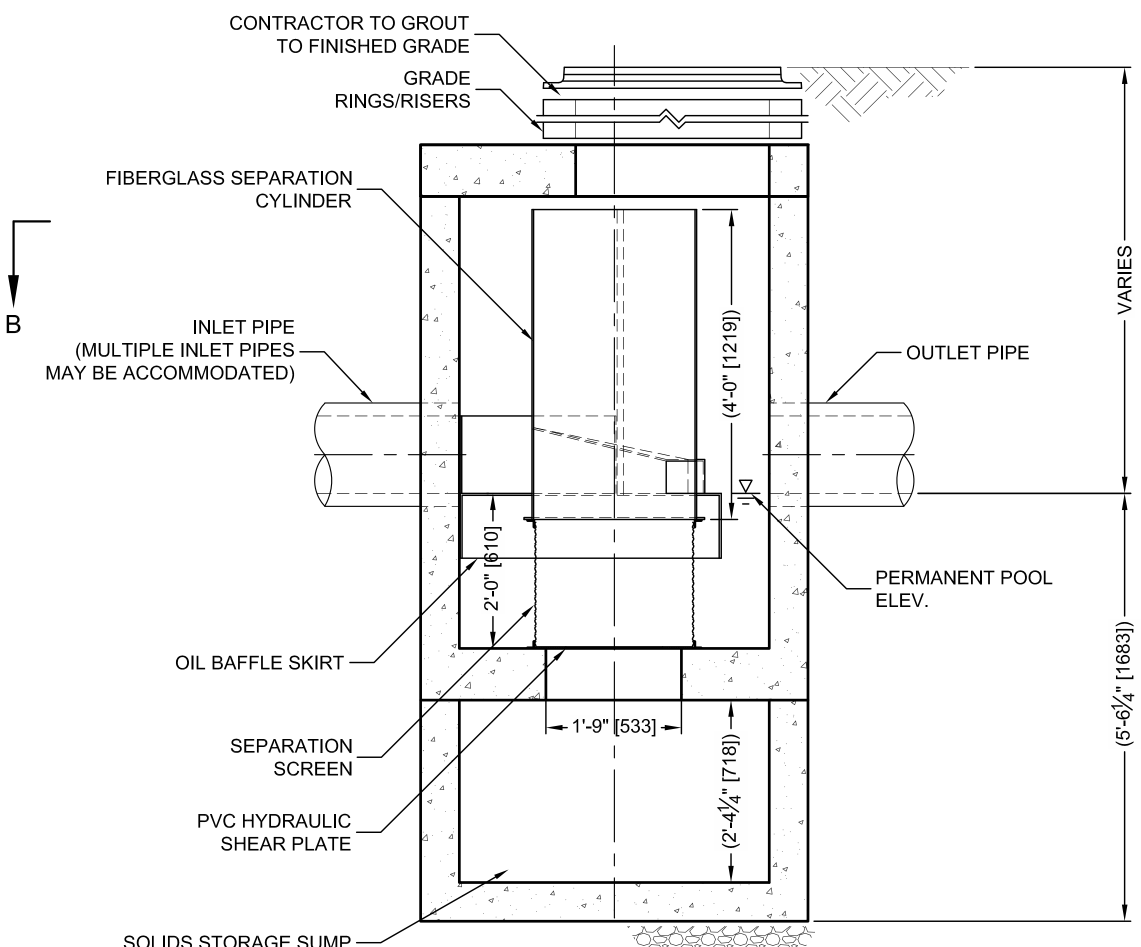
Removal Efficiency Adjustment[2] =	6.5%
Predicted Net Annual Load Removal Efficiency =	**91.9%**
Predicted % Annual Rainfall Treated =	**100.0%**

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

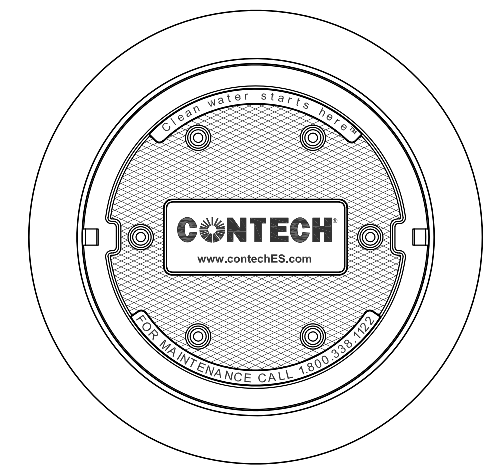
N.T.S.

THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 5,788,848; 6,641,720; 6,511,595; 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

C:\USERS\HUDA.ECHELONENV\DOCUMENTS\START ITEMS\PMSU SAMPLE DRAWINGS\4\CDS2015-4-C-DTL.DWG 5/30/2022 12:30 AM

◆ 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

GLOBE PERFORMANCE SOLUTIONS

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.

