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1.0 PROJECT DESCRIPTION

1.1 Purpose

Egis Canada (Egis) has been retained by Brofort Inc to prepare this Servicing and Stormwater Management Report in support of the Site Plan Control process for the development located at 6165 Thunder Road within the City of Ottawa.

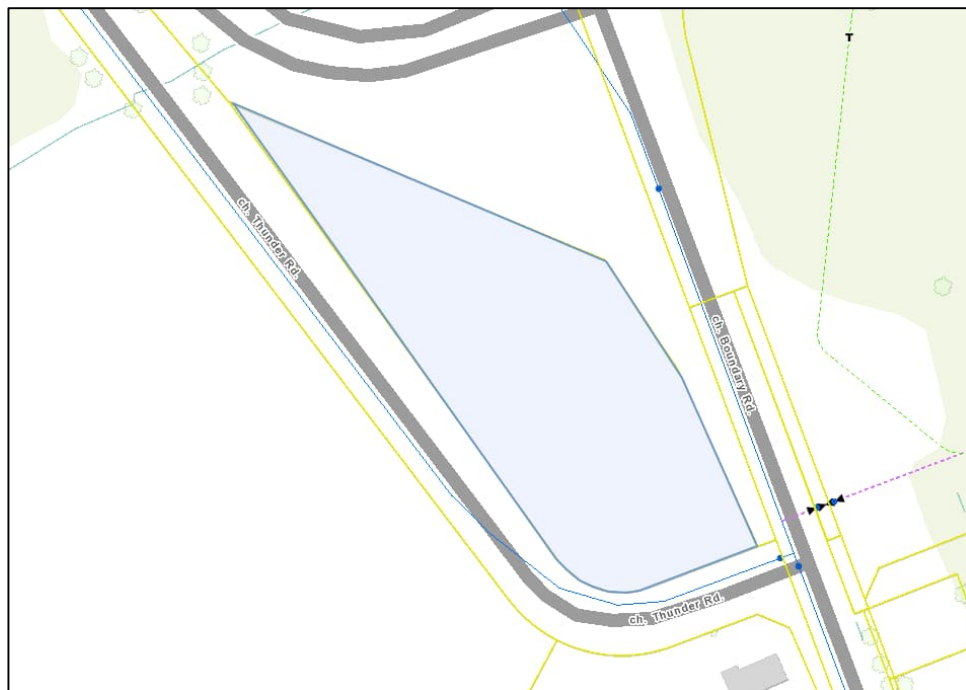
The main purpose of this report is to present a servicing design for the development in accordance with the recommendations and guidelines provided by the City of Ottawa (City), the South Nation Conservation Authority (SNCA), the Ministry of the Environment, Conservation and Parks (MECP), and the Ministry of Transportation (MTO). This report will address the water, sanitary, and storm sewer servicing for the development, ensuring that existing and available services will adequately service the proposed development.

This report should be read in conjunction with the following drawings:

- CCO-23-1882, C101 – Lot Grading, Drainage, Erosion and Sediment Control Plan
- CCO-23-1882, C102 – Site Servicing Plan
- CCO-23-1882, PRE – Pre-Development Drainage Area Plan (Appendix E)
- CCO-23-1882, POST – Post-Development Drainage Area Plan (Appendix F)

1.2 Site Description

Figure 1: Site Map



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The subject property, herein referred to as the site, is located at 6165 Thunder Road within the Osgoode Ward. The site covers approximately 1.65 ha and is located at the northwest corner of the Boundary Road and Thunder Road intersection. The site is zoned for Rural Commercial use (RC). It is also noted that the site is located adjacent to Ministry of Transportation (MTO) lands to the north and is therefore subject to a 14m setback. See Site Location Plan in Appendix A for more details.

1.3 Proposed Development and Statistics

The proposed development consists of a 3,686 m² ground floor area warehouse building with a possible future 368 m² mezzanine. Parking and drive aisles will be provided throughout the site along with landscaping. There will be two site accesses for the development from Thunder Road. The development is proposed within 1.06 ha of the site.

1.4 Existing Conditions and Infrastructure

The site is currently undeveloped with no existing infrastructure.

Sewer and watermain mapping collected from the City of Ottawa indicate that the following services exist across the property frontages within the adjacent municipal rights-of-way(s):

- Thunder Road
 - 76mm diameter Polyethylene watermain

1.5 Approvals

The proposed development is subject to the City of Ottawa site plan control approval process. Site plan control requires the City to review, provide concurrence and approve the engineering design package. Permits to construct civil side works can be requested once the City has issued a site plan agreement.

The site is currently zoned for Rural Commercial use and would therefore not require an Environmental Compliance Approval (ECA). Based on coordination with the development team, the development could be considered as an industrial development. An ECA through the Ministry of Environment, Conservation and Parks (MECP) would be required for the stormwater management system should the zoning and/or site usage change to industrial. The ECA would be submitted to the MECP under the Direction Submission process and can be submitted once the City has approved the engineering design.

2.0 BACKGROUND STUDIES, STANDARDS, AND REFERENCES

2.1 Background Reports / Reference Information

As-built drawings of existing services, provided by the City of Ottawa Information centre, within the vicinity of the proposed site were reviewed in order to identify infrastructure available to service the proposed development.

The following reports have previously been completed and are available under separate cover:

- A topographic survey (#Z10100) of the site was completed by Fairhall, Moffat & Woodland and dated February 30th, 2019.
- The Site Plan (SP-01) was prepared by Stewart + Tsai Architects Inc. and dated June 17th, 2025.
- The Geotechnical Investigation was completed by Paterson Group and dated April 29th, 2024.
- The Carlsbad Springs Trickle Feed System Performance Evaluation report was completed by ETD and dated February, 2000.
- The Lynnwood Mobile Home Park Connection to the Carlsbad Springs Trickle Feed System Feasibility Study was completed by Stantec Consulting Ltd. And dated June 1st, 2009.

2.2 Applicable Guidelines and Standards

City of Ottawa:

- ◆ Ottawa Sewer Design Guidelines, City of Ottawa, SDG002, October 2012. (Ottawa Sewer Guidelines)
 - Technical Bulletin ISTB-2014-01 City of Ottawa, February 2014. (ISTB-2014-01)
 - Technical Bulletin PIETB-2016-01 City of Ottawa, September 2016. (PIETB-2016-01)
 - Technical Bulletin ISTB-2018-01 City of Ottawa, January 2018. (ISTB-2018-01)
 - Technical Bulletin ISTB-2018-04 City of Ottawa, March 2018. (ISTB-2018-04)
 - Technical Bulletin ISTB-2019-02 City of Ottawa, February 2019. (ISTB-2019-02)
 - Technical Bulletin IWSTB-2024-04 City of Ottawa, September 2024. (IWSTB-2024-04)
- ◆ Ottawa Design Guidelines – Water Distribution City of Ottawa, July 2010. (Ottawa Water Guidelines)
 - Technical Bulletin ISD-2010-2 City of Ottawa, December 15, 2010. (ISD-2010-2)
 - Technical Bulletin ISDTB-2014-02 City of Ottawa, May 2014. (ISDTB-2014-02)
 - Technical Bulletin ISTB-2018-02 City of Ottawa, March 2018. (ISTB-2018-02)
 - Technical Bulletin ISTB-2021-03 City of Ottawa, August 2021. (ISTB-2021-03)
 - Technical Bulletin IWSTB-2024-05 City of Ottawa, November 2024. (IWSTB-2024-05)

Ministry of Environment, Conservation and Parks:

- ◆ Stormwater Planning and Design Manual, Ministry of the Environment, March 2003. (MECP Stormwater Design Manual)
- ◆ Design Guidelines for Sewage Works, Ministry of the Environment, 2008. (MECP Sewer Design Guidelines)

Other:

- ◆ Water Supply for Public Fire Protection, Fire Underwriters Survey, 2020. (FUS Guidelines)

3.0 PRE-CONSULTATION SUMMARY

A pre-consultation meeting was conducted on April 28th, 2022 regarding the proposed site. Specific design parameters to be incorporated within this design include the following:

- Control 5 & 100-year post-development flows to the 5 & 100-year pre-development flows, respectively.
- Quality control will be required up to an enhanced level of treatment (80% TSS Removal)
- The site will be entitled to one equivalent connection (2,700 L/d) to the Carlsbad Trickle Feed System.

The notes from the City of Ottawa & South Nation Conservation Authority can be found in Appendix B.

4.0 WATER SERVICING

4.1 Existing Watermain

There is an existing 76mm diameter PE watermain within Thunder Road available to service the development.

The municipality upgraded the watermain network in the area to support recent development adjacent to the subject site in 2018. The upgrades included the installation of a 100mm diameter watermain within Boundary Road, and a 76mm diameter watermain within Thunder Road.

The municipal system is a Trickle-Feed Water System; therefore, it will only provide potable water and will not meet the requirements for the fire suppression system. Based on the pre-consultation notes provided by City of Ottawa staff, the Carlsbad Trickle Feed system can supply the site with a maximum of 2,700 L/day (0.03 L/s).

4.2 Proposed Water Servicing

The new building will be serviced via a new 25 mm diameter water service connection to the Carlsbad Trickle-Feed System for potable water supply. Potable water will be stored within a 2,700 Litre underground water storage tank located outside of the building. A water metering chamber based on a modified City Standard W31.1 will be installed prior to the service entering the water storage tank. The metering chamber will include a back flow preventer, a sediment valve, and a flow control valve to ensure that no more than 2,700 Litres per day is drawn from the trickle feed system. The design of the metering chamber will be completed by a mechanical engineer and will be shown on the Site Servicing plan once available.

A new drilled well located within the limits of the site is also proposed. It is understood that the well will provide additional water for non-potable uses only. The exact size and services required for the well and pump will be designed and specified by others.

The mechanical designer will need to ensure the potable and non-potable water supplies are either directed to fully separated systems to ensure there's no opportunity for contamination of the potable water supply, or that safeguards such as an air gap or back flow preventer are provided between the two systems in accordance with building code requirements. The exact design of the mechanical system will be specified by the mechanical engineer and reviewed by Building Code Services as part of the Building Permit application.

For the purposes of this application, the anticipated water demands have been assumed to be directly related to the anticipated sewage flow demands for the development. Based on the septic system design, the calculated sewage flow demand was found to be 5,415 L/day.

For comparison and information purposes only, water demand calculations have also been calculated to adhere to the Ottawa Design Guidelines – Water Distribution manual and can be found in Appendix 'C'.

Table 1, below, summarizes the estimated water demands based on City of Ottawa guidelines. The average day demand was determined based on the industrial unit rate of 35,000 L/gross ha/d and the total floor area of the building

Table 1: Water Supply Design Criteria and Water Demands

Building Area	4,054 m ²
Light Industrial	35,000 L/gross ha/d
Maximum Daily Peaking Factor	1.5 x avg day
Maximum Hour Peaking Factor	1.8 x max day
Average Day Demand (L/s)	0.16 (13,824 L/d)
Maximum Daily Demand (L/s)	0.25 (21,600 L/d)
Peak Hourly Demand (L/s)	0.44 (38,016 L/d)
FUS Fire Flow Requirement (L/s)	133.33 (8,000 L/min)

It is noted that there is a discrepancy between the water demands calculated based on the City of Ottawa guidelines (13,824 L/day) and the sewage flow demand based on the septic system design (5,415 L/day). The reason for this discrepancy is that the sewage flow demand was calculated based on the design of this specific building, while the City of Ottawa's WDG consumption rates are intended to provide a reasonable estimate for the purpose of watermain sizing and providing minimum pressures. As a result, it is anticipated that the estimated sewage flow demand of 5,415 L/day will best represent the water demand for this site. It is anticipated that 2,700 L/day of potable water will be provided by the Trickle-Feed Water System, and the drilled well will supplement the remaining demand for non-potable uses.

A remote hydrant system and on-site water supply are proposed to provide fire suppression to the development. On-site water supply will be provided in the form of underground water storage tanks.

The Fire Underwriters Survey 2020 (FUS), the Ontario Building Code Method, NFPA1142, and NFPA13 were used to determine the required fire flow for the site. Based on coordination with Ottawa Fire Services, fire flow is to be provided for a duration of 30 minutes.

- The results of the FUS calculations yielded a required fire flow of 8,000 L/min and a required on-site storage volume of 240,000 Litres.
- The results of the OBC calculations yielded a required fire flow of 9,000 L/min and a required on-site storage volume of 689,282 Litres.
- The results of the NFPA1142 calculations yielded a required on-site storage volume of 1,016,179 Litres.
- The results of the NFPA13 calculations yielded a required on-site storage volume of 187,000 Litres for the sprinkler system and 85,500 Litres for handlines.

As Ottawa is Superior Tanker Shuttle qualified, a reduction of 1,900 L/min or 57,000 Litres can be applied to the demands and volumes listed above. Detailed fire flow calculations for the FUS, OBC, and NFPA1142 can be found in Appendix 'C'.

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Based on further coordination with Ottawa Fire Services, it was determined that the following options would provide a reasonable volume of on-site water supply for fire protection:

Option 1 (Separate sprinkler tanks and firefighting tanks)

- Tank 1 (Sprinklers): 187,000 L Required as per NFPA13
- Tank 2 (Handlines): 38,000 L Required

Option 2 (Combined tank)

- Combined Tank: 215,500 L

Fire protection measures have been designed to conform to Option 1, above. Five (5) - 45,460 Litre concrete water storage tanks are proposed to provide a total of 227,300 Litres to the building sprinkler system. The water storage tanks will be located within the landscaped area north of the building, as Ottawa Fire Services will not require access to them during a firefighting scenario.

An additional 38,000 Litre concrete water storage tank is proposed adjacent to the drive aisle to provide Ottawa Fire Services with an on-site supply for handlines. The water storage tank will include a fill station and draw pipe as per City of Ottawa Standards W51 and W52.

Correspondence with Ottawa Fire Services is included in Appendix 'C'.

5.0 SANITARY SERVICING

5.1 Existing Sanitary Sewers

There is no municipal sanitary sewer available to service the development. Existing developments in the area rely on private septic systems for sanitary servicing.

5.2 Proposed Sanitary Servicing

The new building will be serviced via a new private septic system installed within the southeast landscaped area of the property. The septic design including the size, location, and anticipated flow rates will be specified and designed by Paterson Group.

The proposed sewage system completed by Paterson Group has been designed to support a commercial type usage consisting of office, store and warehouse spaces. The design has accounted for 5,415 L/day of anticipated sewage flow, based on OBC Table 8.2.1.3.B. The system consists of an Ejen leaching field, complete with a balance pump chamber and a 16,245 L septic tank.

The septic designer will be responsible for obtaining all required permits and approvals. The on-site septic treatment will be governed by the OBC, as it is anticipated that the Daily Design Flow for the proposed building will be less than 10,000 litres per day. The proposed septic system will need to be constructed with all appropriate setbacks, treatment units and stipulations as per applicable Ontario regulations.

6.0 STORM SEWER SERVICING

6.1 Existing Storm Sewers

Storm runoff from the site is currently tributary to the Bear Brook subwatershed via the watercourse located at the northwest corner of the site. There are no existing storm sewers within Thunder Road available to service the proposed development.

6.2 Proposed Storm Servicing

A new stormwater storage swale located within the landscaped buffer along Thunder Road will be constructed to collect and control runoff within the site prior to discharging to the Right-of-Way (ROW) ditch.

Runoff collected on the roof of the proposed building will be stored and controlled internally using roof drains. Roof drains will be used to limit the flow from the roof to the specified allowable release rate. For calculation purposes a Watts Accutrol roof drain was used estimate a reasonable roof flow. Other products may be specified at detailed building design provided release rates and storage volumes are respected. Roof drainage will outlet to surface and be directed towards the proposed storage swale.

Runoff from the site will be directed towards the proposed storage swale via sheet drainage, culverts, swales, and a proposed catch basin. Runoff within the storage swale will be directed towards a proposed oil and grit separator unit, which will provide further quality control prior to releasing runoff to the ROW ditch.

A plate style orifice is proposed on the inlet of the pipe directed to the OGS unit, which, in combination with a rip-rap lined weir, will restrict runoff and result in temporary detention of stormwater within the stormwater storage swale. A spill point has been incorporated into the design to ensure that runoff exceeding the 100-year event will spill to the ROW ditch.

Foundation drainage and runoff from the depressed loading dock is proposed to be pumped without flow attenuation to surface, where it will then be directed towards the storage swale.

See CCO-23-1882 - POST in Appendix F and Storm Sewer Design Sheet in Appendix G of this report for more details. The Stormwater Management design for the subject property will be outlined in Section 7.0.

7.0 PROPOSED STORMWATER MANAGEMENT

7.1 Design Criteria and Methodology

Stormwater management for the proposed site will be maintained through rooftop attenuation and surface storage. The proposed stormwater management design will direct runoff from the roof, drive aisles, and parking lot to a stormwater storage swale located along the Thunder Road frontage. The restricted flow will then be released into the existing municipal ditch along Thunder Road at the established release rate. The emergency overland flow route for the proposed site will be directed west towards the existing ditch. The quantitative and qualitative properties of the storm runoff for both the pre & post development flows are further detailed below. Stormwater Best Management Practices (SWM BMP's) will be implemented at the "Lot level", "Conveyance" and "End of Pipe" locations. These concepts will be explained further in Section 7.6. In summary, the following design criteria have been employed in developing the stormwater management design for the site as directed by the SNCA and City:

Quality Control

- The site has been designed to achieve an 80% total suspended solids removal (enhanced level of treatment) using a proposed oil and grit separator unit (OGS) as part of a treatment train approach.

Quantity Control

- Post-development 5- & 100-year flows will be restricted to match the pre-development 5- & 100-year flows, respectively.

7.2 Runoff Calculations

Runoff calculations presented in this report are derived using the Rational Method, given as:

$$Q = 2.78CIA$$

Where:	Q	= Flow (L/sec)
	C	= Runoff coefficient
	I	= Rainfall intensity in mm/hr (City of Ottawa IDF curves)
	A	= Drainage area in hectares

It is recognized that the Rational Method tends to overestimate runoff rates. As a result, the conservative calculation of runoff ensures that any SWM facility sized using this method is expected to function as intended. As per the City of Ottawa - Sewer Design Guidelines, the 5-year balanced 'C' value must be increased by 25% for a 100-year storm event to a maximum of 1.0. The following coefficients were used to develop an average C for each area:

Roofs/ Concrete/ Asphalt	0.90
Gravel	0.60
Undeveloped and Grass	0.20

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7.3 Pre-Development Drainage

It has been assumed that the site contains no stormwater management controls for flow attenuation. The estimated pre-development peak flows for the 5 and 100-year events are summarized in Table 2, below. Note the restricted release rate is based solely on the development area A1, as changes to existing release rates or drainage patterns are not proposed within the 0.59 ha MTO setback and undeveloped area (Area A2). See CCO-23-1882 - PRE in Appendix E and Appendix G for calculations.

Table 2: Pre-Development Runoff Summary

Drainage Area	Area (ha)	Runoff Coefficient (5/100-Year)	Time of Concentration (min)	Q (L/s)	
				5-Year	100-Year
A1	1.06	0.20/0.25	20	41.28	88.10
A2 (Undeveloped)	0.59	0.20/0.25	10	34.14	73.14
Total	1.65			75.42	161.24

7.4 Post-Development Drainage

The proposed site drainage limits are demonstrated on the Post-Development Drainage Area Plan. See CCO-23-1882 - POST in Appendix F of this report for more details. A summary of the Post-Development Runoff Calculations can be found below. See Appendix G for calculations.

Table 3: Post-Development Unrestricted Runoff Summary

Drainage Area	Area (ha)	Runoff Coefficient (2/5-Year)	Runoff Coefficient (100-Year)	5-year Uncontrolled Peak Flow (L/s)	100-year Uncontrolled Peak Flow (L/s)
B1	0.37	0.65	0.78	69.50	142.36
B2	0.26	0.59	0.68	44.59	87.39
B3	0.37	0.90	1.00	96.08	182.95
B4	0.06	0.20	0.25	3.45	7.39
Total (Site)	1.06	-	-	213.62	420.08
B5 (Undeveloped)	0.59	0.20	0.25	34.14	73.14
Total	1.65			247.76	493.22

Runoff for areas B1 & B2 will consist of runoff from the parking lot and drive aisles. Runoff will be conveyed to the proposed stormwater storage swale by drainage conveyance swales, culverts, surface drainage and one proposed catch basin.

Area B3 represents the roof of the proposed building. Runoff collected on the roof of the building will be controlled and stored internally using flow-controlled roof drains. Restricted runoff from the roof area will outlet to surface before sheet draining to the proposed stormwater storage swale.

Runoff from area B4 will consist of unrestricted runoff directed towards the municipal ROW along Thunder Road. Flow attenuation in other areas will compensate for the unrestricted flow from area B4 leaving the site.

Runoff from area B5 will consist of existing unrestricted drainage within the MTO setback and undeveloped areas. No changes are proposed to the existing drainage patterns within this area. Runoff from area B5 will continue to surface drain towards the municipal ditch along Thunder Road and the existing watercourse located at the northwest corner of the site.

7.5 Quantity Control

Post development drainage leaving the site area will be restricted to a maximum release rate of 41.24 L/s during the 5-year storm event and 86.88 L/s during the 100-year storm event. Controlled flows will be achieved using flow restrictions and will create the need for onsite storage. The restricted runoff summary is outlined in Table 4, below.

Table 4: Post-Development Controlled Runoff Summary

Drainage Area	Area (ha)	5-year Peak Flow (L/s)	100-year Peak Flow (L/s)	100-year Storage Required (m ³)	100-year Storage Available (m ³)
B1	0.37	37.79	79.49	105.6	106.0
B2	0.26				
B3	0.37				
B4	0.06	3.45	7.39	-	-
Total (Site)	1.06	41.24	86.88	105.6	106.0
B5 (Undeveloped)	0.59	34.14	73.14	-	-
Total (Inc. Undeveloped)	1.65	75.38	160.02		

See Appendix G for calculations.

Runoff from area B3 will be stored on the roof of the proposed building and restricted using eight (8) Watts Accutrol roof drains (or equivalent product) and will provide up to 159.71 m³ of storage. Restricted runoff will outlet to surface and sheet drain towards the proposed stormwater storage swale.

Runoff leaving the stormwater storage swale (Areas B1-B3) will be controlled by a 1.1m rip-rap lined weir and a 152 mm diameter plate style orifice located on the inlet of the pipe directed towards the OGS unit. Runoff will be restricted to a maximum release rate of 37.79 L/s and 79.49 L/s during the 5- and 100-year events, respectively, resulting in ponding depths of 0.68 m and 0.82 m, respectively.

In the event there is a rainfall above the 100-year storm event, or a blockage within the storm sewer system, an emergency overland flow route has been provided so that the stormwater runoff will be conveyed towards the existing municipal ditch along Thunder Road.

7.6 Quality Control

The development of this lot will employ Best Management Practices (BMP's) wherever possible. The intent of implementing stormwater BMP's is to ensure that water quality and quantity concerns are addressed at all stages of development. Lot level BMP's typically include temporary detention of the parking lot runoff, minimizing ground slopes and maximizing landscaped areas. Some of these BMP's cannot be provided for this site due to site constraints and development requirements.

A treatment train approach is proposed to provide quality control for the site.

Runoff from the drive aisle and parking area will be directed towards a storage swale along the property frontage. The swale has been designed with minimal slope to reduce flow velocity and encourage settlement and filtration of solids. Per the CVCA/TRCA LID guidelines, a median TSS removal of 76% has been determined for enhanced grass swales. As per "An Evaluation of Roadside Ditches and Other Related Stormwater Management Practices", prepared by J.F. Sabourin and Associates Inc. and published in February 2001, a TSS removal of 65-98% was determined for grass swales without subdrains based on available performance studies.

As the swale will also be used for storage of stormwater runoff, quality control based on the MECP Stormwater Management Planning & Design Manual was also reviewed. Given the storage swale will temporarily detain stormwater runoff and will not permanently retain runoff, removal efficiency will be most comparable to a dry pond. From Section 3.2.2. of the manual, a base level of water quality was estimated using the site area, imperviousness, and the proposed detention volume. The roof area was excluded as roof runoff is generally considered clean. Based on Table 3.2 of the manual, the proposed storage swale would require a storage volume of 109 m³ to achieve a long term TSS removal of 60%. While only 106 m³ of available storage is proposed, it is noted that the dry pond considered within Table 3.2 assumes continuous flow, while the swale will only have intermittent flow during storm events. As a result, it is anticipated that the actual TSS removal rate will be increased.

To provide a conservative estimate, a TSS removal of 50% has been applied for the grass storage swale.

Runoff leaving the storage swale will be directed to a Stormceptor EFO8 oil and grit separator unit. As per the sizing report included within Appendix 'G', for an ETV particle size distribution, the unit can be credited with providing a TSS removal rate of 63%.

Assuming a base TSS concentration of 100%, the remaining TSS concentration for runoff leaving the swale is estimated to be $[100\% - (0.5 \times 100\%)] = 50\%$. Following 63% removal within the Stormceptor EFO8, runoff leaving the site is estimated to have a TSS concentration of $[50\% - (0.63 \times 50\%)] = 18.5\%$, for a total TSS removal of 81.5%.

It is anticipated that additional TSS removal will be achieved within the Thunder Road Municipal Ditch given the low slope and the length of the travel path.

8.0 EROSION AND SEDIMENT CONTROL

8.1 Temporary Measures

Before construction begins, temporary silt fence, straw bale or rock flow check dams will be installed at all natural runoff outlets from the property. It is crucial that these controls be maintained throughout construction and inspection of sediment and erosion control will be facilitated by the Contractor or Contract Administration staff throughout the construction period.

Silt fences will be installed where shown on the final engineering plans, specifically along the downstream property limits. The Contractor, at their discretion or at the instruction of the City, Conservation Authority or the Contract Administrator shall increase the quantity of sediment and erosion controls on-site to ensure that the site is operating as intended and no additional sediment finds its way off site. The rock flow, straw bale & silt fence check dams and barriers shall be inspected weekly and after rainfall events. Care shall be taken to properly remove sediment from the fences and check dams as required. Fibre roll barriers are to be installed at all existing curb inlet catchbasins and filter fabric is to be placed under the grates of all existing catchbasins and manholes along the frontage of the site and any new structures immediately upon installation. The measures for the existing/proposed structures is to be removed only after all areas have been paved. Care shall be taken at the removal stage to ensure that any silt that has accumulated is properly handled and disposed of. Removal of silt fences without prior removal of the sediments shall not be permitted.

Although not anticipated, work through winter months shall be closely monitored for erosion along sloped areas. Should erosion be noted, the Contractor shall be alerted and shall take all necessary steps to rectify the situation. Should the Contractor's efforts fail at remediating the eroded areas, the Contractor shall contact the City and/or Conservation Authority to review the site conditions and determine the appropriate course of action. As the ground begins to thaw, the Contractor shall place silt fencing at all required locations as soon as ground conditions warrant. Please see the Site Grading, Drainage Plan and Sediment & Erosion Control Plan for additional details regarding the temporary measures to be installed and their appropriate OPSD references.

8.2 Permanent Measures

Rip-rap will be placed at all locations that have the potential for concentrated flow. It is crucial that the Contractor ensure that the geotextile is keyed in properly to ensure runoff does not undermine the rip rapped area. Additional rip rap is to be placed at erosion prone locations as identified by the Contractor / Contract Administrator / City or Conservation Authority. It is expected that the Contractor will promptly ensure that all disturbed areas receive topsoil and seed/sod and that grass be established as soon as possible. Any areas of excess fill shall be removed or levelled as soon as possible and must be located a sufficient distance from any watercourse to ensure that no sediment is washed out into the watercourse. As the vegetation growth within the site provides a key component to the control of sediment for the site, it must be properly maintained once established. Once the construction is complete, it will be up to the landowner to maintain the vegetation and ensure that the vegetation is not overgrown or impeded by foreign objects.

9.0 SUMMARY

- A new 3,686 m² warehouse building is proposed at 6165 Thunder Road.
- Potable water servicing will be provided by a connection to the Carlsbad Trickle-Feed System.
- A private well will be drilled to provide additional water for non-potable uses.
- Fire suppression will be provided by a remote hydrant system and underground water storage tanks.
- Sanitary servicing will be provided by a new private septic system located within the southeast landscaped area.
- Flow controlled roof drains and a stormwater storage swale will be used to restrict runoff to the established release rate.
- Storage for the 5- through 100-year storm events will be provided on the roof of the proposed building and within the proposed stormwater storage swale.
- Quality control will be provided by a treatment train approach including a grass swale and an oil and grit separator unit.

10.0 RECOMMENDATIONS

Based on the information presented in this report, we recommend that City of Ottawa approve this Servicing and Stormwater Management Report in support of the proposed development at 6165 Thunder Road.

This report is respectfully being submitted for approval.

Regards,

Egis Canada Ltd.



Francis Valenti, P.Eng.
Junior Project Engineer, Land Development
E: Francis.VALENTI@egis-group.com

Robert Freel, P.Eng.
Senior Project Manager, Land Development
E: Robert.FREEL@egis-group.com

u:\ottawa\01 project - proposals\2023 jobs\cco\cco-23-1882 brofort - 6165 thunder rd\03 - servicing\report\servicing & stormwater management report\subm5\cco-23-1882_servicing report.docx

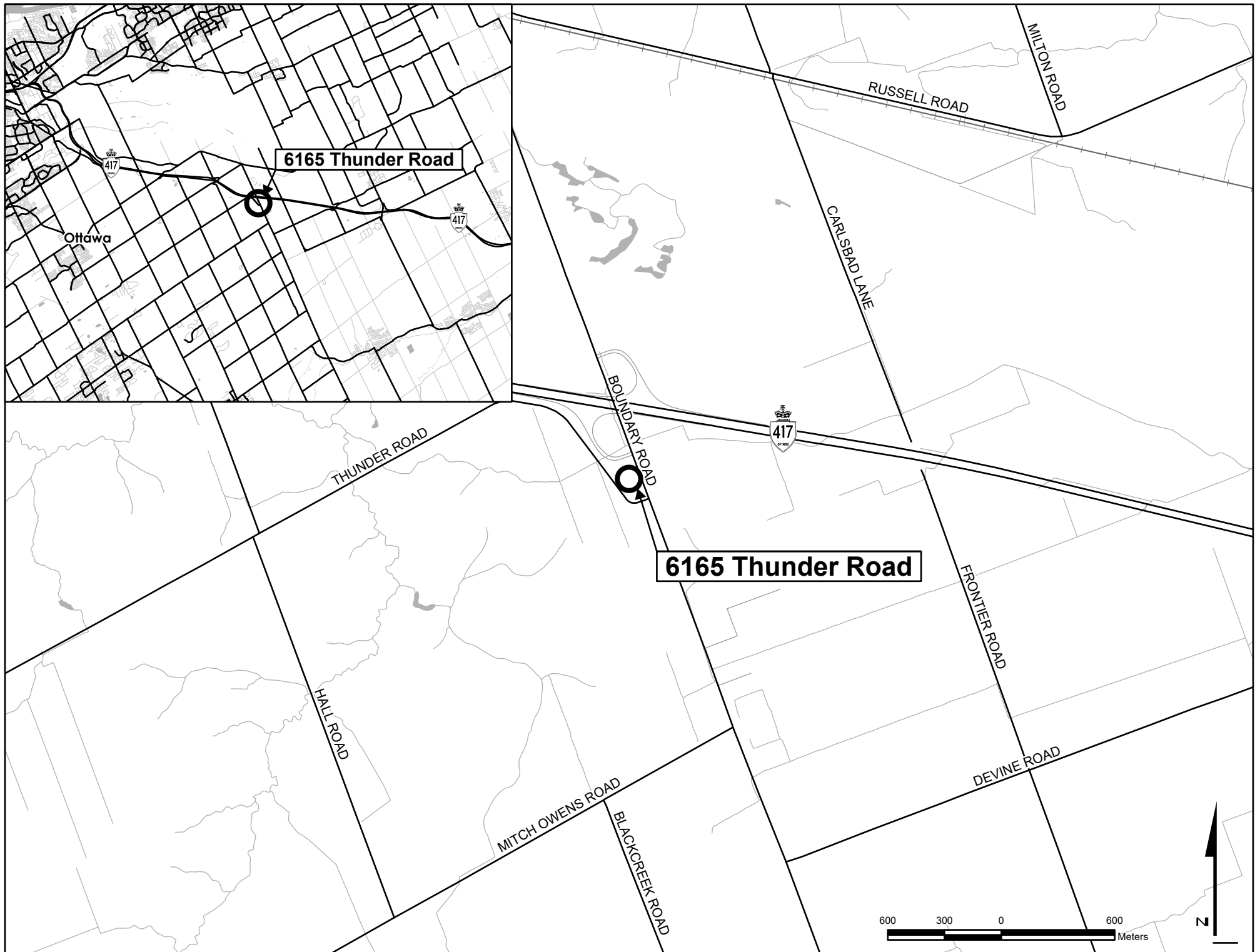
11.0 STATEMENT OF LIMITATIONS

This report was produced for the exclusive use of Brofort Inc. The purpose of the report is to assess the existing stormwater management system and provide recommendations and designs for the post-construction scenario that are in compliance with the guidelines and standards from the Ministry of the Environment, Conservation and Parks, City of Ottawa and local approval agencies. Egis Canada reviewed the site information and background documents listed in Section 2.0 of this report. While the previous data was reviewed by Egis Canada and site visits were performed, no field verification/measures of any information were conducted.

Any use of this review by a third party, or any reliance on decisions made based on it, without a reliance report is the responsibility of such third parties. Egis Canada accepts no responsibility for damages, if any, suffered by any third party as a result of decisions or actions made based on this review.

The findings, conclusions and/or recommendations of this report are only valid as of the date of this report. No assurance is made regarding any changes in conditions subsequent to this date. If additional information is discovered or becomes available at a future date, Egis Canada should be requested to re-evaluate the conclusions presented in this report, and provide amendments, if required.

APPENDIX A KEY PLAN



APPENDIX B BACKGROUND DOCUMENTS

Pre-Application Consultation Meeting Notes

6165 Thunder Road

PC2022- 0076

April 28th, 2022 – 10 – 1:30 am

Applicant: Peter Hume

Ward: 5 - West Carleton March

Proposal Summary: Warehouse

Attendees:

Kevin Hall – Senior Project Manager Engineering - City of Ottawa
Jeffrey Ostafichuk – Planner - City of Ottawa
Adam Brown – Development Review Manager Rural - City of Ottawa
Anissa McAlpine- Parks Planner - City of Ottawa
Sami Rehman – Environmental Planner - City of Ottawa
Josiane Gervais -Transportation Engineer - City of Ottawa
James Holland – Environmental Planner- SNC
Christopher Moise Urban Design – City of Ottawa

Peter Hume – Consultant/Applicant
Renaud Brault

Regrets:

Tessa Di Iorio – Hydrology - City of Ottawa (Notes provided in advance of meeting)

Meeting Notes:

Proposal Details – Provided by – Peter Hume

Located on the west side of Boundary Rd., adjacent the Amazon fulfillment centre. and south of highway 417 Boundary Rd. interchange. The property is zoned Rural Commercial and designated Rural Countryside in the new OP. The current zoning by-law permits a warehouse use.

Site Information

- Legal Description Part Of Lot 1 Concession (Ottawa Front) Part 1 Plan 5R-11663
- Pin 04324-0163
- Total Site Area 16,480.59 sq m
- Zoning RC Rural Commercial
- Building Proposed 3,623 sq m
- No buildings exist on site
- Main Access Thunder Road

Planning Comments - Provided by Jeffrey Osafichuk

RC - Rural Commercial Zone (Sections 217 and 218)

Purpose of the Zone

The purpose of the RC – Rural Commercial Zone is to:

1. permit the development of highway and recreational commercial uses which serve the rural community and visiting public in areas mainly designated as General Rural Area, Village and Carpool Road Corridor Rural Employment Area in the Official Plan;
2. accommodate a range of commercial uses including services for the traveling public as well as agriculture-related, vehicle-oriented and construction products and services;
3. permit research facilities in areas designated Greenbelt Employment and Institutional Area in the Official Plan, and
4. regulate development in a manner that has a minimal impact on the surrounding rural area or villages

Section 217

In the RC Zone:

Permitted Uses

1. The following uses are permitted subject to:
 1. the provisions of subsection 217(3) to (5);
 2. despite the definition amusement park, a go-cart track is not permitted in an RC zone which abuts in whole or in part any VM, V1, V2 or V3 zone;
 3. retail store is limited to the sale of agricultural, construction, gardening or landscaping-related products, equipment or supplies;
 4. the detached dwelling or dwelling unit is limited to one in total and must be accessory to a permitted use;
amusement centre
amusement park
animal care establishment
animal hospital
artist studio
automobile rental establishment
automobile dealership
automobile service station

bar
campground
car wash
click and collect facility (By-law 2016-289)
detached dwelling
dwelling unit
gasbar
heavy equipment and vehicle sales, rental and servicing
hotel
kennel, see Part 3, Section 84
parking lot
restaurant
retail food store, limited to a farmers' market (By-law 2016-134)
retail store
storefront industry, see Part 3, Section 99 (By-law 2018-171)
warehouse (By-law 2013-58)

Urban Design Comments – Provided by Christopher Moiser

This proposal does not run along or does not meet the threshold in one of the City's Design Priority Areas and need not attend the City's UDRP. Staff will be responsible for evaluating the proposal and providing design direction.

We have the following comments about the design presented:

- Trees: To prevent a site characterized by asphalt and grass for vehicles and storm water management we recommend a thorough tree planting approach which is focused on trees along the street and any available areas around parking lots, between parking and vehicle circulation, and within areas not dedicated to water/vehicle management;
- Pedestrian access/safety: We recommend a careful approach to pedestrian movement and safety from the parking area to the pedestrian doors of the building to protect from large vehicle circulation patterns;

A scoped Design Brief is a required submittal for all Ste Plan/ Re-zoning applications and can be combined with the Planning Rationale. Please see the Design Brief Terms of Reference provided.

- Note. The Design Brief submittal should have a section which addresses these pre-consultation comments;

This is an exciting project in an area full of potential. We look forward to helping you achieve its goals with the highest level of design resolution. We are happy to assist and answer any questions regarding the above. Good luck.

Hydrogeological and Terrain Comments Provided by Tessa Di Iorio

It is understood this is a Ste Plan Control application for a warehouse building on 6165 Thunder Road. The development will be serviced by municipal water (the trickle feed system) and a private on-site septic system.

** Note that if a private well is required, then additional discussion will be required prior to submission – groundwater quality is likely to be an issue in this area.

Septic Impact Assessment – A septic impact assessment is required to ensure that septic effluent will not be contaminating any local supply aquifers or the natural environment.