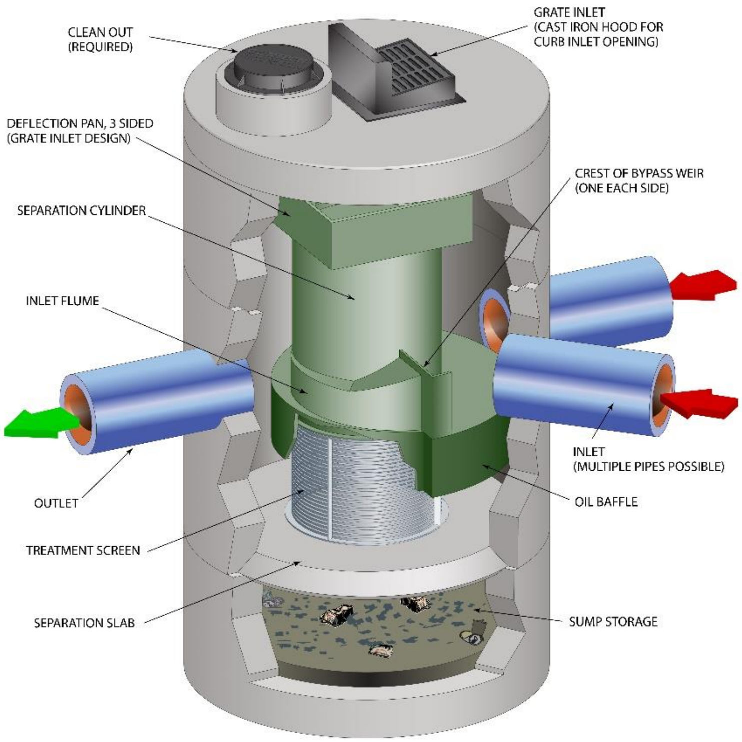


Figure 1. Graphic of typical inline CDS unit and core components.

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.

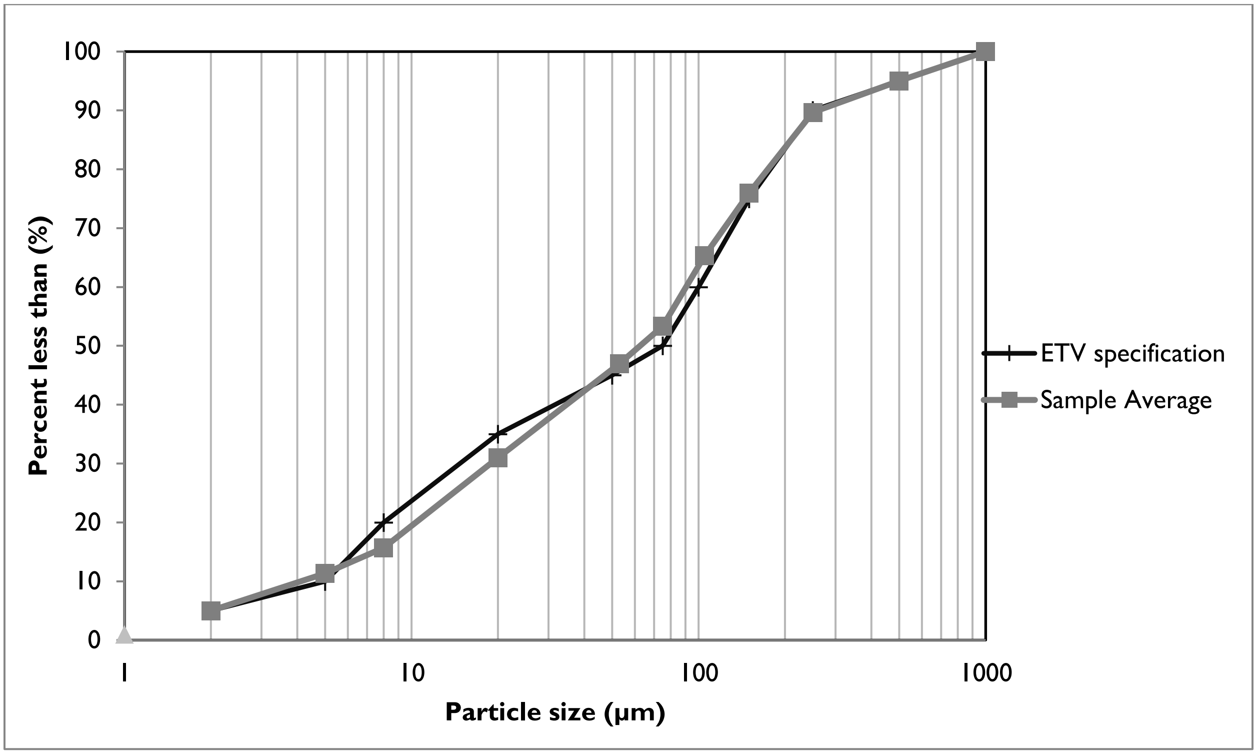


Figure 2. The three sample average particle size distribution (PSD) of the test sediment used for the capture and scour test compared to the specified PSD.

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.