- If the septic system will be >10,000 L/day, then a ECA will be required from the MECP
- If the septic system will be <10,000 L/day, then an impact assessment will be required as per [City of Ottawa Hydrogeological and Terrain Analysis Guidelines](#), which is based on MECP Guideline D-5-4
 - The septic impact assessment may be completed as per Guideline D-5-4 Section 5.6.3 Predictive Assessment – Industrial/ Commercial Developments; note that since the application does not pertain to lot creation or zoning, the main goal is to ensure that the proper level of treatment will be implemented to protect the groundwater.
 - Alternatively, due to the presence of thick marine clays around the site, the assessment may be completed based on system isolation (See Guideline D-5-4, Section 5.5). Pre-consultation is recommended if system isolation will be applied, note that adjacent planning applications have used system isolation and relied on presented supporting geological and geotechnical information. If system isolation is used, then confirmation needs to be provided that there are no local downgradient shallow dug wells which supply water above the marine clay isolating unit.
- Either the ECA (if >10,000 L/day) or the septic permit from the OSSO (if <10,000 L/day) must be included with the application to confirm the size and type/ construction requirements of the septic system.

Engineering Comments – Provided by Kevin Hall

Stormwater:

- Control the post development runoff to the pre-development rates for the 5 to 100 Year storm
- Quality requirements will be as per the direction of the conservation authority.

Site Lighting:

- Control spillage of light off site to City requirements
- City required full cut off fixtures for free standing light and wall mounted lights.
- I assume there will be a MTO requirement for this as well.

Water:

- As of now this site is entitled to one equivalent connect to the Carlsbad Tricklefeed System. Flow to the site will be controlled to 2700 L/d.
- The City is finishing a study to review the capacity of the Trickle Feed system in this area and I don't have the results yet. Once this study is completed then we will know if there is any more capacity available.
- I am working with Infrastructure Policy to see if alternative water servicing (tricklefeed/well water combination) can be permitted in this area.

Other:

- Is Thunder Road able to handle heavier trucks?

Require Plans and Reports:

- Stormwater Report
- Servicing Report
- Geotech Report
- Phase 1 ESA
- Grading Plan
- Servicing Plan
- Erosion and Sediment Control Plan
- Drainage Area Plan

Environmental Comments – Provided by Sami Rehman

The subject property is adjacent to a watercourse, so an EIS will be required for the application. The EIS should address the following:

- The interface with and mitigation measures to protect the watercourse/fish habitat
- Potential significant habitat for threatened or endangered species

For the Site Plan Control application, a Tree Conservation Report (TCR) will be required; it can be combined with the EIS to avoid duplications. City staff will be looking for recommendations for tree retention and tree plantings around the proposal.

I would also advise consulting with the South Nation Conservation Authority to determine if any permits or approvals are required under their regulations.

Transportation Engineering Comments – Provided by Josiane Gervais

Follow Transportation Impact Assessment Guidelines:

- Submit a Screening Form at your earliest convenience to josiane.gervais@ottawa.ca. A full Transportation Impact Assessment is required if any of the triggers on the screening form are satisfied.
- Start this process asap. 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).
- Request base mapping asap if RMA is required. Contact Engineering Services (<https://ottawa.ca/en/city-hall/planning-and-development/engineering-services>)
- An update to the TRANS Trip Generation Manual has been completed (October 2020). This manual is to be utilized for this TIA. A copy of this document can be provided upon request.

Corner triangles as per OP Annex 1 - Road Classification and Rights-of-Way at the following locations on the final plan will be required (measure on the property line/ROW protected line; no structure above or below this triangle): Collector Road to Arterial Road: 10 m x 10 m.

The access location on Thunder Road is supported.

Clear throat requirements for a collector is 8m. Ensure this length is provided. The clear throat length is measured from the end of the driveway curb return radii at the roadway and the point of first conflict on-site.

As the proposed site is industrial and for general public use, AODA legislation applies.

Ensure all crosswalks located internally on the site provide a TWS at the depressed curb, per requirements of the Integrated Accessibility Standards Regulation under the AODA.

- Clearly define accessible parking stalls and ensure they meet AODA standards (include an access aisle next to the parking stall and a pedestrian curb ramp at the end of the access aisle, as required).
- Please consider using the City's Accessibility Design Standards, which provide a summary of AODA requirements. <https://ottawa.ca/en/city-hall/creating-equal-inclusive-and-diverse-city/accessibility-services/accessibility-design-standards-features#accessibility-design-standards>

On site plan:

- Ensure site access meets the City's Private Approach Bylaw.

- Site Plan must show additional details, i.e. drive aisles, parking stalls, etc.
- 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 movement diagrams required for all accesses showing the largest vehicle to access/egress the site.
- Turning movement diagrams required for internal movements (loading areas, garbage).
- Show all curb radii measurements; ensure that all curb radii are reduced as much as possible and fall within TAC guidelines (Figure 8.5.1).
- Show dimensions for site elements (i.e. lane/aisle widths, access width and throat length, parking stalls, sidewalks, pedestrian pathways, etc.).

Conservation Authority Comments – Provided by James Holland SNC

Natural Heritage

- There is a mapped watercourse with permanent flows north of the property. The feature has been assumed to contain fish at all times of the year by an adjacent development. Roadside ditches also occur adjacent to the property, which may contribute flows to the permanent watercourse.
- An Environmental Impact Statement should be completed to provide suitable setbacks from the watercourses and to demonstrate no negative impacts to fish habitat. The study should also confirm that all provincial and federal requirements for species at risk have been addressed. The Conservation Partners will provide a technical review of the study.

Natural Hazards

- There are no mapped hazards on the property.
- A 100-year floodplain analysis has been completed for the permanent watercourse, approximately 360m downstream from the property. Development of the property must not negatively impact flooding and erosion downstream of the property.

Stormwater Management

- The stormwater management design should follow the 2003 MECP Stormwater guidelines. The Conservation Partners request 80% TSS removal, and runoff quantity post-development equal to pre-development runoff for the 1 or 5 and the 100-year event.
- The Conservation Partners will provide a technical review of the stormwater design. At a minimum, the stormwater design package should include a report, demonstrating how water quantity and quality standards will be achieved, a grading and drainage plan, and a sediment and erosion control plan.

O. Reg. 170/06

- Any interference with a watercourse, including a stormwater outlet to a roadside ditch, may require a permit from the South Nation Conservation, and restriction may apply.

Parks Comments - Provided by Anissa McAlpine

Cash in lieu of parkland will be needed if they register a site plan at a rate of 2% of the gross land area of the site being developed.

Submission requirements/Next Steps

Based on the sketch filed for the Pre-Consultation the following applications will be required:

Zoning Amendment/Ste Plan Control

- Planning Rationale (Design Statement and Integrated Environmental Review Statement)
- Ste Plan
- Landscape
- Survey
- Building Elevations
- Archaeological Resource Report
- Scoped Urban Design Brief
- Stormwater management report
- Ste Servicing Plan and Report
- Erosion and Sediment Control Plan
- Ste Servicing Study, including assessment of adequacy of public services
- Geotechnical Investigation Report
- Drainage Area Plan
- Phase 1 Environmental Ste Assessment (ESA)
- Transportation Impact Assessment Screening Form (Prior to submission)
- Environmental Impact Study
- Tree Conservation Report
- Urban Design brief that follows the provided Terms of Reference is required upon submission of the application(s).

NOTE: Changes to the proposal may change the required applications and studies. The following are the required studies

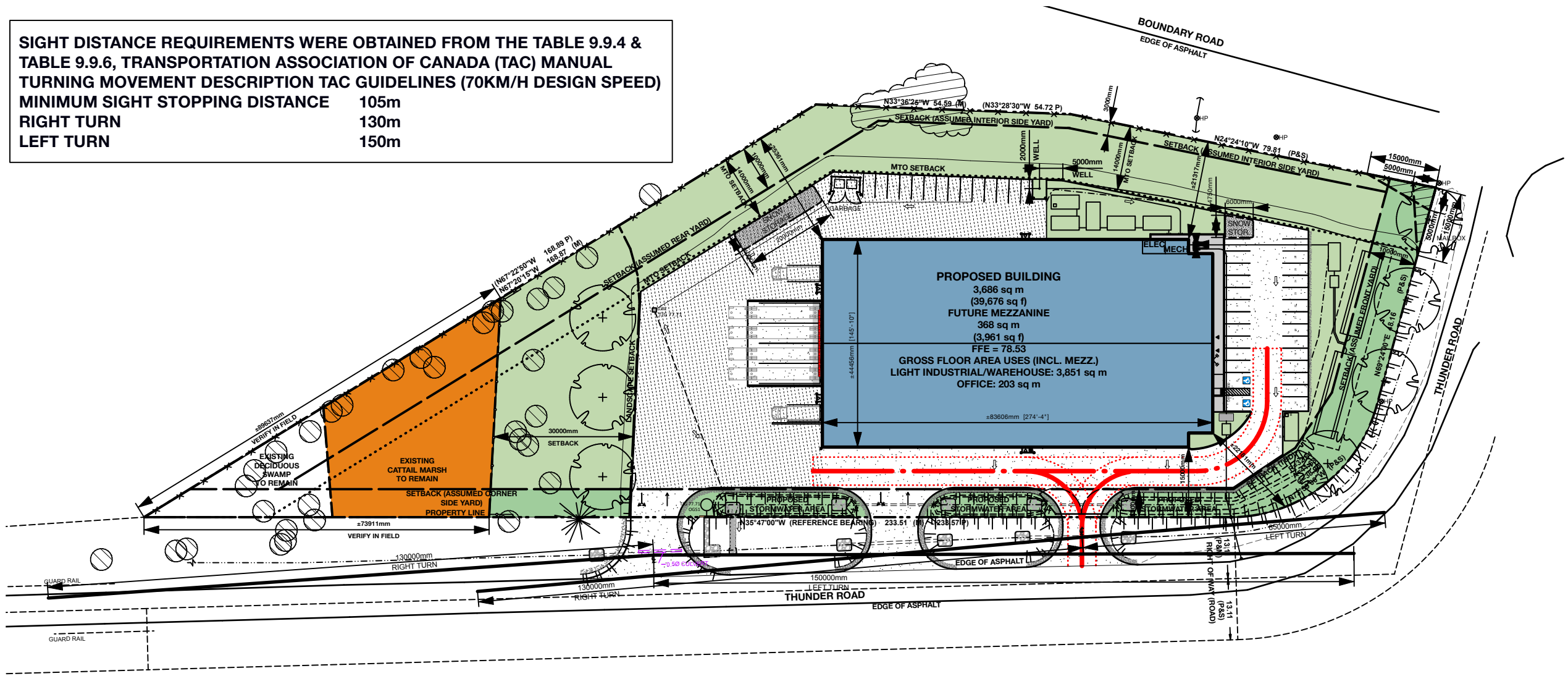
Attachments:

Design Brief Terms of Reference

Transportation Assessment Screening Form

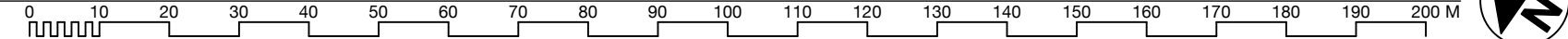
SITE INFORMATION		
ADDRESS 6165 THUNDER ROAD		
LEGAL DESCRIPTION PART OF LOT 1 CONCESSION 9 (OTTAWA FRONT) PART 1 PLAN 5R-11663 PIN 04324-0163		
TOTAL SITE AREA*	16,480.59 sq m	
*based on GeoOttawa property report		
ZONING RC RURAL COMMERCIAL		
SETBACKS		
Front Yard		
Minimum Required:	10.00 m	
Proposed:	*22.18 m	
*Approximate minimum distance as shown on Site Plan (property line is curved)		
Interior Side Yard		
Minimum Required:	3.00 m	
Proposed:	*21.32 m	
*Approximate minimum distance as shown on Site Plan		
Corner Side Yard		
Minimum Required:	6.00 m	
Proposed:	15.00 m	
Rear Yard		
Minimum Required:	10.00 m	
Proposed:	*25.36 m	
*Approximate minimum distance as shown on Site Plan		
Proposed Building meets all setback requirements.		
BUILDING HEIGHT		
Maximum Height	11.00 m	
Proposed Height	11.00 m	
GROSS FLOOR AREA		
Building	Proposed	3,686 sq m
Future Mezzanine	Proposed	368 sq m
TOTAL		4,054 sq m
Gross Floor Area Uses (including future mezzanine)		
Light Industrial/Warehouse		3,851 sq m
Office		203 sq m
LOT COVERAGE		
Proposed		22.4%
Maximum Allowed		25.0%
LANDSCAPED AREA		
Landscaping of yards: Required front and corner side yards to be landscaped, except for driveways crossing the front or corner side yard leading to a parking area.		
PARKING/LOADING CALCULATIONS		
PARKING REQUIRED	Rate	Required Spaces
Building 95% Light Industrial/Warehouse	0.8	28
Building 05% Office	2.4	4
Accessible Parking (20-99 spaces in parking lot)		
		1
PARKING PROVIDED		
Spaces		38
Accessible Spaces		2
Total		40
LOADING		
Required Spaces (GFA = 2,000-4,999 sq m)		1
Provided Spaces (oversized spaces not required)		6
PARKING LANDSCAPED AREA		
15% of area of parking lot must be provided as perimeter or interior landscaped areas		
Parking Area 'A'		730 sq m
Required Landscape Area	15.0%	
Proposed Landscape Area	15.1%	110 sq m
Parking Area 'B'		457 sq m
Required Landscape Area	15.0%	
Proposed Landscape Area	15.1%	69 sq m

SIGHT DISTANCE REQUIREMENTS WERE OBTAINED FROM THE TABLE 9.9.4 & TABLE 9.9.6, TRANSPORTATION ASSOCIATION OF CANADA (TAC) MANUAL
TURNING MOVEMENT DESCRIPTION TAC GUIDELINES (70KM/H DESIGN SPEED)
MINIMUM SIGHT STOPPING DISTANCE 105m
RIGHT TURN 130m
LEFT TURN 150m



2 SITE PLAN - TURN LINES REFERENCE

SP-01 Scale: 1:1000

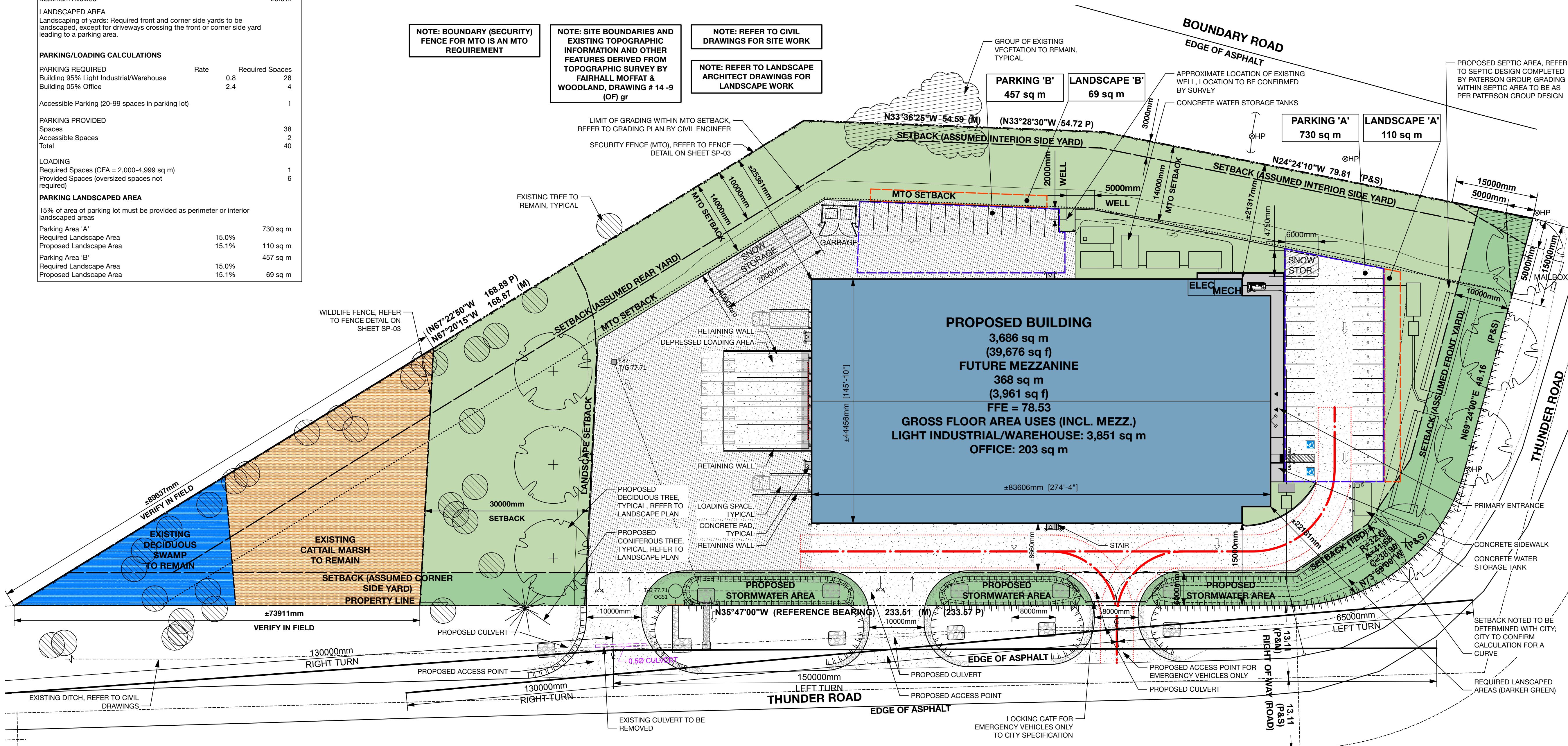


NOTE: BOUNDARY (SECURITY) FENCE FOR MTO IS AN MTO REQUIREMENT

NOTE: SITE BOUNDARIES AND EXISTING TOPOGRAPHIC INFORMATION AND OTHER FEATURES DERIVED FROM TOPOGRAPHIC SURVEY BY FAIRHALL MOFFAT & WOODLAND, DRAWING # 14 -9 (OF) gr

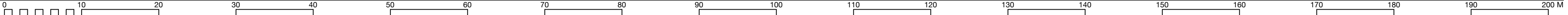
NOTE: REFER TO CIVIL DRAWINGS FOR SITE WORK

NOTE: REFER TO LANDSCAPE ARCHITECT DRAWINGS FOR LANDSCAPE WORK



1 SITE PLAN

SP-01 Scale: 1:400



DEVELOPER/OWNER INFORMATION
BROFORT DEVELOPMENTS INC.
2161 THURSTON DRIVE
OTTAWA, ONTARIO K1G 6C9

LEGEND

- PROPERTY LINE
- SETBACK LINE
- MTO SETBACK
- LANDSCAPE SETBACK (WETLAND)
- SECURITY FENCE
- WILDLIFE FENCE
- FIRE ROUTE
- TO BE REMOVED OR DEMOLISHED AS NOTED
- HP HYDRO POLE
- SIAMESE CONNECTION
- MAIN/PRIMARY ENTRANCE
- SECONDARY ENTRANCE/EXIT
- EXISTING CATTAIL MARSH
- EXISTING DECIDUOUS SWAMP
- LANDSCAPED AREA
- REQUIRED LANDSCAPED SETBACK
- CONCRETE
- ASPHALT
- GRANULAR/GRAVEL

STEWART + TSAI ARCHITECTS INC.
t: 613.686.5910
f: 613.686.6216
e: info@stewarttsai.com

SEAL

CONSULTANTS

KEY PLAN

ISSUE / REVISION	DATE
01 REVIEW & COORDINATION	FEB 23, 2023
02 REVIEW & COORDINATION	MAR 01, 2023
03 REVIEW & COORDINATION	JUN 28, 2023
04 REVIEW & COORDINATION	SEP 28, 2023
05 REVIEW	JAN 17, 2024
06 REVIEW & COORDINATION	APR 8, 2024
07 REVIEW & COORDINATION	MAY 7, 2024
08 SITE PLAN CONTROL	MAY 17, 2024
09 REVIEW & COORDINATION	SEP 04, 2024
10 REV. SITE PLAN CONTROL	OCT 18, 2024
11 REV. SITE PLAN CONTROL	OCT 29, 2024
12 REV. SITE PLAN CONTROL	MAR 03, 2025
13 REV. SITE PLAN CONTROL	JUN 17, 2025

PROJECT NAME

THUNDER ROAD DEVELOPMENT
6165 THUNDER ROAD
OTTAWA, ON

SHEET TITLE

PROPOSED SITE PLAN

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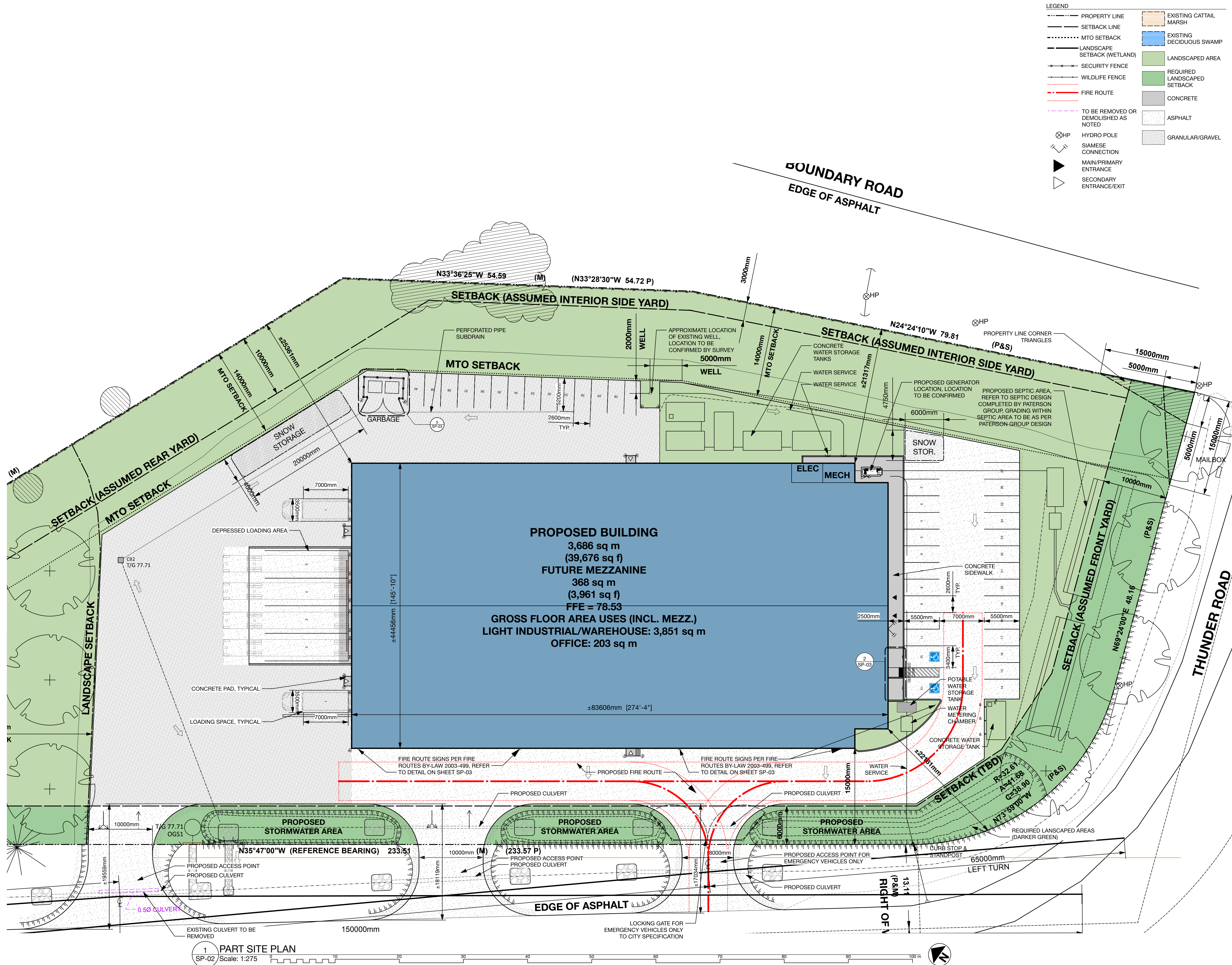
PROJECT NO: 22003

DRAWN BY: GS

CHECKED BY: GS

SHEET

SP-01



SEAL

CONSULTANTS

KEY PLAN

ISSUE / REVISION	DATE
01 REVIEW & COORDINATION	JUN 28, 2023
02 REVIEW & COORDINATION	SEP 28, 2023
03 REVIEW	JAN 17, 2024
04 REVIEW & COORDINATION	APR 8, 2024
05 REVIEW & COORDINATION	MAY 7, 2024
06 SITE PLAN CONTROL	MAY 17, 2024
07 REVIEW & COORDINATION	SEP 04, 2024
08 REV. SITE PLAN CONTROL	OCT 18, 2024
09 REV. SITE PLAN CONTROL	OCT 29, 2024
10 REV. SITE PLAN CONTROL	MAR 03, 2025
11 REV. SITE PLAN CONTROL	JUN 17, 2025

PROJECT NAME

THUNDER ROAD
DEVELOPMENT
6165 THUNDER ROAD
OTTAWA, ON

SHEET TITLE

PROPOSED PART
SITE PLAN

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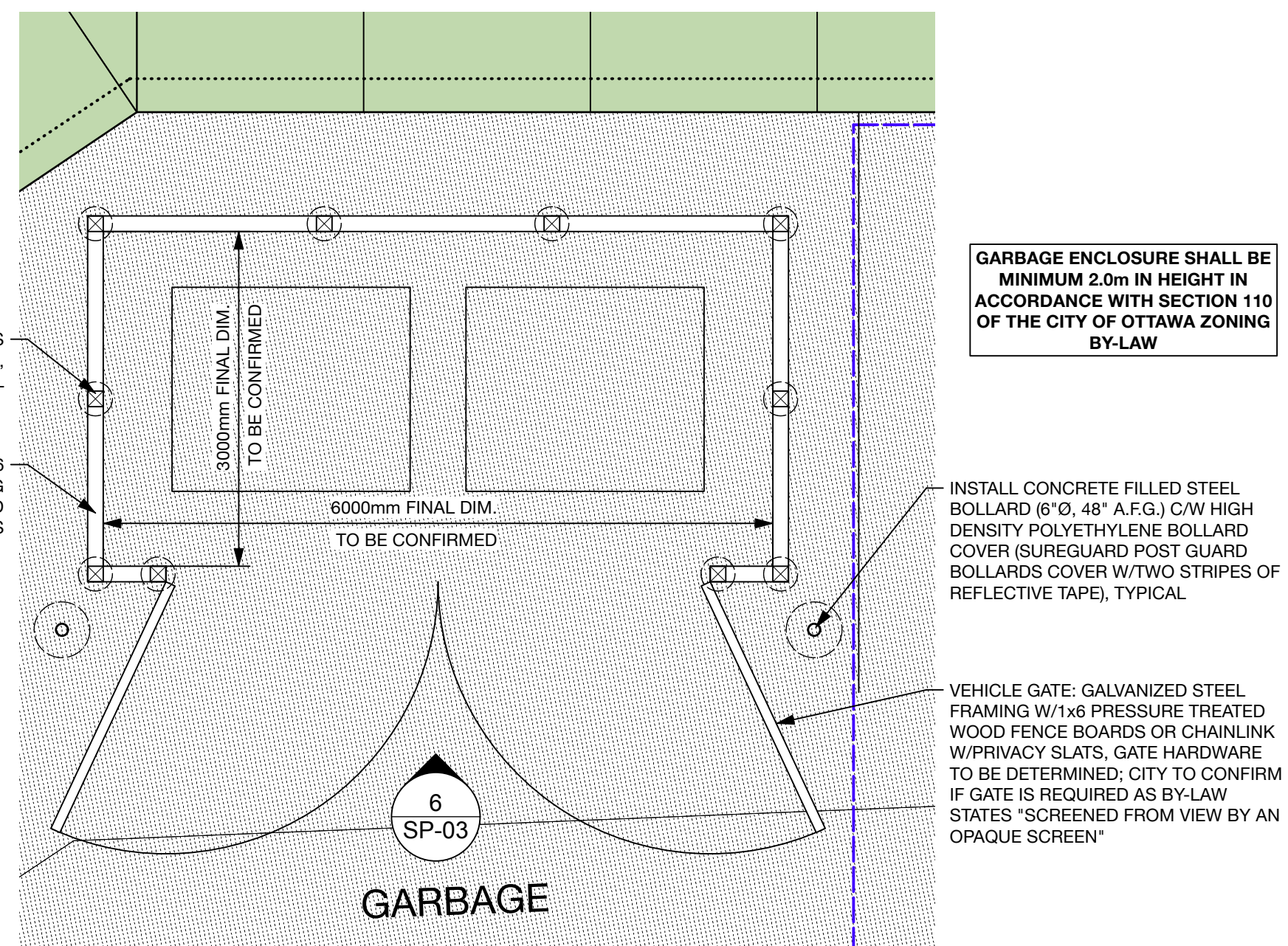
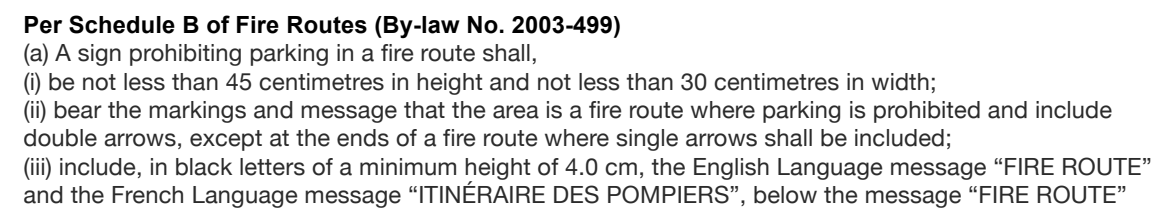
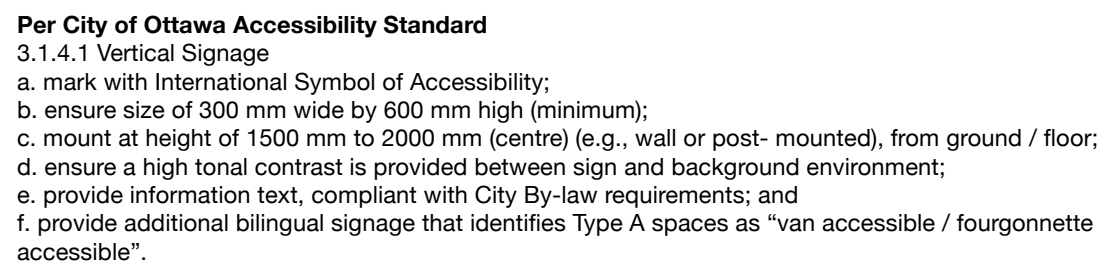
PROJECT NO: 22003

DRAWN BY: GS

CHECKED BY: GS

SHEET

SP-02



APPENDIX C WATERMAIN CALCULATIONS

000-23-1882 - 6165 Thunder Road - Water Demands

Project:	6165 Thunder Road
Project No.:	000-23-1882
Designed By:	FV
Checked By:	JH
Date:	October 31, 2024
Site Area:	1.65 gross ha

Industrial - Light

4054 m2

AVERAGE DAILY DEMAND

DEMAND TYPE	AMOUNT	UNITS
Residential	280	L/c/d
Industrial - Light	35,000	L/gross ha/d
Industrial - Heavy	55,000	L/gross ha/d
Shopping Centres	2,500	L/(1000m ² /d)
Hospital	900	L/(bed/day)
Schools	70	L/(Student/d)
Trailer Park with no Hook-Ups	340	L/(space/d)
Trailer Park with Hook-Ups	800	L/(space/d)
Campgrounds	225	L/(campsite/d)
Mobile Home Parks	1,000	L/(Space/d)
Motels	150	L/(bed-space/d)
Hotels	225	L/(bed-space/d)
Tourist Commercial	28,000	L/gross ha/d
Other Commercial	28,000	L/gross ha/d
AVERAGE DAILY DEMAND	Residential	0.00 L/s
	Commercial/ Industrial/ Institutional	0.16 L/s

MAXIMUM DAILY DEMAND

DEMAND TYPE	AMOUNT	UNITS
Residential	9.5 x avg. day	L/c/d
Industrial	1.5 x avg. day	L/gross ha/d
Commercial	1.5 x avg. day	L/gross ha/d
Institutional	1.5 x avg. day	L/gross ha/d
MAXIMUM DAILY DEMAND	Residential	0.00 L/s
	Commercial/ Industrial/ Institutional	0.25 L/s

MAXIMUM HOUR DEMAND

DEMAND TYPE	AMOUNT	UNITS
Residential	14.3 x avg. day	L/c/d
Industrial	1.8 x max. day	L/gross ha/d
Commercial	1.8 x max. day	L/gross ha/d
Institutional	1.8 x max. day	L/gross ha/d
MAXIMUM HOUR DEMAND	Residential	0.00 L/s
	Commercial/ Industrial/ Institutional	0.44 L/s

WATER DEMAND DESIGN FLOWS PER UNIT COUNT

CITY OF OTTAWA - WATER DISTRIBUTION GUIDELINES, JULY 2010

AVERAGE DAILY DEMAND	0.16	L/s
MAXIMUM DAILY DEMAND	0.25	L/s
MAXIMUM HOUR DEMAND	0.44	L/s

000-23-1882 - 6165 Thunder Road - Fire Underwriters Survey

Project: 6165 Thunder Road
 Project No.: 000-23-1882
 Designed By: FV
 Checked By: JH
 Date: October 31, 2024

From the Fire Underwriters Survey (2020)

From Part II – Guide for Determination of Required Fire Flow Copyright I.S.O.:
 City of Ottawa Technical Bulletin ISTB-2018-02 Applied Where Applicable

A. BASE REQUIREMENT (Rounded to the nearest 1000 L/min)

F = 220 x C x √A Where:
 F = Required fire flow in liters per minute
 C = Coefficient related to the type of construction.
 A = The total floor area in square meters (including all storey's, but excluding basements at least 50 percent below grade) in the building being considered.

Construction Type Non-Combustible Construction

C	0.8	A	4,054.0 m ²
Total Floor Area (per the 2020 FUS Page 20 - Total Effective Area)			4,054.0 m ² * Unprotected Vertical Openings

Calculated Fire Flow	11,206.1 L/min
	11,000.0 L/min

B. REDUCTION FOR OCCUPANCY TYPE (No Rounding)

From Page 24 of the Fire Underwriters Survey:
 Free Burning 15%

Fire Flow	12,650.0 L/min
-----------	----------------

C. REDUCTION FOR SPRINKLER TYPE (No Rounding)

Fully Supervised Sprinklered -40%

Reduction	-5,060.0 L/min
-----------	----------------

D. INCREASE FOR EXPOSURE (No Rounding)

	Separation Distance (m)	Cons. of Exposed Wall	Length Exposed Adjacent Wall (m)	Height (Stories)	Length-Height Factor	
Exposure 1	Over 30 m	Ordinary - Mass Timber (Unprotected)	N/A	1	N/A	0%
Exposure 2	Over 30 m	Ordinary - Mass Timber (Unprotected)	N/A	1	N/A	0%
Exposure 3	Over 30 m	Ordinary - Mass Timber (Unprotected)	N/A	1	N/A	0%
Exposure 4	Over 30 m	Ordinary - Mass Timber (Unprotected)	N/A	1	N/A	0%
% Increase*						0%

Increase*	0.0 L/min
-----------	-----------

E. Total Fire Flow (Rounded to the Nearest 1000 L/min)

Fire Flow	7,590.0 L/min
Fire Flow Required**	8,000.0 L/min

* In accordance with Part II, Section 4, the Increase for separation distance is not to exceed 75%

** In accordance with Section 4 the Fire flow is not to exceed 45,000 L/min or be less than 2,000 L/min

000-23-1882 - 6165 Thunder Road - OBC Fire Calculations

Project:	6165 Thunder Road
Project No.:	000-23-1882
Designed By:	FV
Checked By:	JH
Date:	October 31, 2024

Ontario 2006 Building Code Compendium (Div. B - Part 3)

Water Supply for Fire-Fighting - Warehouse Building

Building is classified as Group : F2

Building is of noncombustible construction with fire separations and fire-resistance ratings provided in accordance with subsections 3.2.2., including loadbearing walls, columns and arches

From Div. B A-3.2.5.7. of the Ontario Building Code - 3. Building On-Site Water Supply:

$$(a) Q = K \times V \times S_{tot}$$

where:

Q = minimum supply of water in litres

K = water supply coefficient from Table 1

V = total building volume in cubic metres

S_{tot} = total of spatial coefficient values from the property line exposures on all sides as obtained from the formula:

$$S_{tot} = 1.0 + [S_{side1} + S_{side2} + S_{side3} + \dots \text{etc.}]$$

K	17	
V	40,546	(Total building volume in m³.)
S _{tot}	1.0	(From figure 1 pg A-32)
Q =	689,282.00 L	

				From Figure 1 (A-32)
Shorth	24.3	m	0.0	
Seast	21.7	m	0.0	
South	18	m	0.0	
Swest	15	m	0.0	
				* approximate distances

From Table 2: Required Minimum Water Supply Flow Rate (L/s)

9000 L/min if Q > 270,000 L
2378 gpm

000-23-1882 - 6165 Thunder Road - NFPA 1142 Fire Calculations

Project:	6165 Thunder Road
Project No.:	000-23-1882
Designed By:	FV
Checked By:	JH
Date:	October 31, 2024

NFPA 1142 - 2022 Edition

$$WS_{min} = (VS_{tot} / OHC) * (CC) * 3.785$$

Where:

WS_{min} = Minimum supply of water in Litres

VS_{tot} = Total volume of structure in ft^3

OHC = Occupancy Hazard Classification Number

CC = Construction Classification Number

3.785 = Conversion Factor (Gallons to Litres)

Building volume is calculated as: $3686 m^2 * 11 m$

$$VS_{tot} = 40,546 m^3$$

$$VS_{tot} = 1,431,868.5 ft^3$$

Building Occupancy is classified as: 4 (Warehouse) as per 5.2.2.2 (13)

$$OHC = 4$$

Construction Classification Number is determined as: 0.75 (Type II - 111) as per Table 6.2.1

$$CC = 0.75$$

$$WS_{min} = [(1,431,868.5 ft^3) / (4)] * 0.75 * 3.785$$

$$WS_{min} = 1,016,179 \text{ Litres}$$

Note: As per 4.6.1, the AHJ shall be permitted to reduce the water supply required by this standard for manual firefighting purposes when a structure is protected by an automatic sprinkler system that fully meets the requirements of NFPA 13, NFPA 13D, or NFPA 13R.