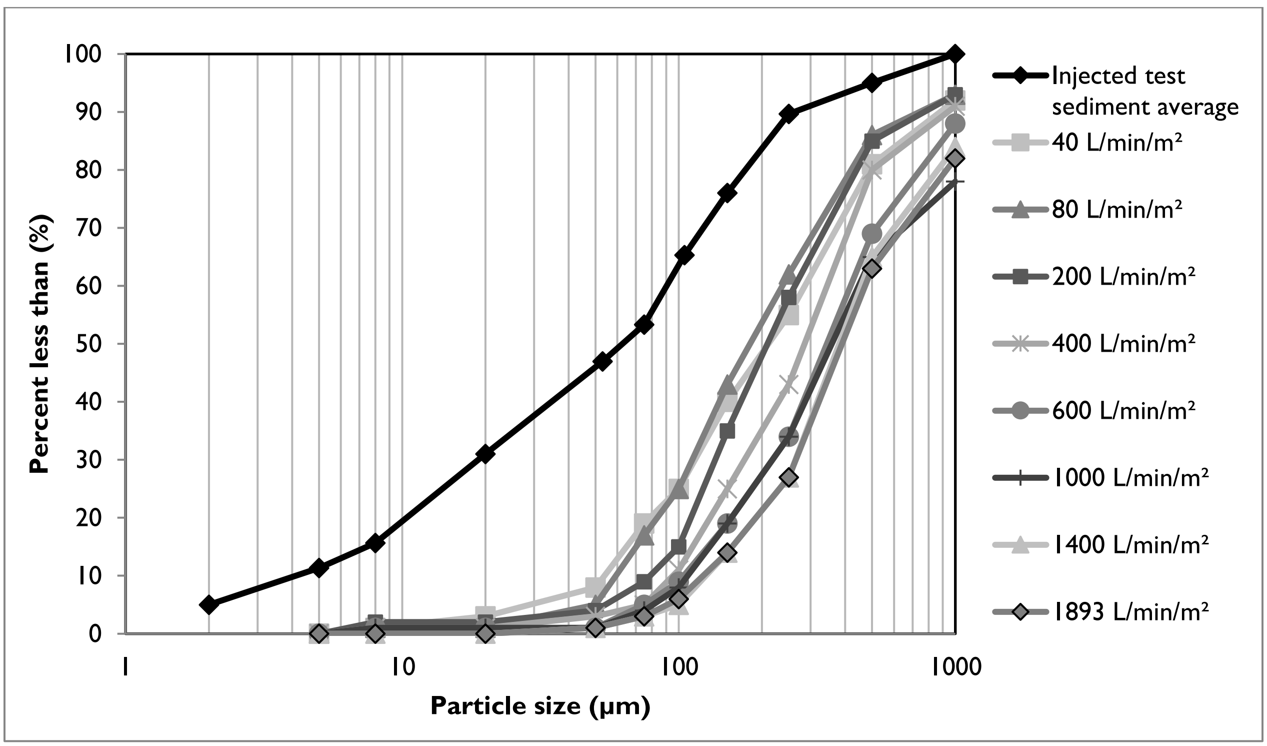


Figure 3. Particle size distribution of retained sediment in relation to the injected test sediment average.

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/m² 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/m²)	Run time (min)	Background sample concentration (mg/L)	Adjusted effluent suspended sediment concentration (mg/L)[ǂ]	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	

ǂ 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/m² 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 1.17m²) 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/m²) 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/m²)	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/m², 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/m². 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/m² 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/m² 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

03-Feb-23
REVISED 21-Jun-24

1353 Coker Street

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 (undeveloped area prior to 2015 - draining north)

	Area (sq.m.)	Precipitation + (mm/yr)	Evapo-transpiration ++ (mm/yr)	Surplus (mm/yr)	Topography Factor *	Soil Factor **	Vegetation Factor ***	Infiltration Coefficient	Infiltration (mm/yr)
"Forest-decidous"	955	943	638	305	0.10	0.15	0.2	0.45	137
Total:	955							Weighted Average:	137

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)
Landscaped	12	943	577	366	0.10	0.15	0.1	0.35	128
Permeable Pavers	607	943	174	769	0.13	0.15	0.0	0.28	215
Hard Surfaces	336	943	150	793				0.00	0
Total:	955							Weighted Average:	138

+ Ottawa International Airport (1981-2010)
++ Eastern Ontario Water Resources Management Study (2001); Carp River Watershed / Subwatershed Study; & Effects On Evaporation Rates From Different Water-Permeable Pavement Designs, P. Starke, P. Göbel & W. G. Coldewey (16% increase relative impermeable pavements)

		Factor	Subject Property
* Topography:	Flat Land, average slope < 0.6m/km (<.06%)	0.3	Permeable Pavers: 0.13 = 0.15 for 377 sq.m. (1% to 2.8% slopes) +
	Rolling Land, average slope 2.8 to 3.8m/km (0.28% to 0.38%)	0.2	0.10 for 257 sq.m. (2.8% to 5% slopes)
	Hilly Land, average slope 28 to 47m/km (2.8% to 4.7%)	0.1	Landscaped: 0.10 (2.8% to 4.7%)
** Soil:	Tight impervious clay	0.1	= 0.15 for sily sand / silty clay
	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