VALENTI Francis

From: Francis.VALENTI@egis-group.com
Subject: FW: 6165 Thunder Road Fire Protection Review

Importance: High



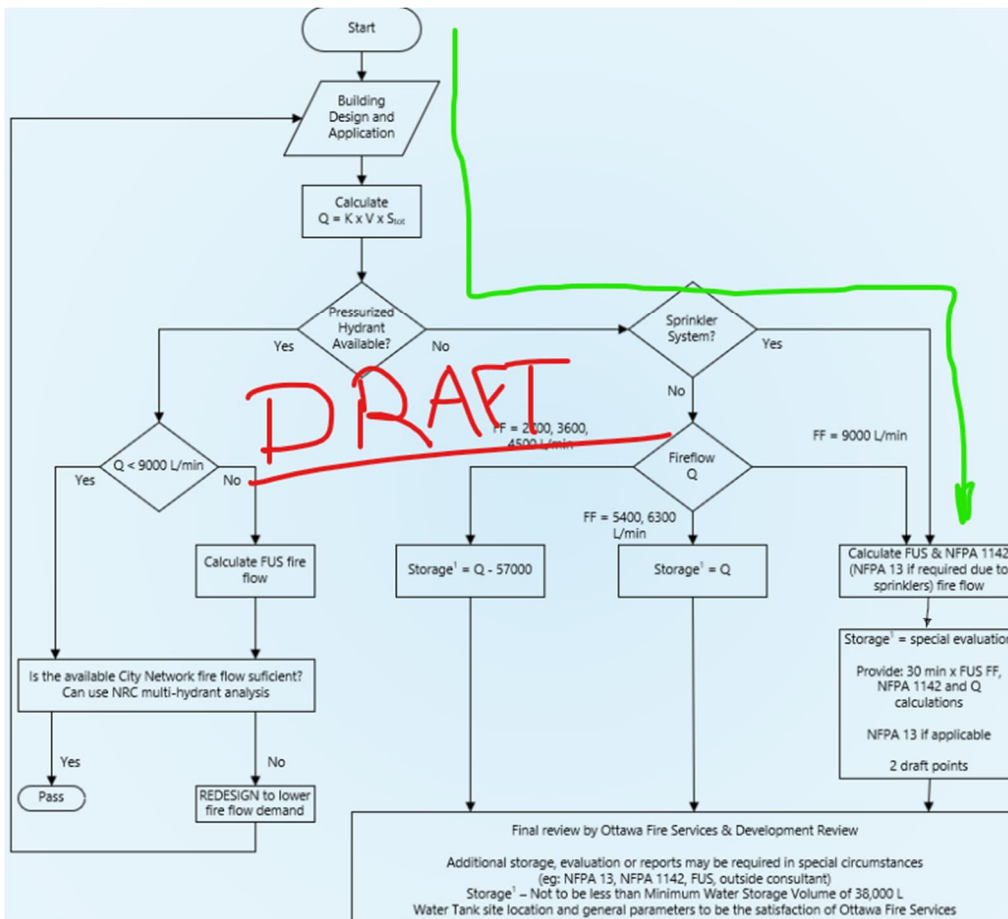
Francis Valenti, EIT
Engineering Intern, North America
Phone: +1 613-714-6895, Mobile: +1 613-808-2123
From: Evans, Allan <Allan.Evans@ottawa.ca>
Sent: Tuesday, September 17, 2024 10:50 AM
To: HEWSON James <james.hewson@egis-group.com>; FREEL Robert <Robert.FREEL@egis-group.com>; Whittaker, Damien <Damien.Whittaker@ottawa.ca>
Subject: FW: 6165 Thunder Road Fire Protection Review
Importance: High

Below are the code sections and reasoning that I took into consideration for determining storage requirements for this site. As with all reviews (especially under the “special review” category), this is only applicable for this site application and may be subject to change in the future as this process evolves.

All recommendations subject to Building Code Services approval.

Please let me know if you have any concerns.

Rural Water Supply (DRAFT):



NFPA 13:

19.1.4.2* The minimum water demand requirements for a sprinkler system shall be determined by adding the hose stream allowance to the water demand for sprinklers.

19.1.5 Water Supplies.

19.1.5.1 The minimum water supply shall be available for the minimum duration specified in Chapter 19.

19.1.5.2* Tanks shall be sized to supply the equipment that they serve.

19.1.5.3* Pumps shall be sized to supply the equipment that they serve.

Table 19.2.3.1.2 Hose Stream Allowance and Water Supply Duration Requirements for Hydraulically Calculated Systems

Occupancy	Inside Hose		Total Combined Inside and Outside Hose		Duration (minutes)
	gpm	L/min	gpm	L/min	
Light hazard	0, 50, or 100	0, 190, or 380	100	380	30
Ordinary hazard	0, 50, or 100	0, 190, or 380	250	950	60 or 90
Extra hazard	0, 50, or 100	0, 190, or 380	500	1900	90 or 120

19.2.3.1.2 The minimum water supply shall be available for the minimum duration specified in Table 19.2.3.1.2.

NFPA 1142:

4.4* Structures with Automatic Sprinkler Protection.

4.4.1 The AHJ shall be permitted to reduce the water supply required by this standard for manual firefighting purposes when a structure is protected by an automatic sprinkler system that fully meets the requirements of NFPA 13, NFPA 13D, or NFPA 13R. *(See Annex F.)*

OBCA-3.2.5.7. Water Supply:

For larger more complex buildings, an on-site water supply for firefighting would be needed to provide an extent of hose stream use by the fire department to allow search and evacuation of the building, exposure protection and suppression. The volume of this on-site water supply would be dependent on the building size, construction, occupancy exposure and environmental impact potential, and should be sufficient to allow at least 30 minutes of fire department stream use.

Comparison of FF and volumes:

Address	OBC		FUS		NFPA 1142
	FF	Q	FF	Storage (30 min)	Storage
6165 Thunder Road	9000	689282	8000	240000	1016179

Our new process within the city is focused upon using the OBC method as much as practical for calculating water storage requirements. Since the OBC method does not directly take into consideration having sprinklers for a water storage reduction, we will use other methodologies to compliment the OBC and determine an appropriate storage volume.

The FUS calculation shows 8000 L/min and a total storage of close to 1 million liters – even with our proposed reduction to 30 minutes, this is 240000 L total storage which is a very large volume of water – FUS does take into account sprinklers, but we still consider FUS to be a conservative methodology. NFPA 1142 is supported by FUS as an alternative and it also produces a storage volume of also close to 1 million liters. However, NFPA 1142 also permits the AHJ to reduce the water supply for manual firefighting (ie: handlines) when a sprinkler system is installed that “fully meets the requirements of NFPA 13...” (confirmation will be required by applicant). Moving on to NFPA 13, the applicant has provided a storage volume of 187000L for the sprinklers (assumption here made that this is SOLELY for the use of the sprinklers as it was not clear from provided information). NFPA 13 also assigns required storage for handlines based upon Table 19.2.3.1.2.. Occupancy is F2 but also stated as industrial – Light in the provided documentation, so I chose Ordinary Hazard and worst case 950 L/min x 90 min duration (it is the responsibility of the applicant to confirm that this selection is correct). $950 \times 90 = 85500\text{L}$ additional storage. So, according to NFPA 13, the **total water required is $187000 + 85500 = 272500\text{L}$** . Ottawa is also Superior Tanker Shuttle qualified which means we are capable of delivering 1900 L/min and some form of credit can be afforded towards a water storage reduction - similar to our standard flowchart process, a 30 min x 1900 L/min = 57000L. However, we also have a minimum tank size of 38000L (10000 USgal), so the following two options are proposed:

Option 1 (separate sprinkler tanks and firefighting tanks):

Tank 1 (sprinklers) = 187000L as per NFPA 13 design

Tank 2 (handlines) = 38000L ($85500 - 57000 = 28500 < \text{minimum tank size}$) – single draft point

Option 2 (combined tank for sprinklers and firefighting draft):

Combined tank = $187000 + 85500 - 57000 = 215500\text{L}$ – single draft point

With Option 1, the tank for the sprinklers can be located wherever it makes sense and meets code as fire would not need direct access to it but would require a fire department connection for the sprinkler system as is standard. The separate 38000 L tank would have to be located where it meets our requirements (normal restrictions/requirements). With Option 2, a single combined tank would provide water for both the sprinkler system and firefighting handlines. The location of the tank would need to meet OFS requirements and there are several options we have seen in the past that allows the draft point to be more remote than the tank location when shared with sprinkler systems.

Due to the large size of this building, we will want a large distance away for our draft point. OFS will likely request >45m whereas OBC wants <45m for distance from hydrant to FDC – this will have to be determined, but is applicable for both options above. NFPA 13 does not have a large handline flowrate requirement, so a single draft point is sufficient.

Allan Evans

Fire Protection Engineer / Ingénieur de Protection d'Incendies

Prevention Division / Prévention des Incendies

Ottawa Fire Services / Service des Incendies d'Ottawa

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Ottawa, ON K1Z 7L9

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



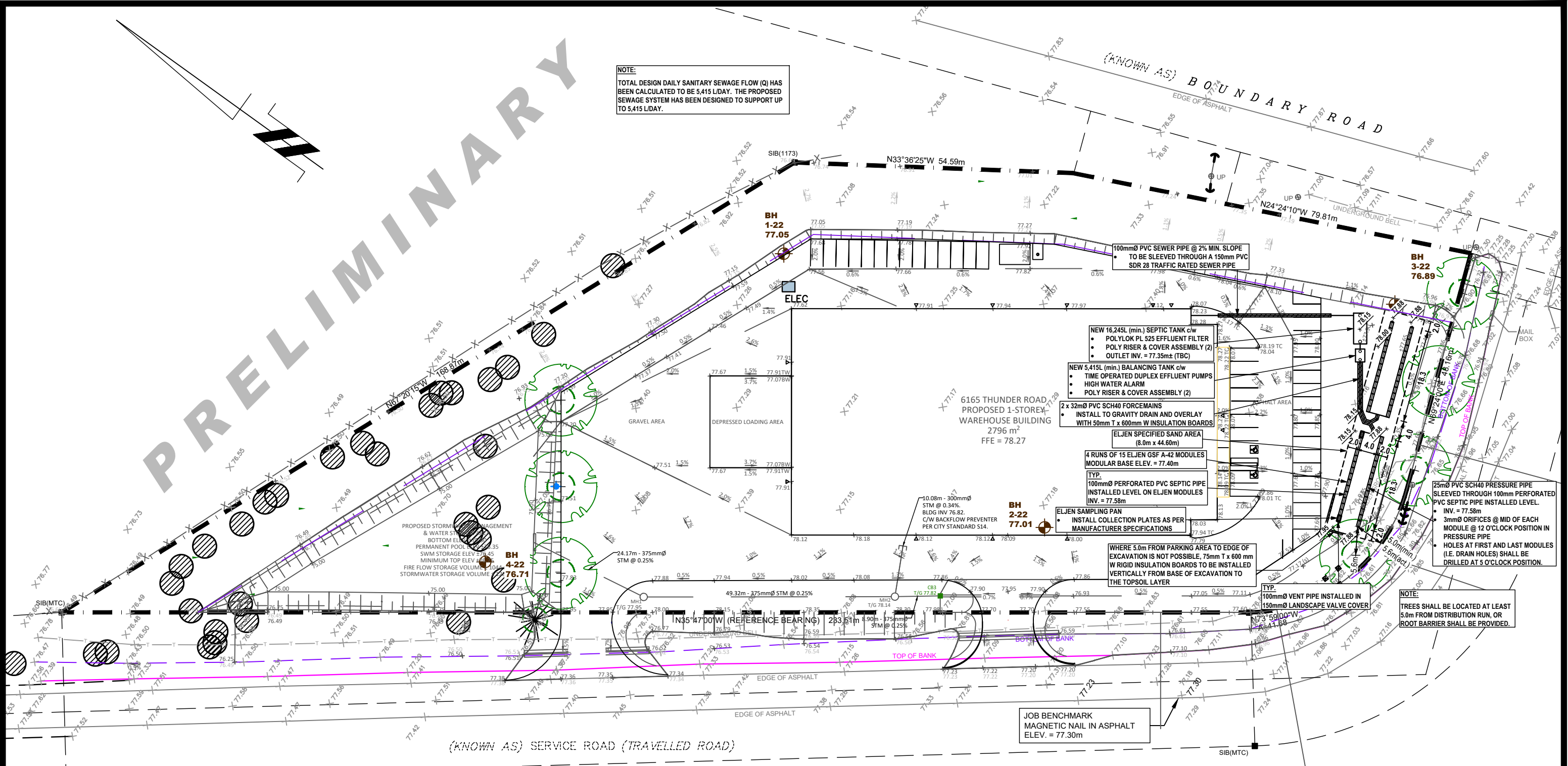
An internationally accredited agency 2019-2024



OTTAWA FIRE SERVICES
SERVICE DES INCENDIES D'OTTAWA

Protecting Our Nation's Capital With Honour
Protéger notre capitale nationale avec honneur

APPENDIX D
DRAFT SEPTIC DESIGN (BY PATERSON GROUP)



NOTE:
TOTAL DESIGN DAILY SANITARY SEWAGE FLOW (Q) HAS BEEN CALCULATED TO BE 5,415 L/DAY. THE PROPOSED SEWAGE SYSTEM HAS BEEN DESIGNED TO SUPPORT UP TO 5,415 L/DAY.

LEGEND:

- Bore Hole Location
- Existing Ground Surface Elev. (m)
- Proposed Ground Surface Elev. (m)
- Surficial Flow Direction
- Proposed Structure

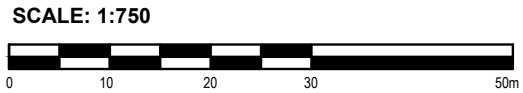
BENCHMARK INFORMATION:

TBM: Top of Magnetic Nail In Asphalt of Thunder Road near south west corner of subject Property

Approximate Geodetic Elevation = 77.30m

REFERENCE:

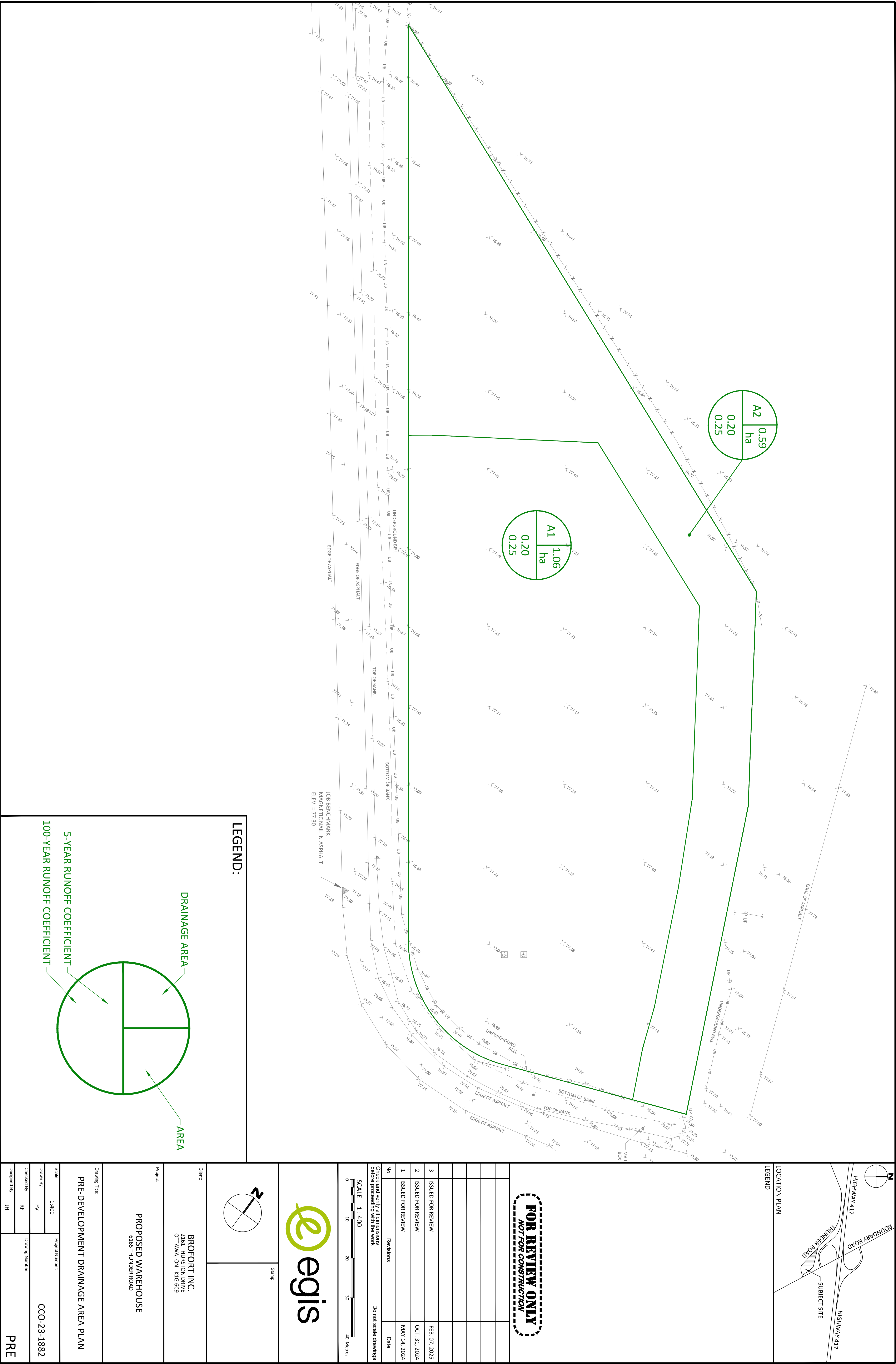
Base Plan and Topographic Information obtained from Lot Grading Drainage and Servicing Plan No. C101, provided on April 22, 2024, by McIntosh PERRY