SUMMARY TABLES

ONE-HUNDRED-YEAR EVENT

Drainage Area	Pre-Development Flow Rate			Post Development Flow Rate			Maximum Volume Required & Stored (cu.m)
	North (L/s)	South (L/s)	Total (L/s)	North (L/s)	South (L/s)	Total (L/s)	
AREA I (Uncontrolled Flow Rate North)	-	-	-	15.70	-	-	-
AREA II (Uncontrolled Flow Rate South)	-	-	-	-	61.49	-	-
AREA III (Roof South)	-	-	-	-	0.63	-	16.92
TOTAL	17.78	65.42	83.20	15.70	62.12	77.82	16.92

FIVE-YEAR EVENT

Drainage Area	Pre-Development Flow Rate			Post Development Flow Rate			Maximum Volume Required & Stored (cu.m)
	North (L/s)	South (L/s)	Total (L/s)	North (L/s)	South (L/s)	Total (L/s)	
AREA I (Uncontrolled Flow Rate North)	-	-	-	7.39	-	-	-
AREA II (Uncontrolled Flow Rate South)	-	-	-	-	31.40	-	-
AREA III (Roof South)	-	-	-	-	0.63	-	7.41
TOTAL	8.30	33.74	42.04	7.39	32.04	39.43	7.41

TWO-YEAR EVENT

Drainage Area	Pre-Development Flow Rate			Post Development Flow Rate			Maximum Volume Required & Stored (cu.m)
	North (L/s)	South (L/s)	Total (L/s)	North (L/s)	South (L/s)	Total (L/s)	
AREA I (Uncontrolled Flow Rate North)	-	-	-	5.46	-	-	-
AREA II (Uncontrolled Flow Rate South)	-	-	-	-	23.15	-	-
AREA III (Roof South)	-	-	-	-	0.63	-	4.97
TOTAL	6.12	24.87	30.99	5.46	23.78	29.24	4.97

	March 7, 2022
REVISED	February 3, 2023
REVISED	August 8, 2023
REVISED	June 21, 2024
REVISED	November 28, 2024

1353 Coker Street

Ottawa, Ontario

STORMWATER MANAGEMENT CALCULATIONS

Modified Rational Method

ONE-HUNDRED-YEAR EVENT

NORTH PRE-DEVELOPMENT (2015) FLOW RATE

			C	
Roof Area:	0	sq.m	1.00	
Asphalt/Concrete 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
Gravel Area:	0	sq.m	1.00	
Exisitng Conditions:	955	sq.m	0.375	
Landscaped Area:	0	sq.m	0.25	
Total Catchment Area:	955	sq.m	0.38	

Bransby Williams Formula

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

Sheet Flow Distance (L):	50	m
Slope of Land (Sw):	1	%
Area (A):	0.0955	ha
Time of Concentration (Sheet Flow):	4	min
Area (A):	955	sq.m
Time of Concentration:	10	min
Rainfall Intensity (i):	179	mm/hr
Runoff Coeficient (C):	0.38	
Flow Rate (2.78AiC):	17.78	L/s

SOUTH PRE-DEVELOPMENT (2015) FLOW RATE

			C
Roof Area:	505	sq.m	1.00
Asphalt/Concrete Area:	600	sq.m	1.00
Gravel Area:	75	sq.m	1.00
Landscaped Area:	552	sq.m	0.25
Total Catchment Area:	1,732	sq.m	0.76

Bransby Williams Formula

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

Sheet Flow Distance (L):	35	m
Slope of Land (Sw):	0.5	%
Area (A):	0.1732	ha
Time of Concentration (Sheet Flow):	3	min
Area (A):	1,732	sq.m
Time of Concentration:	10	min
Rainfall Intensity (i):	179	mm/hr
Runoff Coeficient (C):	0.76	
Flow Rate (2.78AiC):	65.42	L/s

DRAINAGE AREA I (Uncontrolled Flow Rate North)

(ONE-HUNDRED-YEAR EVENT)

			C
Roof Area:	0	sq.m	1.00
Asphalt/Concrete Area:	21	sq.m	1.00
Gravel Area:	38	sq.m	1.00
Permeable Pavers Area:	533	sq.m	0.625
Landscaped Area:	12	sq.m	0.25
Total Catchment Area:	604	sq.m	0.65
Area (A):	604	sq.m	
Time of Concentration:	15	min	
Rainfall Intensity (i):	143	mm/hr	
Runoff Coeficient (C):	0.65		
Flow Rate (2.78AiC):	15.70	L/s	

DRAINAGE AREA II (Uncontrolled Flow Rate South)

(ONE-HUNDRED-YEAR EVENT)

			C
Roof Area:	387	sq.m	1.00
Asphalt/Concrete Area:	545	sq.m	1.00
Gravel Area:	69	sq.m	1.00
Permeable Pavers Area:	130	sq.m	0.625
Landscaped Area:	626	sq.m	0.25
Total Catchment Area:	1,757	sq.m	0.71
Area (A):	1,757	sq.m	
Time of Concentration:	10	min	
Rainfall Intensity (i):	179	mm/hr	
Runoff Coeficient (C):	0.71		
Flow Rate (2.78AiC):	61.49	L/s	

DRAINAGE AREA III (Proposed Roof - Drains South)

(ONE-HUNDRED-YEAR EVENT)

			C
Total Catchment Area:	326	sq.m	1.00

No. of Roof Drains:	2	
Fully Closed Adjustable Wiers:	1	0.01242 L/s/slot (5 USgpm/slot)
Depth at Roof Drain:	146	mm
Maximum Release Rate:	0.63	L/s

Pond Area:	281	sq.m
Maximum Volume Stored:	16.92	cu.m
Maximum Volume Required:	16.92	cu.m

Time (min)	i (mm/hr)	2.78AiC (L/s)	Release Rate (L/s)	Stored Rate (L/s)	Required Storage Volume (cu.m)
5	243	22.00	0.63	21.36	6.41
10	179	16.18	0.63	15.55	9.33
15	143	12.95	0.63	12.32	11.09
20	120	10.87	0.63	10.24	12.29
25	104	9.41	0.63	8.78	13.17
30	92	8.33	0.63	7.69	13.85
40	75	6.81	0.63	6.18	14.83
50	64	5.80	0.63	5.17	15.50
60	56	5.07	0.63	4.43	15.96
70	50	4.51	0.63	3.88	16.30
80	45	4.08	0.63	3.45	16.54
90	41	3.73	0.63	3.09	16.71
100	38	3.44	0.63	2.80	16.82
110	35	3.19	0.63	2.56	16.89
120	33	2.98	0.63	2.35	16.92
130	31	2.80	0.63	2.17	16.92
140	29	2.64	0.63	2.01	16.89
150	28	2.50	0.63	1.87	16.84
160	26	2.38	0.63	1.75	16.77
170	25	2.27	0.63	1.64	16.68
180	24	2.17	0.63	1.54	16.58
190	23	2.08	0.63	1.44	16.46
200	22	1.99	0.63	1.36	16.34
210	21	1.92	0.63	1.29	16.20

Five-Year Event

North Pre-Development (2015) Flow Rate

			C
Roof Area:	0	sq.m	0.90
Asphalt/Concrete Area:	0	sq.m	0.90
Gravel Area:	0	sq.m	0.80
Exisitng Conditions:	955	sq.m	0.30
Landscaped Area:	0	sq.m	0.20
Total Catchment Area:	955	sq.m	0.30

1.25 x Woodland or Pasture - Flat - Clay and Silt Loam as per Table 5.7 Ottawa Sewer Design Guidelines

Area (A):	955	sq.m
Time of Concentration:	10	min
Rainfall Intensity (i):	104	mm/hr
Runoff Coeficient (C):	0.30	
Flow Rate (2.78AiC):	8.30	L/s

South Pre-Development (2015) Flow Rate

			C
Roof Area:	505	sq.m	0.90
Asphalt/Concrete Area:	600	sq.m	0.90
Gravel Area:	75	sq.m	0.80
Landscaped Area:	552	sq.m	0.20
Total Catchment Area:	1,732	sq.m	0.67

Area (A):	1,732	sq.m
Time of Concentration:	10	min
Rainfall Intensity (i):	104	mm/hr
Runoff Coeficient (C):	0.67	
Flow Rate (2.78AiC):	33.74	L/s

DRAINAGE AREA I (Uncontrolled Flow Rate North)

(FIVE-YEAR EVENT)

			C
Roof Area:	0	sq.m	0.90
Asphalt/Concrete Area:	21	sq.m	0.90
Gravel Area:	38	sq.m	0.80
Permeable Pavers Area:	533	sq.m	0.50
Landscaped Area:	12	sq.m	0.20
Total Catchment Area:	604	sq.m	0.53
Area (A):	604	sq.m	
Time of Concentration:	15	min	
Rainfall Intensity (i):	84	mm/hr	
Runoff Coeficient (C):	0.53		
Flow Rate (2.78AiC):	7.39	L/s	

DRAINAGE AREA II (Uncontrolled Flow Rate South)

(FIVE-YEAR EVENT)

			C
Roof Area:	387	sq.m	0.90
Asphalt/Concrete Area:	545	sq.m	0.90
Gravel Area:	69	sq.m	0.80
Permeable Pavers Area:	130	sq.m	0.50
Landscaped Area:	626	sq.m	0.20
Total Catchment Area:	1,757	sq.m	0.62
Area (A):	1,757	sq.m	
Time of Concentration:	10	min	
Rainfall Intensity (i):	104	mm/hr	
Runoff Coeficient (C):	0.62		
Flow Rate (2.78AiC):	31.40	L/s	

DRAINAGE AREA III (Proposed Roof - Drains South)

(FIVE-YEAR EVENT)

			C
Total Catchment Area:	326	sq.m	0.90

No. of Roof Drains:	2	
Fully Closed Adjustable Wiers:	1	0.01242 L/s/slot (5 USgpm/slot)
Depth at Roof Drain:	103	mm
Maximum Release Rate:	0.63	L/s

Pond Area:	168	sq.m
Maximum Volume Stored:	7.41	cu.m
Maximum Volume Required:	7.41	cu.m