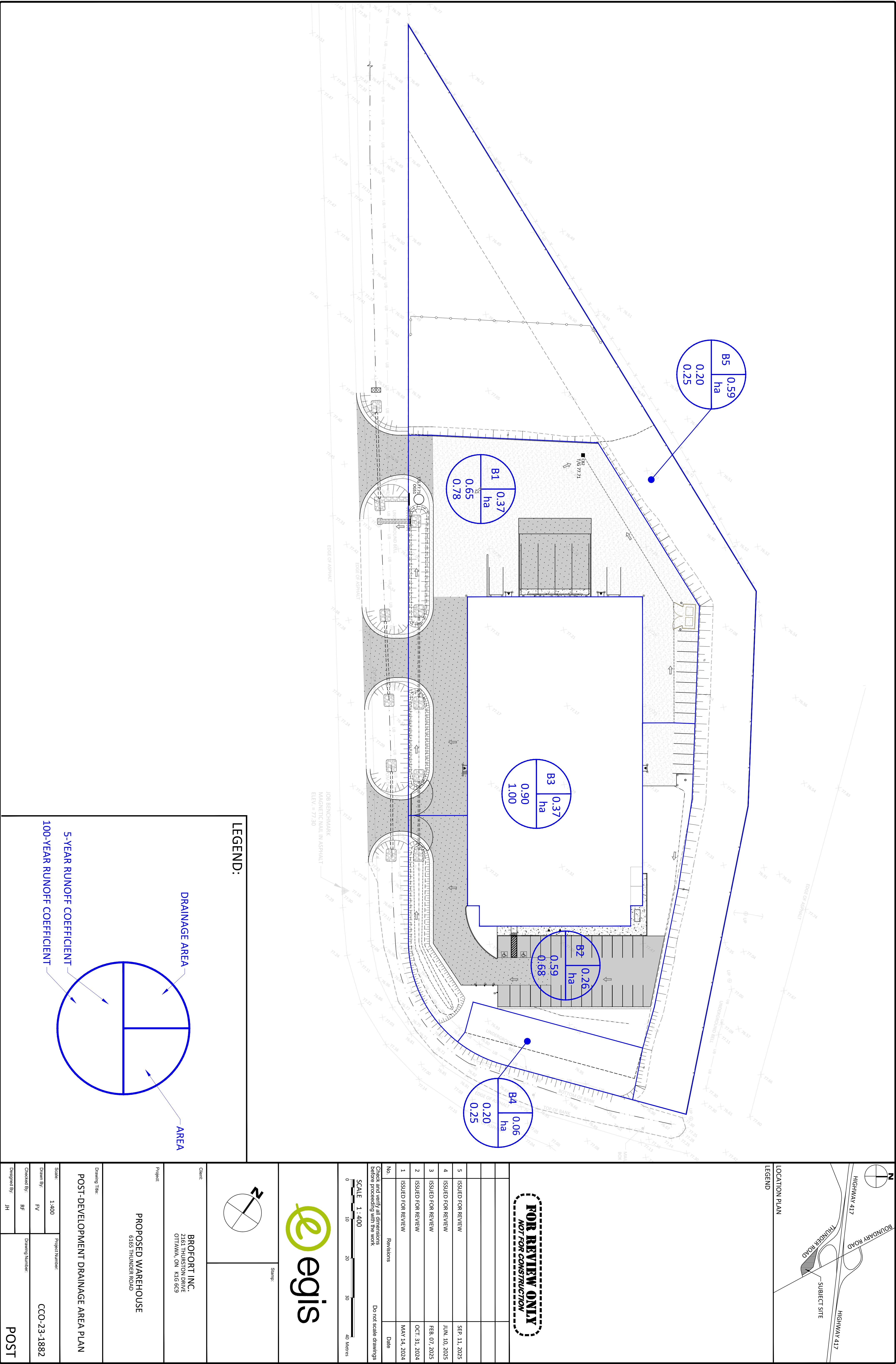
 PATERSON GROUP 9 AURIGA DRIVE OTTAWA, ON K2E 7S9 TEL: (613) 226-7381				Client	BROFORT INVESTMENTS Project PROPOSED COMMERCIAL DEVELOPMENT 6165 THUNDER ROAD OTTAWA (CARLSBAD SPRINGS), ONTARIO	Drawing	SEWAGE SYSTEM LAYOUT PLAN	Scale:	1:750	Drawn by:	HV
	Date:	03/2025	Checked by:	MK							
	Drawing no.:							PH4650-1(rev.2)			
	05/03/25	Revised to Include Tree Locations	2								
	29/04/24	Issued for Site Plan Application	1								
	26/02/23	Issued for Preliminary Discussion Purposes	0								
	DD/MM/YY	Description	Rev.								

p:\autocad\drawings\hydrology\ph46x\ph4650 - brofort investments - 6165 thunder road - prelim.nia\ph4650-1(rev.2).dwg

APPENDIX E PRE-DEVELOPMENT DRAINAGE PLAN



APPENDIX F POST-DEVELOPMENT DRAINAGE PLAN



FOR REVIEW ONLY
NOT FOR CONSTRUCTION

1	ISSUED FOR REVIEW	SEP 11, 2025
2	ISSUED FOR REVIEW	JUN 10, 2025
3	ISSUED FOR REVIEW	FEB 07, 2025
4	ISSUED FOR REVIEW	OCT 31, 2024
5	ISSUED FOR REVIEW	MAY 14, 2024

Check and verify all dimensions before proceeding with the work

SCALE 1:400

0 10 20 30 40 Metres

egis

Stamp:

Client:

BROFORT INC.
2161 THURSTON DRIVE
OTTAWA, ON K1G 6C9

Project:

PROPOSED WAREHOUSE
6165 THUNDER ROAD

Drawing Title:

POST-DEVELOPMENT DRAINAGE AREA PLAN

Scale: 1:400

Drawn By: FV

Checked By: RF

Designed By: JH

Project Number: CCO-23-1882

POST

LOCATION PLAN

LEGEND

BOUNDARY ROAD

THUNDER ROAD

SUBJECT SITE

HIGHWAY 417

HIGHWAY 417

APPENDIX G STORMWATER MANAGEMENT CALCULATIONS

CO-23-1882 - 6165 Thunder Road

1 of 5

Tc (min)	Intensity (mm/hr)	
	5-Year	100-Year
20	70.3	120.0
10	104.2	178.6

C-Values	
Impervious	0.90
Gravel	0.60
Pervious	0.20

Pre-Development Runoff Coefficient

Drainage Area	Impervious Area (m ²)	Gravel (m ²)	Pervious Area (m ²)	Average C (5-year)	Average C (100-year)	
A1	0	0	10,568	0.20	0.25	Development Area
A2	0	0	5,894	0.20	0.25	Existing Unrestricted

Pre-Development Runoff Calculations

Drainage Area	Area (ha)	C 5-Year	C 100-Year	Tc (min)	Q (L/s)		
					5-Year	100-Year	
A1	1.06	0.20	0.25	20	41.28	88.10	Development Area
A2	0.59	0.20	0.25	10	34.14	73.14	Existing Unrestricted
Total	1.65				75.42	161.24	

Post-Development Runoff Coefficient

Drainage Area	Impervious Area (m ²)	Gravel (m ²)	Pervious Area (m ²)	Average C (5-year)	Average C (100-year)	
B1	1,053	2,311	325	0.65	0.78	Surface Restricted - NW
B2	1,309	258	1,030	0.59	0.68	Surface Restricted - SE
B3	3,686	0	0	0.90	1.00	Building - Restricted
B4	0	0	595	0.20	0.25	Unrestricted
B5	0	0	16,462	0.20	0.25	Existing Unrestricted

Post-Development Runoff Calculations

Drainage Area	Area (ha)	C 5-Year	C 100-Year	Tc (min)	Q (L/s)		
					5-Year	100-Year	
B1	0.37	0.65	0.78	10	69.50	142.36	Surface Restricted - NW
B2	0.26	0.59	0.68	10	44.59	87.39	Surface Restricted - SE
B3	0.37	0.90	1.00	10	96.08	182.95	Building - Restricted
B4	0.06	0.20	0.25	10	3.45	7.39	Unrestricted
B5	0.59	0.20	0.25	10	34.14	73.14	Existing Unrestricted
Total	1.65				247.76	493.22	

Required Restricted Flow for Area B1-B4

Drainage Area	Area (ha)	C 5-Year	Tc (min)	Q (L/s)	
				5-Year	100-Year
A1	1.06	0.20	20	41.28	88.10

Post-Development Restricted Runoff Calculations

Drainage Area	Unrestricted Flow (L/s)		Restricted Flow (L/s)		Storage Required (m ³)		Storage Provided (m ³)	
	5-year	100-Year	5-Year	100-Year	5-Year	100-Year	5-Year	100-Year
B1	69.50	142.36	37.79	79.49	57.9	105.6	58.3	106.0
B2	44.59	87.39						
B3	96.08	182.95						
B4	3.45	7.39	3.45	7.39	-	-	-	-
Total (Site)	213.62	420.08	41.24	86.88	57.93	105.64	58.30	106.03
B5	34.14	73.14	34.14	73.14				
Total	247.76	493.22	75.38	160.02	57.93	105.64	58.30	106.03

CO-23-1882 - 6165 Thunder Road

Storage Requirements for Area B1-B3

2 of 5

5-Year Storm Event

Tc (min)	I (mm/hr)	Runoff (L/s) B1-B3	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m ³)
10	104.2	123.18	37.79	85.39	51.24
20	70.3	86.06	37.79	48.27	57.93
30	53.9	68.10	37.79	30.32	54.57
40	44.2	57.48	37.79	19.70	47.27
50	37.7	50.37	37.79	12.58	37.73

Maximum Storage Required 5-year = 58 m³

100-Year Storm Event

Tc (min)	I (mm/hr)	Runoff (L/s) B1-B3	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m ³)
10	178.6	242.92	79.49	163.43	98.06
20	120.0	167.52	79.49	88.03	105.64
30	91.9	131.37	79.49	51.88	93.38
40	75.1	109.75	79.49	30.26	72.62
50	64.0	95.47	79.49	15.98	47.93

Maximum Storage Required 100-year = 106 m³

5-Year Storm Event Storage Summary

Storage Available (m³) = 58.3
Storage Required (m³) = 57.9

100-Year Storm Event Storage Summary

Storage Available (m³) = 106.0
Storage Required (m³) = 105.6

* Available Storage calculated from AutoCAD

CO-23-1882 - 6165 Thunder Road

For Orifice Flow, C= 0.61
For Weir Flow, C= 1.84

3 of 5

	Orifice 1	Orifice 2	Weir 1	Weir 2
invert elevation	76.59	X	77.33	X
center of crest elevation	76.67	X		X
orifice width / weir length	152 mm	X	1.10 m	X
weir height				X
orifice area (m ²)	0.018	X	x	X

Elevation Discharge Table - Storm Routing

Elevation	Orifice 1		Orifice 2		Weir 1		Weir 2		Total
	H [m]	Q [m ³ /s]	H [m]	Q [m ³ /s]	H [m]	Q [m ³ /s]	H [m]	Q [m ³ /s]	
77.06	0.39	0.031	x	x	x	x	x	x	30.78
77.07	0.40	0.03	x	x	x	x	x	x	31.16
77.08	0.41	0.03	x	x	x	x	x	x	31.55
77.09	0.42	0.03	x	x	x	x	x	x	31.93
77.10	0.43	0.03	x	x	x	x	x	x	32.30
77.11	0.44	0.03	x	x	x	x	x	x	32.67
77.12	0.45	0.03	x	x	x	x	x	x	33.04
77.13	0.46	0.03	x	x	x	x	x	x	33.40
77.14	0.47	0.03	x	x	x	x	x	x	33.76
77.15	0.48	0.03	x	x	x	x	x	x	34.11
77.16	0.49	0.03	x	x	x	x	x	x	34.46
77.17	0.50	0.03	x	x	x	x	x	x	34.81
77.18	0.51	0.04	x	x	x	x	x	x	35.15
77.19	0.52	0.04	x	x	x	x	x	x	35.49
77.20	0.53	0.04	x	x	x	x	x	x	35.83
77.21	0.54	0.04	x	x	x	x	x	x	36.16
77.22	0.55	0.04	x	x	x	x	x	x	36.49
77.23	0.56	0.04	x	x	x	x	x	x	36.82
77.24	0.57	0.04	x	x	x	x	x	x	37.15
77.25	0.58	0.04	x	x	x	x	x	x	37.47
77.26	0.59	0.04	x	x	x	x	x	x	37.79
77.27	0.60	0.04	x	x	x	x	x	x	38.10
77.28	0.61	0.04	x	x	x	x	x	x	38.42
77.29	0.62	0.04	x	x	x	x	x	x	38.73
77.30	0.63	0.04	x	x	x	x	x	x	39.04
77.31	0.64	0.04	x	x	x	x	x	x	39.35
77.32	0.65	0.04	x	x	x	x	x	x	39.65
77.33	0.66	0.04	x	x	0.00	0.00	x	x	39.95
77.34	0.67	0.04	x	x	0.01	0.00	x	x	42.28
77.35	0.68	0.04	x	x	0.02	0.01	x	x	46.27
77.36	0.69	0.04	x	x	0.03	0.01	x	x	51.36
77.37	0.70	0.04	x	x	0.04	0.02	x	x	57.33
77.38	0.71	0.04	x	x	0.05	0.02	x	x	64.06
77.39	0.72	0.04	x	x	0.06	0.03	x	x	71.46
77.40	0.73	0.04	x	x	0.07	0.04	x	x	79.49
77.41	0.74	0.04	x	x	0.08	0.05	x	x	88.09
77.42	0.75	0.04	x	x	0.09	0.05	x	x	97.22
77.43	0.76	0.04	x	x	0.10	0.06	x	x	106.86

5-Year

100-Year

- Notes:
1. For Orifice Flow, User is to Input an Elevation Higher than Crown of Orifice.
 2. Orifice Equation: $Q = cA(2gh)^{1/2}$
 3. Weir Equation: $Q = CLH^{3/2}$
 4. These Computations Do Not Account for Submergence Effects Within the Pond Riser.
 5. H for orifice equations is depth of water above the centroid of the orifice.
 6. H for weir equations is depth of water above the weir crest.

CCO-23-1882 - 6165 Thunder Road - Roof Storage

4 of 5

5-Year Storm Event

Tc (min)	I (mm/hr)	B3 Runoff (L/s)	Allowable	Runoff to	Storage
			Outflow (L/s)	be Stored (L/s)	Required (m ³)
10	104.2	96.09	9.08	87.00	52.20
20	70.3	64.83	9.08	55.74	66.89
30	53.9	49.70	9.08	40.62	73.11
40	44.2	40.76	9.08	31.67	76.01
50	37.7	34.76	9.08	25.68	77.04
60	32.9	30.34	9.08	21.25	76.51
70	29.4	27.11	9.08	18.03	75.71
80	26.6	24.53	9.08	15.44	74.13

Maximum Storage Required 5-Year (m³) = 77.04

100-Year Storm Event

Tc (min)	I (mm/hr)	B3 Runoff (L/s)	Allowable	Runoff to	Storage
			Outflow (L/s)	be Stored (L/s)	Required (m ³)
10	178.6	182.95	13.12	169.83	101.90
20	120.0	122.90	13.12	109.78	131.73
30	91.9	94.13	13.12	81.00	145.81
40	75.1	76.99	13.12	63.87	153.29
50	64.0	65.53	13.12	52.40	157.21
60	55.9	57.27	13.12	44.15	158.92
70	49.8	51.01	13.12	37.89	159.14
80	45.0	46.10	13.12	32.97	158.28

Maximum Storage Required 100-Year (m³) = 159.14

Storage Parameters

Roof Area (m ²)	3,685.54
Usable Roof Area (%)	75%
Usable Roof Area (m ²)	2764.16

5-Year Storage Summary

Max. Storage Available (m ³)	82.92
Storage Required (m ³)	77.04
Max. Ponding Depth (m)	0.090

100-Year Storage Summary

Max. Storage Available (m ³)	159.71
100-Year Storage Required (m ³)	159.14
Max. Ponding Depth (m)	0.130

CCO-23-1882 - 6165 Thunder Road - Roof Storage

Roof Drain Flow (B3)

5 of 5

Roof Drains Summary		
Type of Control Device	Watts Drainage - Accutrol Weir	
Number of Roof Drains	8	
Roof Drain Position	Open	
	5-Year	100-Year
Rooftop Storage Available (m ³)	82.92	159.71
Rooftop Storage Required (m ³)	77.04	159.14
Storage Depth (m)	0.090	0.130
Flow (Per Roof Drain) (L/s)	1.14	1.64
Total Flow (L/s)	9.08	13.12

Flow Rate Vs. Build-Up (Individual Drain)	
Depth (mm)	Flow (L/s)
0	0.00
5	0.06
10	0.13
15	0.19
20	0.25
25	0.32
30	0.38
35	0.44
40	0.50
45	0.57
50	0.63
55	0.69
60	0.76
65	0.82
70	0.88
75	0.95
80	1.01
85	1.07
90	1.14
95	1.20
100	1.26
105	1.32
110	1.39
115	1.45
120	1.51
125	1.58
130	1.64
135	1.70
140	1.77
145	1.83
150	1.89

	Roof Drain Flow		
	Individual Flow (l/s)	Storage Depth (mm)	Cumulative Flow (l/s)
5-Year	0.00	0	0.00
	0.06	5	0.50
	0.13	10	1.01
	0.19	15	1.51
	0.25	20	2.02
	0.32	25	2.52
	0.38	30	3.03
	0.44	35	3.53
	0.50	40	4.04
	0.57	45	4.54
	0.63	50	5.05
	0.69	55	5.55
	0.76	60	6.06
	0.82	65	6.56
	0.88	70	7.07
	0.95	75	7.57
	1.01	80	8.08
	1.07	85	8.58
	1.14	90	9.08
	1.20	95	9.59
	1.26	100	10.09
100-Year	1.32	105	10.60
	1.39	110	11.10
	1.45	115	11.61
	1.51	120	12.11
	1.58	125	12.62
	1.64	130	13.12
	1.70	135	13.63
	1.77	140	14.13
	1.83	145	14.64
	1.89	150	15.14

* Roof Drain model to be Accutrol Weirs, See attached sheets

* Roof Drain Flow information taken from Watts Drainage website

Note: The flow leaving through a restricted roof drain is based on flow vs. head information

STORM SEWER DESIGN SHEET

PROJECT: OOO-23-1882
LOCATION: 6165 Thunder Road
CLIENT: Brofort Inc.



LOCATION				CONTRIBUTING AREA (ha)				RATIONAL DESIGN FLOW											SEWER DATA									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17		18	19	20	21	22	23	24	25	26	27	28
STREET	AREA ID	FROM MH	TO MH	C-VALUE	AREA	INDIV AC	CUMUL AC	INLET (min)	TIME IN PIPE	TOTAL (min)	i (5) (mm/hr)	i (10) (mm/hr)	i (100) (mm/hr)	5yr PEAK FLOW (L/s)	10yr PEAK FLOW (L/s)	100yr PEAK FLOW (L/s)	ROOF FLOW (L/s)	FIXED FLOW (L/s)	DESIGN FLOW (L/s)	CAPACITY (L/s)	LENGTH (m)	PIPE SIZE (mm)			SLOPE (%)	VELOCITY (m/s)	AVAIL CAP (5yr)	
																						DIA	W	H			(L/s)	(%)
Thunder Road																												
	B2	S.E. CULV INLET	S.E. CULV OUTLET	0.59	0.26	0.15	0.15	10.00	0.25	10.25	104.19	122.14	178.56	44.43			9.08		53.51	129.34	17.1	375			0.50	1.134	75.82	58.63%
	B1A	N.W. CULV INLET	N.W. CULV OUTLET	0.65	0.10	0.06	0.22	10.25	0.30	10.55	102.88	120.60	176.29	61.89			9.08		70.97	129.34	20.2	375			0.50	1.134	58.37	45.13%
	B1B	CB2	SWM Area	0.65	0.13	0.09	0.09	10.00	0.84	10.84	104.19	122.14	178.56	25.22					25.22	43.87	43.6	250			0.50	0.866	18.65	42.51%
	B1C	Gravel Area	SWM Area	0.65	0.14	0.09	0.09																					
	B1-B3	375mm Inlet Control	OGSI				0.39	10.84	0.06	10.90	99.96	117.15	171.23	109.25			9.08		118.33	182.91	5.6	375			1.00	1.604	64.58	35.31%
		OGSI	Municipal Ditch				0.39	10.90	0.03	10.93	99.68	116.83	170.75	108.95			9.08		118.03	182.91	2.7	375			1.00	1.604	64.88	35.47%
Definitions: Q = 2.78QA, where: Q = Peak Flow in Litres per Second (L/s) A = Area in Hectares (ha) i = Rainfall intensity in millimeters per hour (mm/hr) [i = 998.071 / (TC+6.053)^0.814] 5 YEAR [i = 1174.184 / (TC+6.014)^0.816] 10 YEAR [i = 1735.688 / (TC+6.014)^0.820] 100 YEAR				Notes: 1. Mannings coefficient (n) = 0.013				Designed: FV						No.	Revision						Date							
														1	Issued for Review						2024-05-14							
														2	Issued for Review						2024-10-31							
								Checked: FF						3	Issued for Review						2025-02-07							
														4	Issued for Review						2025-08-06							
								Project No.: OOO-23-1882																	Date: 2025.02.07			

Stormceptor®EF Sizing Report

Imbrium® Systems ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION 08/05/2025																			
Province:		Ontario	Project Name:		6165 Thunder Rd.														
City:		Ottawa	Project Number:		CCO-23-1882														
Nearest Rainfall Station:		OTTAWA CDA RCS	Designer Name:		Brandon O'Leary														
Climate Station Id:		6105978	Designer Company:		Rinker Pipe														
Years of Rainfall Data:		20	Designer Email:		brandon.oleary@RinkerPipe.com														
Site Name:		6165 Thunder Rd.	Designer Phone:		905-630-0359														
Drainage Area (ha):		0.9972	EOR Name:		Francis Valenti														
Runoff Coefficient 'c':		0.73	EOR Company:		Egis Group														
Particle Size Distribution:		CA ETV	EOR Email:																
Target TSS Removal (%):		60.0	EOR Phone:																
Required Water Quality Runoff Volume Capture (%):		90.0	Net Annual Sediment (TSS) Load Reduction Sizing Summary <table><tr><td>Stormceptor Model</td><td>TSS Removal Provided (%)</td></tr><tr><td>EFO4</td><td>51</td></tr><tr><td>EFO5</td><td>55</td></tr><tr><td>EFO6</td><td>59</td></tr><tr><td>EFO8</td><td>63</td></tr><tr><td>EFO10</td><td>66</td></tr><tr><td>EFO12</td><td>68</td></tr></table>			Stormceptor Model	TSS Removal Provided (%)	EFO4	51	EFO5	55	EFO6	59	EFO8	63	EFO10	66	EFO12	68
Stormceptor Model	TSS Removal Provided (%)																		
EFO4	51																		
EFO5	55																		
EFO6	59																		
EFO8	63																		
EFO10	66																		
EFO12	68																		
Estimated Water Quality Flow Rate (L/s):		23.56	Recommended Stormceptor EFO Model: EFO8 Estimated Net Annual Sediment (TSS) Load Reduction (%): 63 Water Quality Runoff Volume Capture (%): > 90																
Oil / Fuel Spill Risk Site?		Yes																	
Upstream Flow Control?		Yes																	
Upstream Orifice Control Flow Rate to Stormceptor (L/s):		78.95																	
Peak Conveyance (maximum) Flow Rate (L/s):		78.95																	
Influent TSS Concentration (mg/L):		200																	
Estimated Average Annual Sediment Load (kg/yr):		614																	
Estimated Average Annual Sediment Volume (L/yr):		500																	



Stormceptor®EF Sizing Report

THIRD-PARTY TESTING AND VERIFICATION

► **Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** and performance has been third-party verified in accordance with the **ISO 14034 Environmental Technology Verification (ETV)** protocol.