Time (min)	i (mm/hr)	2.78AiC (L/s)	Release Rate (L/s)	Stored Rate (L/s)	Required Storage Volume (cu.m)
5	141.2	11.52	0.63	10.88	3.27
10	104.2	8.50	0.63	7.87	4.72
15	83.6	6.82	0.63	6.18	5.57
20	70.3	5.73	0.63	5.10	6.12
25	60.9	4.97	0.63	4.34	6.50
30	53.9	4.40	0.63	3.77	6.78
40	44.2	3.60	0.63	2.97	7.14
50	37.7	3.07	0.63	2.44	7.32
60	32.9	2.69	0.63	2.06	7.40
70	29.4	2.40	0.63	1.76	7.41
80	26.6	2.17	0.63	1.54	7.37
90	24.3	1.98	0.63	1.35	7.29
100	22.4	1.83	0.63	1.20	7.18
110	20.8	1.70	0.63	1.07	7.05
120	19.5	1.59	0.63	0.96	6.89
130	18.3	1.49	0.63	0.86	6.72
140	17.3	1.41	0.63	0.78	6.53
150	16.4	1.33	0.63	0.70	6.33
160	15.6	1.27	0.63	0.64	6.12
170	14.8	1.21	0.63	0.58	5.90
180	14.2	1.16	0.63	0.53	5.68
190	13.6	1.11	0.63	0.48	5.44
200	13.0	1.06	0.63	0.43	5.20
210	12.6	1.02	0.63	0.39	4.95

Two-Year Event

North Pre-Development (2015) Flow Rate

			C
Roof Area:	0	sq.m	0.90
Asphalt/Concrete Area:	0	sq.m	0.90
Gravel Area:	0	sq.m	0.80
Exisitng Conditions:	955	sq.m	0.30
Landscaped Area:	0	sq.m	0.20
Total Catchment Area:	955	sq.m	0.30

1.25 x Woodland or Pasture - Flat - Clay and Silt Loam as per Table 5.7 Ottawa Sewer Design Guidelines

Area (A):	955	sq.m
Time of Concentration:	10	min
Rainfall Intensity (i):	77	mm/hr
Runoff Coeficient (C):	0.30	
Flow Rate (2.78AiC):	6.12	L/s

South Pre-Development (2015) Flow Rate

			C
Roof Area:	505	sq.m	0.90
Asphalt/Concrete Area:	600	sq.m	0.90
Gravel Area:	75	sq.m	0.80
Landscaped Area:	552	sq.m	0.20
Total Catchment Area:	1,732	sq.m	0.67

Area (A):	1,732	sq.m
Time of Concentration:	10	min
Rainfall Intensity (i):	77	mm/hr
Runoff Coeficient (C):	0.67	
Flow Rate (2.78AiC):	24.87	L/s

DRAINAGE AREA I (Uncontrolled Flow Rate North)

(TWO-YEAR EVENT)

			C
Roof Area:	0	sq.m	0.90
Asphalt/Concrete Area:	21	sq.m	0.90
Gravel Area:	38	sq.m	0.80
Permeable Pavers Area:	533	sq.m	0.50
Landscaped Area:	12	sq.m	0.20
Total Catchment Area:	604	sq.m	0.53
Area (A):	604	sq.m	
Time of Concentration:	15	min	
Rainfall Intensity (i):	62	mm/hr	
Runoff Coeficient (C):	0.53		
Flow Rate (2.78AiC):	5.46	L/s	

DRAINAGE AREA II (Uncontrolled Flow Rate South)

(TWO-YEAR EVENT)

			C
Roof Area:	387	sq.m	0.90
Asphalt/Concrete Area:	545	sq.m	0.90
Gravel Area:	69	sq.m	0.80
Permeable Pavers Area:	130	sq.m	0.50
Landscaped Area:	626	sq.m	0.20
Total Catchment Area:	1,757	sq.m	0.62
Area (A):	1,757	sq.m	
Time of Concentration:	10	min	
Rainfall Intensity (i):	77	mm/hr	
Runoff Coeficient (C):	0.62		
Flow Rate (2.78AiC):	23.15	L/s	

DRAINAGE AREA III (Proposed Roof - Drains South)

(TWO-YEAR EVENT)

			C
Total Catchment Area:	326	sq.m	0.90

No. of Roof Drains:	2	
Fully Closed Adjustable Wiers:	1	0.01242 L/s/slot (5 USgpm/slot)
Depth at Roof Drain:	87	mm
Maximum Release Rate:	0.63	L/s

Pond Area:	132	sq.m
Maximum Volume Stored:	4.97	cu.m
Maximum Volume Required:	4.97	cu.m

Time (min)	i (mm/hr)	2.78AiC (L/s)	Release Rate (L/s)	Stored Rate (L/s)	Required Storage Volume (cu.m)
5	103.6	8.45	0.63	7.82	2.35
10	76.8	6.26	0.63	5.63	3.38
15	61.8	5.04	0.63	4.41	3.97
20	52.0	4.24	0.63	3.61	4.34
25	45.2	3.68	0.63	3.05	4.58
30	40.0	3.27	0.63	2.64	4.74
40	32.9	2.68	0.63	2.05	4.92
50	28.0	2.29	0.63	1.66	4.97
60	24.6	2.00	0.63	1.37	4.94
70	21.9	1.79	0.63	1.16	4.86
80	19.8	1.62	0.63	0.99	4.74
90	18.1	1.48	0.63	0.85	4.58
100	16.7	1.37	0.63	0.73	4.41
110	15.6	1.27	0.63	0.64	4.22
120	14.6	1.19	0.63	0.56	4.01
130	13.7	1.12	0.63	0.49	3.79
140	12.9	1.05	0.63	0.42	3.56
150	12.3	1.00	0.63	0.37	3.32
160	11.7	0.95	0.63	0.32	3.07
170	11.1	0.91	0.63	0.28	2.81
180	10.6	0.87	0.63	0.24	2.55
190	10.2	0.83	0.63	0.20	2.28
200	9.8	0.80	0.63	0.17	2.00
210	9.4	0.77	0.63	0.14	1.73

D.B. Gray Engineering Inc.

Stormwater Management - Grading & Drainage - Storm & Sanitary Sewers - Watermains

700 Long Point Circle
Ottawa, Ontario K1T 4E9

613-425-8044
d.gray@dbgrayengineering.com

STORM SEWER CALCULATIONS

Rational Method

2-YEAR EVENT

Project: 1353 Coker Street
Ottawa, Ontario

Date: April 11, 2025

Manning's Roughness Coefficient: 0.013

Location		Individual					Cumulative				Sewer Data							
From	To	Hard C = 0.90 (ha)	Gravel C = 0.80 (ha)	Permeable Pavers C = 0.50 (ha)	Soft C = 0.20 (ha)	2.78AC	2.78AC	Time (min)	Rainfall Intensity (mm/hr)	Q Flow Rate (L/s)	Length (m)	Nominal Diameter (mm)	Actual Diameter (mm)	Slope (%)	Velocity (m/s)	Q_{Full} Capacity (L/s)	Time (min)	Q / Q_{Full}
		DRAINAGE AREA I																
MH-1	MH-2	0.0021	0.0038	0.0533	0.0012	0.0885	0.0885	15.00	62	5.46	2.0	200	200	0.5	0.74	23.19	0.05	24%
MH-2	ditch					0.0000	0.0885	15.05	62	5.45	3.0	200	200	0.33	0.60	18.84	0.08	29%

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Ottawa, Ontario K1T 4E9

613-425-8044
d.gray@dbgrayengineering.com

STORM SEWER CALCULATIONS

Rational Method

100-YEAR EVENT

Project: 1353 Coker Street
Ottawa, Ontario

Date: April 11, 2025

Manning's Roughness Coefficient: 0.013

Location		Individual					Cumulative				Sewer Data							
From	To	Hard C = 1.00 (ha)	Gravel C = 1.00 (ha)	Permeable Pavers C = 0.625 (ha)	Soft C = 0.25 (ha)	2.78AC	2.78AC	Time (min)	Rainfall Intensity (mm/hr)	Q Flow Rate (L/s)	Length (m)	Nominal Diameter (mm)	Actual Diameter (mm)	Slope (%)	Velocity (m/s)	Q_{Full} Capacity (L/s)	Time (min)	Q / Q_{Full}
		DRAINAGE AREA I																
MH-1	MH-2	0.0021	0.0038	0.0533	0.0012	0.1098	0.1098	15.00	143	15.70	2.0	200	200	0.5	0.74	23.19	0.05	68%
MH-2	ditch					0.0000	0.1098	15.05	62	6.77	3.0	200	200	0.33	0.60	18.84	0.08	36%

APPENDIX C

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

Pre-Consult 1353 and 1359 Cooker Street

South Nation Conservation – James Holland

- There Is a water course on site
- needs quality protection
- permit previously issued for enclosing watercourse only a section 30 ft long with a 20 inch dia pipe.
- review/require DFO
- need update stormwater - from old site plan - 80% TSS post to pre quantity.
- Watercourses are likely low-flow, intermittent watercourses that likely are indirect fish habitat. Year-round use is unlikely due to flow and heavy vegetation.
- SNC recommends that DFO is consulted via a Request for Review when a project has the potential to cause a Harmful Alteration, Disruption, or Destruction (HADD) to fish and/or fish habitat. However, if a project can be completed following all of DFO's fish protection measures, a Request for Review is not needed. In this case, I think a piping/culverts of this watercourse can be done without a RFR provided all of the fish protection measures are followed.

Engineering (Reza Bakhit)

- need new Stormwater Managament – demonstrate post to pre
- comply with the Shields Creek Subwatershed Study
- site servicing report required
- erosion and sediment
- geotech
- hydrogeological assessment and terrain analysis report required to demonstrate private servicing (well and septic)
- ECA required from MECP

Other (C McWilliams)

- Fire services may require addition on site suppression
- landscape plan needed, so also incclde a tree conservation report.
- verify permitting for buildings on site – appears to be more than had been permitted between the 3 parcels
- demonstrate zoning compliance

Transportation (Mike Giampa)

- Submit a screening form. If a TIA is warranted proceed to scoping.

The application will not be deemed complete until the submission of the draft step 1-4, including the functional draft RMA package (if applicable) and/or monitoring report (if applicable). Although a full review of the TIA Strategy report (Step 4) is not required prior to an application, it is strongly recommended.