PERFORMANCE

► **Stormceptor® EF and EFO** remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterways.

PARTICLE SIZE DISTRIBUTION (PSD)

► The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.

Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5



Stormceptor® EF Sizing Report

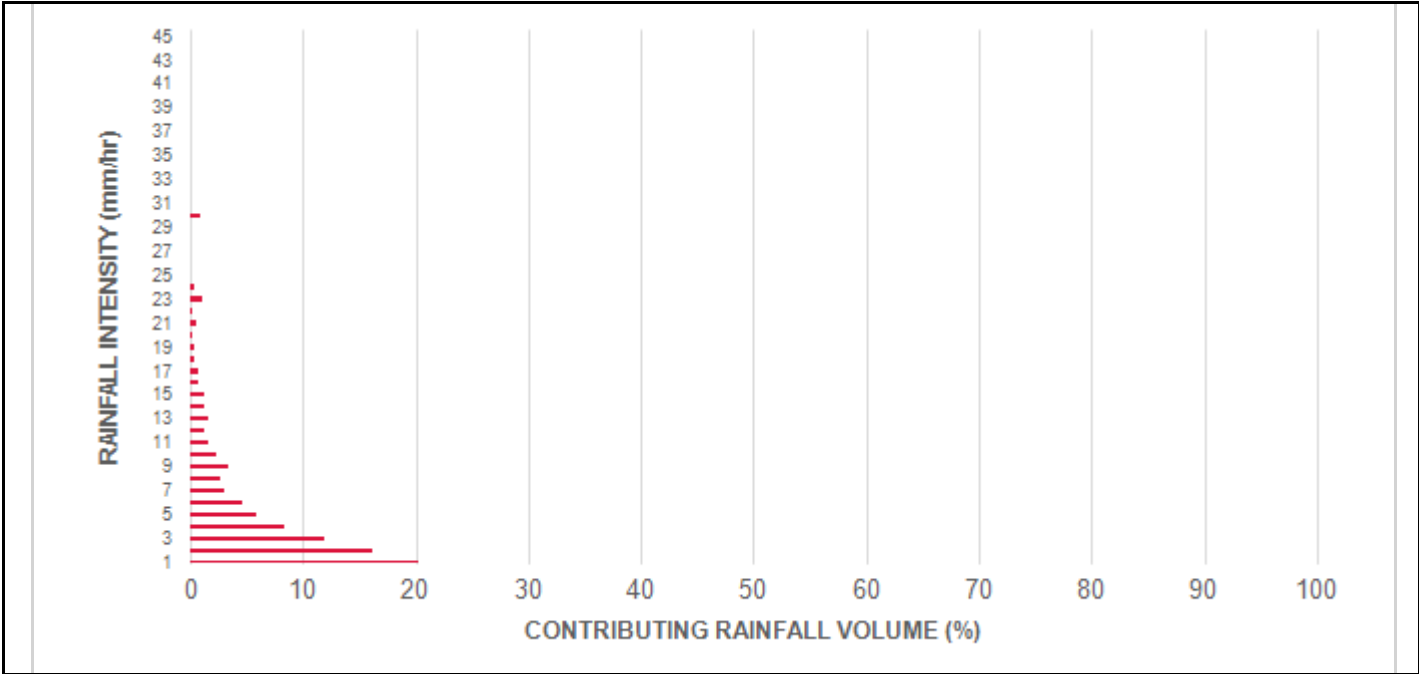
Upstream Flow Controlled Results

Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.50	8.6	8.6	1.01	61.0	13.0	70	6.1	6.1
1.00	20.3	29.0	2.03	122.0	26.0	70	14.3	20.4
2.00	16.2	45.2	4.06	244.0	52.0	69	11.2	31.5
3.00	12.0	57.2	6.09	365.0	78.0	66	7.9	39.4
4.00	8.4	65.6	8.12	487.0	104.0	62	5.3	44.7
5.00	5.9	71.6	10.15	609.0	130.0	60	3.6	48.2
6.00	4.6	76.2	12.18	731.0	155.0	58	2.7	50.9
7.00	3.1	79.3	14.21	852.0	181.0	56	1.7	52.6
8.00	2.7	82.0	16.24	974.0	207.0	54	1.5	54.1
9.00	3.3	85.3	18.26	1096.0	233.0	53	1.8	55.9
10.00	2.3	87.6	20.29	1218.0	259.0	52	1.2	57.1
11.00	1.6	89.2	22.32	1339.0	285.0	52	0.8	57.9
12.00	1.3	90.5	24.35	1461.0	311.0	51	0.7	58.6
13.00	1.7	92.2	26.38	1583.0	337.0	50	0.9	59.4
14.00	1.2	93.5	28.41	1705.0	363.0	49	0.6	60.0
15.00	1.2	94.6	30.44	1826.0	389.0	49	0.6	60.6
16.00	0.7	95.3	32.47	1948.0	415.0	48	0.3	60.9
17.00	0.7	96.1	34.50	2070.0	440.0	47	0.3	61.3
18.00	0.4	96.5	36.53	2192.0	466.0	46	0.2	61.5
19.00	0.4	96.9	38.56	2314.0	492.0	45	0.2	61.6
20.00	0.2	97.1	40.59	2435.0	518.0	45	0.1	61.7
21.00	0.5	97.5	42.62	2557.0	544.0	44	0.2	61.9
22.00	0.2	97.8	44.65	2679.0	570.0	43	0.1	62.0
23.00	1.0	98.8	46.68	2801.0	596.0	42	0.4	62.5
24.00	0.3	99.1	48.71	2922.0	622.0	42	0.1	62.6
25.00	0.9	100.0	50.74	3044.0	648.0	42	0.4	63.0
30.00	0.9	100.9	60.88	3653.0	777.0	41	0.4	63.4
35.00	-0.9	100.0	71.03	4262.0	907.0	41	0.0	63.0
40.00	0.0	100.0	79.00	4740.0	1009.0	40	0.0	63.0
45.00	0.0	100.0	79.00	4740.0	1009.0	40	0.0	63.0
Estimated Net Annual Sediment (TSS) Load Reduction =								63 %

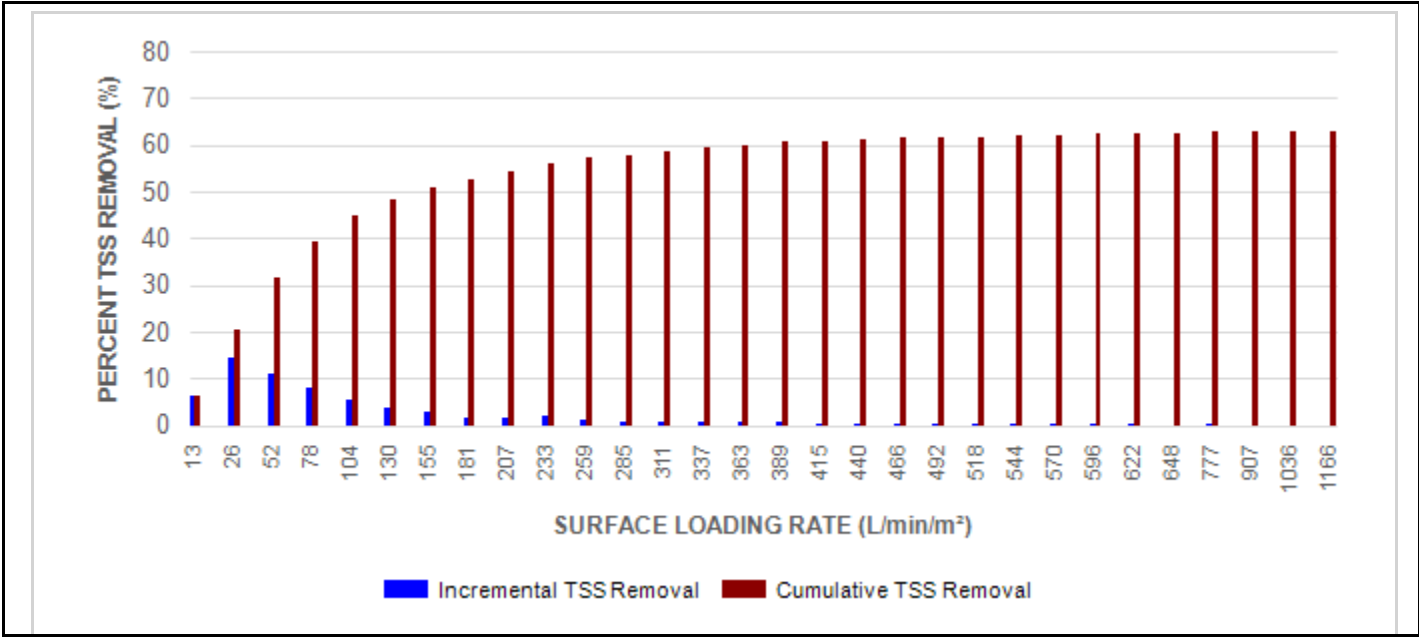
Climate Station ID: 6105978 Years of Rainfall Data: 20

Stormceptor®EF Sizing Report

RAINFALL DATA FROM OTTAWA CDA RCS RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL
FOR THE RECOMMENDED STORMCEPTOR® MODEL



Stormceptor®EF Sizing Report

Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF5 / EFO5	1.5	5	90	762	30	762	30	710	25
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

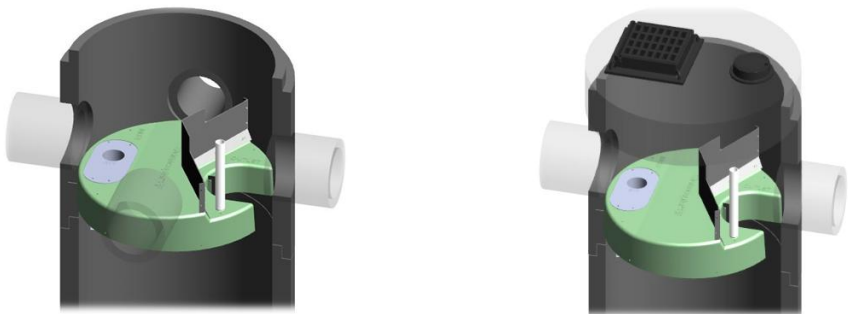
► Stormceptor® EF and EFO feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

DESIGN FLEXIBILITY

► Stormceptor® EF and EFO offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle, and can be modified to ensure performance in submerged conditions.

OIL CAPTURE AND RETENTION

► While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff, Stormceptor® EFO has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid re-entrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.



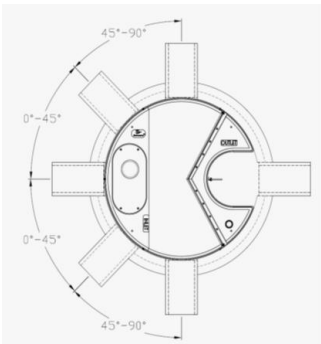
INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.
0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.
45° - 90° : The inlet pipe is 2 inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 2.2.

Stormceptor®EF Sizing Report



Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft³)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF5 / EFO5	1.5	5	1.62	5.3	420	111	305	10	2124	75	2612	5758
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity

** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft³)

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit <http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef>

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

For specifications, please visit <http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef>



Stormceptor® EF Sizing Report

Table of TSS Removal vs Surface Loading Rate Based on Third-Party Test Results
Stormceptor® EFO

SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL
1	70	660	42	1320	35	1980	24
30	70	690	42	1350	35	2010	24
60	67	720	41	1380	34	2040	23
90	63	750	41	1410	34	2070	23
120	61	780	41	1440	33	2100	23
150	58	810	41	1470	32	2130	22
180	56	840	41	1500	32	2160	22
210	54	870	41	1530	31	2190	22
240	53	900	41	1560	31	2220	21
270	52	930	40	1590	30	2250	21
300	51	960	40	1620	29	2280	21
330	50	990	40	1650	29	2310	21
360	49	1020	40	1680	28	2340	20
390	48	1050	39	1710	28	2370	20
420	47	1080	39	1740	27	2400	20
450	47	1110	38	1770	27	2430	20
480	46	1140	38	1800	26	2460	19
510	45	1170	37	1830	26	2490	19
540	44	1200	37	1860	26	2520	19
570	43	1230	37	1890	25	2550	19
600	42	1260	36	1920	25	2580	18
630	42	1290	36	1950	24	2600	26



STANDARD PERFORMANCE SPECIFICATION FOR “OIL GRIT SEPARATOR” (OGS) STORMWATER QUALITY TREATMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit Separators**

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The minimum sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m ³ sediment / 265 L oil
	5 ft (1524 mm) Diameter OGS Units:	1.95 m ³ sediment / 420 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m ³ sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m ³ sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m ³ sediment / 1,673 L oil

Stormceptor[®] EF Sizing Report

12 ft (3657 mm) Diameter OGS Units: 31.23 m³ sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol Procedure for Laboratory Testing of Oil-Grit Separators, as follows:

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m² to 1400 L/min/m², and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m² and 1400 L/min/m² shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m² shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m². No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m².

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m² shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m², and shall be calculated using a simple proportioning formula, with 1400 L/min/m² in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m².

The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

Stormceptor[®] EF Sizing Report

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators**.

- 3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m².

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators**, with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to assess whether light liquids captured after a spill are effectively retained at high flow rates.

- 3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m² to 2600 L/min/m²) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators**. However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.

\\NMBR\PRODUCTS\STORMCEPTOR EF40 DRAWINGS & DETAILS\STANDARD DETAILS\EFO8-DETAIL.DWG 10/19/2018 9:54 AM



- ## INSTALLATION NOTES

- FOR SITE SPECIFIC DRAWINGS PLEASE CONTACT YOUR LOCAL STORMCEPTOR REPRESENTATIVE. SITE SPECIFIC DRAWINGS ARE BASED ON THE BEST AVAILABLE INFORMATION AT THE TIME. SOME FIELD REVISIONS TO THE SYSTEM LOCATION OR CONNECTION PIPING MAY BE NECESSARY BASED ON AVAILABLE SPACE OR SITE CONFIGURATION REVISIONS. ELEVATIONS SHOULD BE MAINTAINED EXCEPT WHERE NOTED ON BYPASS STRUCTURE (IF REQUIRED).

OUTLET RISER & MAINTENANCE ACCESS

OUTLET RISER VANE

DROP PIPE

SINGLE OR MULTIPLE INLET PIPES
25mm [1"] DIFFERENCE BETWEEN
INLET INVERT AND OUTLET INVERT

FRAME AND COVER
MIN. $\text{ø}755$ [22"]
TO BE LOCATED OVER
DROP PIPE.

FRAME AND COVER
MIN. $\text{ø}710$ [28"]
TO BE LOCATED OVER
MAINTENANCE ACCESS,
OIL INSPECTION PORT.

WEIR

OUTLET PLATFORM

OIL INSPECTION PORT

PLAN VIEW (STANDARD)

OUTLET RISER & MAINTENANCE ACCESS

OUTLET RISER VANE

DROP PIPE

SINGLE OR MULTIPLE INLET PIPES
25mm [1"] DIFFERENCE BETWEEN
INLET INVERT AND OUTLET INVERT

INLET FRAME AND GRATE
MIN. 610x610 mm [24"x24"]
TO BE LOCATED OVER
DROP PIPE.

FRAME AND COVER
MIN. $\text{ø}710$ [28"]
TO BE LOCATED OVER
MAINTENANCE ACCESS,
OIL INSPECTION PORT.

WEIR

OUTLET PLATFORM

OIL INSPECTION PORT

PLAN VIEW (INLET TOP)

<u>SITE SPECIFIC DATA REQUIREMENTS</u>					
STORMCEPTOR MODEL			EFO8		
STRUCTURE ID					*
HYDROCARBON STORAGE REQ'D (L)					*
WATER QUALITY FLOW RATE (L/s)					*
PEAK FLOW RATE (L/s)					*
RETURN PERIOD OF PEAK FLOW (yrs)					*
DRAINAGE AREA (HA)					*
DRAINAGE AREA IMPERVIOUSNESS (%)					*
PIPE DATA:	I.E.	MAT'L	DIA	SLOPE %	HGL
INLET #1	*	*	*	*	*
INLET #2	*	*	*	*	*
OUTLET	*	*	*	*	*
* PER ENGINEER OF RECORD					



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SCALE = NTS

DATE: 10/13/2017

DESIGNED: JSK	DRAWN: JSK
CHECKED: BSF	APPROVED: *
PROJECT No.: EFO8	SEQUENCE No.: *

SHEET: 1 OF 1

STANDARD SPECIFICATION FOR “OIL GRIT SEPARATOR” (OGS) STORMWATER QUALITY TREATMENT DEVICE WITH THIRD-PARTY VERIFIED LIGHT LIQUID RE-ENTRAINMENT SIMULATION PERFORMANCE TESTING RESULTS

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, designing, maintaining, and constructing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, **specifically an OGS device that has been third-party tested for oil and fuel retention capability using a protocol for light liquid re-entrainment simulation testing, with testing results and a Statement of Verification in accordance with all the provisions of ISO 14034 Environmental Management – Environmental Technology Verification (ETV).** Work includes supply and installation of concrete bases, precast sections, and the appropriate precast section with OGS internal components correctly installed within the system, watertight sealed to the precast concrete prior to arrival to the project site.