- A Noise Impact Study is not required
- On site plan:

Show all details of the roads abutting the site up to and including the opposite curb; include such items as pavement markings, accesses and/or sidewalks.
Turning templates will be required for all accesses showing the largest vehicle to access the site; required for internal movements and at all access (entering and exiting and going in both directions).
Show existing and proposed access widths.

City of Ottawa Servicing Study Checklist

General

Executive Summary: **N/A**

Date and revision number of report: **Included**

Location map and plan showing municipal address, boundary and layout of proposed development: **Included**

Plan showing site and location of all existing services: **Included**

Development statistics, land use, density, adherence to zoning and Official Plan and reference to applicable watershed and subwatershed plans: **N/A**

Summary of Pre-Application Consultation meetings with City of Ottawa and other approval agencies: **Included**

Confirmation of conformance with higher level studies: **N/A**

Statement of objectives and servicing criteria: **Included**

Identification of existing and proposed infrastructure available in the immediate area: **Included**

Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development: **Included**

Concept level master grading plan to confirm existing and proposed grades in the proposed development: **Included**

Identification of potential impacts of proposed piped services on private services on adjacent lands: **N/A**

Proposed phasing of proposed development: **N/A**

Reference to geotechnical studies: **Included**

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

- Metric scale: **Included**
- North arrow: **Included**
- Key plan: **Included**
- Name and contact information of applicant and property owner: **N/A**
- Property limits: **Included**
- Existing and proposed structures and parking areas: **Included**
- Easements, road widenings and right-of-ways: **Included**
- Street names: **Included**

Water Servicing

Confirmation of conformance with Master Servicing Study: **N/A**

Availability of public infrastructure to service proposed development: **N/A**

Identification of system constraints: **N/A**

Identification of boundary conditions: **N/A**

Confirmation of adequate domestic supply: **N/A**

Confirmation of adequate fire flow: **TBD**

Check of high pressures: **N/A**

Definition of phasing constraints: **N/A**

Address reliability requirements: **N/A**

Check on necessity of a pressure zone boundary modification: **N/A**

Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for proposed development: **N/A**

Description of proposed water distribution network: **N/A**

Description of required off-site infrastructure to service proposed development: **N/A**

Confirmation that water demands are calculated based on the City of Ottawa Water Design Guidelines: **N/A**

Provision of a model schematic showing the boundary conditions locations, streets, parcels and building locations: **N/A**

SANITARY SERVICING

Summary of proposed design criteria: **Included**

Confirmation of conformance with Master Servicing Study: **N/A**

Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the City of Ottawa Sewer Design Guidelines: **N/A**

Description of existing sanitary sewer available for discharge of wastewater from proposed development: **N/A**

Verification of available capacity in downstream sanitary sewer and/or identification of upgrades necessary to service proposed development: **N/A**

Calculations related to dry-weather and wet-weather flow rates: **N/A**

Description of proposed sewer network: **Included**

Discussion of previously identified environmental constraints and impact on servicing: **N/A**

Impacts of proposed development on existing pumping stations or requirements for new pumping station: **N/A**

Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity: **N/A**

Identification and implementation of emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding: **N/A**

Special considerations (e.g. contamination, corrosive environment): **N/A**

STORMWATER MANAGEMENT & STORM SERVICING

Description of drainage outlets and downstream constraints: **Included**

Analysis of available capacity in existing public infrastructure: **N/A**

Plan showing subject lands, its surroundings, receiving watercourse, existing drainage pattern and proposed drainage pattern: **Included**

Water quantity control objective: **Included**

Water quality control objective: **Included**

Description of the stormwater management concept: **Included**

Setback from private sewage disposal systems: **N/A**

Watercourse and hazard lands setbacks: **N/A**

Record of pre-consultation with the Ministry of the Environment, Conservation and Parks and the Conservation Authority having jurisdiction on the affected watershed: **Included**

Confirmation of conformance with Master Servicing Study: **N/A**

Storage requirements and conveyance capacity for minor events (5-year return period) and major events (100-year return period): **Included**

Identification of watercourses within the proposed development and how watercourses will be protected or if necessary altered by the proposed development: **Included**
Calculation of pre-development and post-development peak flow rates: **Included**

Any proposed diversion of drainage catchment areas from one outlet to another: **N/A**

Proposed minor and major systems: **N/A**

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: **N/A**

Identification of potential impacts to receiving watercourses: **Included**

Identification of municipal drains: **N/A**

Description of how the conveyance and storage capacity will be achieved for the proposed development: **Included**

100-year flood levels and major flow routing: **Included**

Inclusion of hydraulic analysis including hydraulic grade line elevations: **N/A**

Description of erosion and sediment control during construction: **Included**

Obtain relevant floodplain information from Conservation Authority: **N/A**

Identification of fill constraints related to floodplain and geotechnical investigation: **N/A**

APPROVAL AND PERMIT REQUIREMENTS

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: **N/A**

Application for Certificate of Approval (CofA) under the Ontario Water Resources Act: **N/A**

Changes to Municipal Drains: **N/A**

Other permits (e.g. National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation): **N/A**

CONCLUSIONS

Clearly stated conclusions and recommendations: **Included**

Comments received from review agencies: **N/A**

Signed and stamped by a professional Engineer registered in Ontario: **Included**