1.2 REFERENCE STANDARDS

1.2.1 For Canadian projects only, the following reference standards apply:

CAN/CSA-A257.4-14: Joints for Circular Concrete Sewer and Culvert Pipe, Manhole Sections, and Fittings Using Rubber Gaskets

CAN/CSA-A257.4-14: Precast Reinforced Circular Concrete Manhole Sections, Catch Basins, and Fittings

CAN/CSA-S6-00: Canadian Highway Bridge Design Code

1.2.2 For ALL projects, the following reference standards apply:

ASTM D-4097: Contact Molded Glass Fiber Reinforced Chemical Resistant Tanks

ASTM C 478: Specification for Precast Reinforced Concrete Manhole Sections

ASTM C 443: Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets

ASTM C 891: Standard Practice for Installation of Underground Precast Concrete Utility Structures

ASTM D2563: Standard Practice for Classification of Visual Defects in Reinforced Plastics

1.3 SHOP DRAWINGS

1.3.1 Shop drawings shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail the precast concrete components and OGS internal components prior to shipment, including the sequence for installation.

1.3.2 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record. Any and all changes to project cost estimates, bonding amounts, plan check fees for revision of approved documents, or design impacts due to regulatory requirements as a result of a product substitution shall be coordinated by the Contractor with the Engineer of Record.

1.4 HANDLING AND STORAGE

Prevent damage to materials during storage and handling.

1.4.1 OGS internal components supplied by the Manufacturer for attachment to the precast concrete vessel shall be pre-fabricated, bolted to the precast and watertight sealed to the precast vessel surface prior to site delivery to ensure Manufacturer's internal assembly process and quality control processes are fully adhered to, and to prevent materials damage on site.

1.4.2 Follow all instructions including the sequence for installation in the shop drawings during installation.

PART 2 – PRODUCTS

2.1 GENERAL

2.1.1 The OGS vessel shall be cylindrical and constructed from precast concrete riser and slab components.

2.1.2 The precast concrete OGS internal components shall include a fiberglass insert bolted and watertight sealed inside the precast concrete vessel, prior to site delivery. Primary internal components that are to be anchored and watertight sealed to the precast concrete vessel shall be done so only by the Manufacturer prior to arrival at the job site to ensure product quality.

2.1.3 The OGS shall be allowed to be specified and have the ability to function as a 240-degree bend structure in the stormwater drainage system, or as a junction structure.

2.1.4 The OGS to be specified shall have the capability to accept influent flow from an inlet grate and an inlet pipe.

2.2 PRECAST CONCRETE SECTIONS

All precast concrete components shall be designed and manufactured to meet highway loading conditions per State/Provincial or local requirements.

2.3 GASKETS

Only profile neoprene or nitrile rubber gaskets that are oil resistant shall be accepted. For Canadian projects only, gaskets shall be in accordance to CSA A257.4-14. Mastic sealants, butyl tape/rope or Conseal CS-101 alone are not acceptable gasket materials.

2.4 JOINTS

The concrete joints shall be watertight and meet the design criteria according to ASTM C-990. For projects where joints require gaskets, the concrete joints shall be watertight and oil resistant and meet the design criteria according to ASTM C-443. Mastic sealants or butyl tape/rope alone are not an acceptable alternative.

2.5 FRAMES AND COVERS

Frames and covers shall be manufactured in accordance with State/Provincial or local requirements for inspection and maintenance access purposes. A minimum of one cover, at least 22-inch (560 mm) in diameter, shall be clearly embossed with the OGS manufacturer's product name to properly identify this asset's purpose is for stormwater quality treatment.

2.6 PRECAST CONCRETE

All precast concrete components shall conform to the appropriate CSA or ASTM specifications.

2.7 FIBERGLASS

The fiberglass portion of the OGS device shall be constructed in accordance with ASTM D2563, and in accordance with the PS15-69 manufacturing standard, and shall only be installed, bolted and watertight sealed to the precast concrete by the Manufacturer prior to arrival at the project site to ensure product quality.

2.8 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a fiberglass insert for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The total sediment storage capacity shall be a minimum 40 ft³ (1.1 m³). The total petroleum hydrocarbon storage capacity shall be a minimum 50 gallons (189 liters). The access opening to the sump of the OGS device for periodic inspection and maintenance purposes shall be a minimum 16 inches (406 mm) in diameter.

2.9 LADDERS

Ladder rungs shall be provided upon request or to comply with State/Provincial or local requirements.

2.10 INSPECTION

All precast concrete sections shall be level and inspected to ensure dimensions, appearance, integrity of internal components, and quality of the product meets State/Provincial or local specifications and associated standards.

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 HYDROLOGY AND RUNOFF VOLUME

The OGS device shall be engineered, designed and sized to treat a minimum of 90 percent of the average annual runoff volume, unless otherwise stated by the Engineer of Record, using historical rainfall data. Rainfall data sets should be comprised of a minimum 15-years of rainfall data or a longer continuous period if available for a given location, but in all cases a minimum 5-year period of rainfall data.

3.3 ANNUAL (TSS) SEDIMENT LOAD AND STORAGE CAPACITY

The OGS device shall be capable of removing and have sufficient storage capacity for the calculated annual total suspended solids (TSS) mass load and volume without scouring previously captured pollutants prior to maintenance being required. The annual (TSS) sediment load and volume transported from the drainage area should be calculated and compared to the OGS device's available storage capacity by the specifying Engineer to ensure adequate capacity between maintenance cycles. Sediment loadings shall be determined by land use and defined as a minimum of 450 kg (992 lb) of sediment (TSS) per impervious hectare of drainage area per year, or greater based on land use, as noted in Table 1 below.

Annual sediment volume calculations shall be performed using the projected average annual treated runoff volume, a typical sediment bulk density of 1602 kg/m³ (100 lbs/ft³) and an assumed Event Mean Concentration (EMC) of 125 mg/L TSS in the runoff, or as otherwise determined by the Engineer of Record.

Example calculation for a 1.3-hectares parking lot site:

- 1.28 meters of rainfall depth, per year
- 1.3 hectares of 100% impervious drainage area
- EMC of 125 mg/L TSS in runoff
- Treatment of 90% of the average annual runoff volume
- Target average annual TSS removal rate of 60% by OGS

Annual Runoff Volume:

- $1.28 \text{ m rain depth} \times 1.3 \text{ ha} \times 10,000 \text{ m}^2/\text{ha} = 16,640 \text{ m}^3$ of runoff volume
- $16,640 \text{ m}^3 \times 1000 \text{ L/m}^3 = 16,640,000 \text{ L}$ of runoff volume
- $16,640,000 \text{ L} \times 0.90 = 14,976,000 \text{ L}$ to be treated by OGS unit

Annual Sediment Mass and Sediment Volume Load Calculation:

- $14,976,000 \text{ L} \times 125 \text{ mg/L} \times \text{kg}/1,000,000 \text{ mg} = 1,872 \text{ kg}$ annual sediment mass
- $1,872 \text{ kg} \times \text{m}^3/1602 \text{ kg} = 1.17 \text{ m}^3$ annual sediment volume
- $1.17 \text{ m}^3 \times 60\% \text{ TSS removal rate by OGS} = 0.70 \text{ m}^3$ minimum expected annual storage requirement in OGS

As a guideline, the U.S. EPA has determined typical annual sediment loads per drainage area for various sites by land use (see Table 1). Certain States, Provinces and local jurisdictions have also established such guidelines.

Table 1 – Annual Mass Sediment Loading by Land Use								
	Commercial	Parking Lot	Residential			Highways	Industrial	Shopping Center
			High	Med.	Low			
(lbs/acre/yr)	1,000	400	420	250	10	880	500	440
(kg/hectare/yr)	1,124	450	472	281	11	989	562	494

Source: U.S. EPA Stormwater Best Management Practice Design Guide Volume 1, Appendix D, Table D-1, Burton and Pitt 2002

3.4 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in Table 2, Section 3.5, and based on third-party performance testing conducted in accordance with the Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit Separators**. Sizing of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol *Procedure for Laboratory Testing of Oil-Grit Separators*, as follows:

3.4.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m² to 1400 L/min/m², and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.4.2 Sediment removal efficiency for surface loading rates between 40 L/min/m² and 1400 L/min/m² shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.4.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m² shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m². No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m².

3.4.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m² shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m², and shall be calculated using a simple proportioning formula, with 1400 L/min/m² in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m².

The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 3.3.

3.4.5 The Peclet Number is not an approved method or model for calculating TSS removal, sizing, or scaling OGS devices.

3.4.6 If an alternate OGS device is proposed, supporting documentation shall be submitted that demonstrates:

- Canadian ETV or ISO 14034 ETV Verification Statement which verifies third-party performance testing conducted in accordance with the **Procedure for Laboratory Testing of Oil-Grit Separators**, including the Light Liquid Re-entrainment Simulation Testing.
- Equal or better sediment (TSS) removal of the PSD specified in Table 2 at equivalent surface loading rates, as compared to the OGS device specified herein.
- Equal or better Light Liquid Re-entrainment Simulation Test results (using low-density polyethylene beads as a surrogate for light liquids such as oil and fuel) at equivalent surface loading rates, as compared to the OGS device specified herein. However, an alternative OGS device shall not be allowed as a substitute if the Light Liquid Re-entrainment Simulation Test was performed with screening components within the OGS device that are effective at retaining the low-density polyethylene beads, but would not be expected to retain light liquids such as oil and fuel.
- Equal or greater sediment storage capacity, as compared to the OGS device specified herein.
- Supporting documentation shall be signed and sealed by a local registered Professional Engineer. All costs associated with preparing and certifying this documentation shall be born solely by the Contractor.

3.5 PARTICLE SIZE DISTRIBUTION (PSD) FOR SIZING

The OGS device shall be sized to achieve the Engineer-specified average annual percent sediment (TSS) removal based solely on the test sediment used in the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators**. This test sediment is comprised of inorganic ground silica with a specific gravity of 2.65, uniformly mixed, and containing a broad range of particle sizes as specified in Table 2. No alternative PSDs or deviations from Table 2 shall be accepted.

Table 2 Canadian ETV Program Procedure for Laboratory Testing of Oil-Grit Separators Particle Size Distribution (PSD) of Test Sediment		
Particle Diameter (Microns)	% by Mass of All Particles	Specific Gravity
1000	5%	2.65
500	5%	2.65
250	15%	2.65
150	15%	2.65
100	10%	2.65
75	5%	2.65
50	10%	2.65
20	15%	2.65
8	10%	2.65
5	5%	2.65
2	5%	2.65

3.6 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party scour testing conducted and have in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators**. This scour testing is conducted with the device pre-loaded with test sediment comprised of the particle size distribution (PSD) illustrated in Table 2.

3.6.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m².

Data generated from laboratory scour testing performed with an OGS device pre-loaded with a coarser PSD than in Table 2 (i.e. the coarser PSD has no particles in the 1-micron to 50-micron size range, or the D₅₀ of the test sediment exceeds 75 microns) shall not be acceptable for the determination of the device's suitability for on-line installation.

3.7 DESIGN ACCOUNTING FOR BYPASS

3.7.1 The OGS device shall be specified to achieve the TSS removal performance and water quality objectives without washout of previously captured pollutants. The OGS device shall also have sufficient hydraulic conveyance capacity to convey the peak storm event, in accordance with hydraulic conditions per the Engineer of Record. To ensure this is achieved, there are two design options with associated requirements:

3.7.1.1 The OGS device shall be placed **off-line** with an upstream diversion structure (typically in an upstream manhole) that only allows the water quality volume to be diverted to the OGS device, and excessive flows diverted downstream around the OGS device to prevent high flow washout of pollutants previously captured. This design typically incorporates a triangular layout including an upstream bypass manhole with an appropriately engineered weir wall, the OGS device, and a downstream junction manhole, which is connected to both the OGS device and bypass structure. In this case with an external bypass required, the OGS device manufacturer must provide calculations and designs for all structures, piping and any other required material applicable to the proper functioning of the system, stamped by a Professional Engineer.

3.7.1.2 Alternatively, OGS devices in compliance with Section 3.6 shall be acceptable for an **on-line** design configuration, thereby eliminating the requirement for an upstream bypass manhole and downstream junction manhole.

3.7.2 The OGS device shall also have sufficient hydraulic conveyance capacity to convey the peak storm event, in accordance with hydraulic conditions per the Engineer of Record. If an alternate OGS device is proposed, supporting documentation shall be submitted that demonstrates equal or better hydraulic conveyance capacity as compared to the OGS device specified herein. This documentation shall be signed and sealed by a local registered Professional Engineer. All costs associated with preparing and certifying this documentation shall be born solely by the Contractor.

3.8 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators**, with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to assess whether light liquids captured after a spill are effectively retained at high flow rates.

3.8.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m² to 2600 L/min/m²) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators**. However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.

3.9 PETROLEUM HYDROCARBONS AND FLOATABLES STORAGE CAPACITY

Petroleum hydrocarbons and floatables storage capacity in the OGS device shall be a minimum 50 gallons (189 Liters), or more as specified.

3.9.1 The OGS device shall have gasketed precast concrete joints that are watertight, and oil resistant and meet the design criteria according to ASTM C-443 to provide safe oil and other hydrocarbon materials storage and ground water protection. Mastic sealants or butyl tape/rope alone are not an acceptable alternative.

3.10 SURFACE LOADING RATE SCALING OF DIFFERENT MODEL SIZES

The reference device for scaling shall be an OGS device that has been third-party tested in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators**. Other model sizes of the tested device shall only be scaled such that the claimed TSS removal efficiency of the scaled device shall be no greater than the TSS removal efficiency of the tested device at identical **surface loading rates** (flow rate divided by settling surface area). The depth of other model sizes of the tested device shall be scaled in accordance with the depth scaling provisions within Section 6.0 of the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators**.

3.10.1 The Peclet Number and volumetric scaling are not approved methods for scaling OGS devices.

PART 4 – INSPECTION & MAINTENANCE

The OGS manufacturer shall provide an Owner's Manual upon request. Maintenance shall be performed by a professional service provider who has experience in cleaning OGS devices and has been trained and certified in applicable health and safety practices, including confined space entry procedures.

- 4.1 A Quality Assurance Plan that provides inspection for a minimum of 5 years shall be included with the OGS stormwater quality device, and written into the Environmental Compliance Approval (ECA) or the appropriate State/Provincial or local approval document.
- 4.2 OGS device inspection shall include determination of sediment depth and presence of petroleum hydrocarbons below the insert. Inspection shall be easily conducted from finished grade through a frame and cover of at least 22 inch (560 mm) in diameter.
- 4.3 Inspection and pollutant removal shall be conducted periodically. For routine maintenance cleaning activities, pollutant removal shall typically utilize a truck equipped with vacuum apparatus, and shall be easily conducted from finished grade through a frame and cover of at least 22-inches (560 mm) in diameter.
- 4.4 Diameter of the maintenance access opening to the lower chamber and sump shall be scaled consistently across all model sizes, and shall be 1/3 the inside diameter of the OGS structure, or larger.
- 4.5 No confined space entry shall be required for routine inspection and maintenance cleaning activities.

- 4.6 For OGS model sizes of diameter 72 inches (1828 mm) and greater, the access opening to the OGS device's lower chamber and sump shall be large enough to allow a maintenance worker to enter the lower chamber to facilitate non-routine maintenance cleaning activities and repairs, as needed.
- 4.7 The orifice-containing component (i.e. drop pipe, duct, chute, etc.) of the OGS device used to control flow rate into the lower chamber shall be removable from the insert to facilitate cleaning, repair, or replacement of the orifice-containing component, as needed.

PART 5 – EXECUTION

5.1 PRECAST CONCRETE INSTALLATION

The installation of the precast concrete OGS stormwater quality treatment device shall conform to ASTM C 891, ASTM C 478, ASTM C 443, CAN/CSA-A257.4-14, CAN/CSA-A257.4-14, CAN/CSA-S6-00 and all highway, State/Provincial, or local specifications for the construction of manholes. Selected sections of a general specification that are applicable are summarized below. The Contractor shall furnish all labor, equipment and materials necessary to offload, assemble as needed the OGS internal components as specified in the Shop Drawings.

5.2 EXCAVATION

5.2.1 Excavation for the installation of the OGS stormwater quality treatment device shall conform to highway, State/Provincial or local specifications. Topsoil that is removed during the excavation for the OGS stormwater quality treatment device shall be stockpiled in designated areas and not be mixed with subsoil or other materials. Topsoil stockpiles and the general site preparation for the installation of the OGS stormwater quality device shall conform to highway, State/Provincial or local specifications.

5.2.2 The OGS device shall not be installed on frozen ground. Excavation shall extend a minimum of 12 inch (300 mm) from the precast concrete surfaces plus an allowance for shoring and bracing where required. If the bottom of the excavation provides an unsuitable foundation additional excavation may be required.

5.2.3 In areas with a high water table, continuous dewatering shall be provided to ensure that the excavation is stable and free of water.

5.3 BACKFILLING

Backfill material shall conform to highway, State/Provincial or local specifications. Backfill material shall be placed in uniform layers not exceeding 12 inches (300 mm) in depth and compacted to highway, State/Provincial or local specifications.

5.4 OGS WATER QUALITY DEVICE CONSTRUCTION SEQUENCE

5.4.1 The precast concrete OGS stormwater quality treatment device is installed and leveled in sections in the following sequence:

- aggregate base
- base slab, or base
- riser section(s) (if required)
- riser section w/ pre-installed fiberglass insert
- upper riser section(s)
- internal OGS device components
- connect inlet and outlet pipes
- riser section, top slab and/or transition (if required)
- frame and access cover

5.4.2 The precast concrete base shall be placed level at the specified grade. The entire base shall be in contact with the underlying compacted granular material. Subsequent sections, complete with oil resistant, watertight joint seals, shall be installed in accordance with the precast concrete manufacturer's recommendations.

5.4.3 Adjustment of the OGS stormwater quality treatment device can be performed by lifting the upper sections free of the excavated area, re-leveling the base, and re-installing the sections. Damaged sections and gaskets shall be repaired or replaced as necessary. Once the OGS stormwater quality treatment device has been constructed, any lift holes must be plugged with mortar.

5.5 DROP PIPE AND OIL INSPECTION PIPE

Once the upper precast concrete riser has been attached to the lower precast concrete riser section, the OGS device Drop Pipe and Oil Inspection Pipe must be attached, and watertight sealed to the fiberglass insert using Sikaflex 1a. Installation instructions and required materials shall be provided by the OGS manufacturer.

5.6 INLET AND OUTLET PIPES

Inlet and outlet pipes shall be securely set using grout or approved pipe seals (flexible boot connections, where applicable) so that the structure is watertight. Non-secure inlets and outlets will result in improper performance.

5.7 FRAME AND COVER OR FRAME AND GRATE INSTALLATION

Precast concrete adjustment units shall be installed to set the frame and cover/grate at the required elevation. The adjustment units shall be laid in a full bed of mortar with successive units being joined using sealant recommended by the manufacturer. Frames for the cover/grate should be set in a full bed of mortar at the elevation specified.

5.7.1 A minimum of one cover, at least 22-inch (560 mm) in diameter, shall be clearly embossed with the OGS device brand or product name to properly identify this asset's purpose is for stormwater quality treatment.