SERVICING & STORMWATER MANAGEMENT REPORT MYERS BARRHAVEN – 4149 STRANDHERD DRIVE

Project No.: CCO-22-2933

City File No.: D07-12-22-0040

Prepared for:

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McINTOSH PERRY

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1.0 PROJECT DESCRIPTION

1.1 Purpose

McIntosh Perry (MP) has been retained by BBS Construction to prepare this Servicing and Stormwater Management Report in support of the Site Plan Control Amendment process for the proposed development located at 4149 Strandherd Drive within the City of Ottawa.

The main purpose of this report is to present a servicing and stormwater management design for the development in accordance with the recommendations and guidelines provided by the City of Ottawa (City), the Rideau Valley Conservation Authority (RVCA), and the Ministry of the Environment, Conservation and Parks (MECP). 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. In addition, the report will discuss the amendment to the previously approved site servicing design.

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

- CCO-22-2933, C101 – Grading Plan
- CCO-22-2933, C102 – Servicing Plan
- CCO-22-2933, C103 – Erosion & Sediment Control Plan
- CCO-22-2933, SAN – Sanitary Drainage Plan (Appendix 'D')
- CCO-22-2933, POST – Post Development Drainage Area Plan (Appendix 'F')

1.2 Site Description

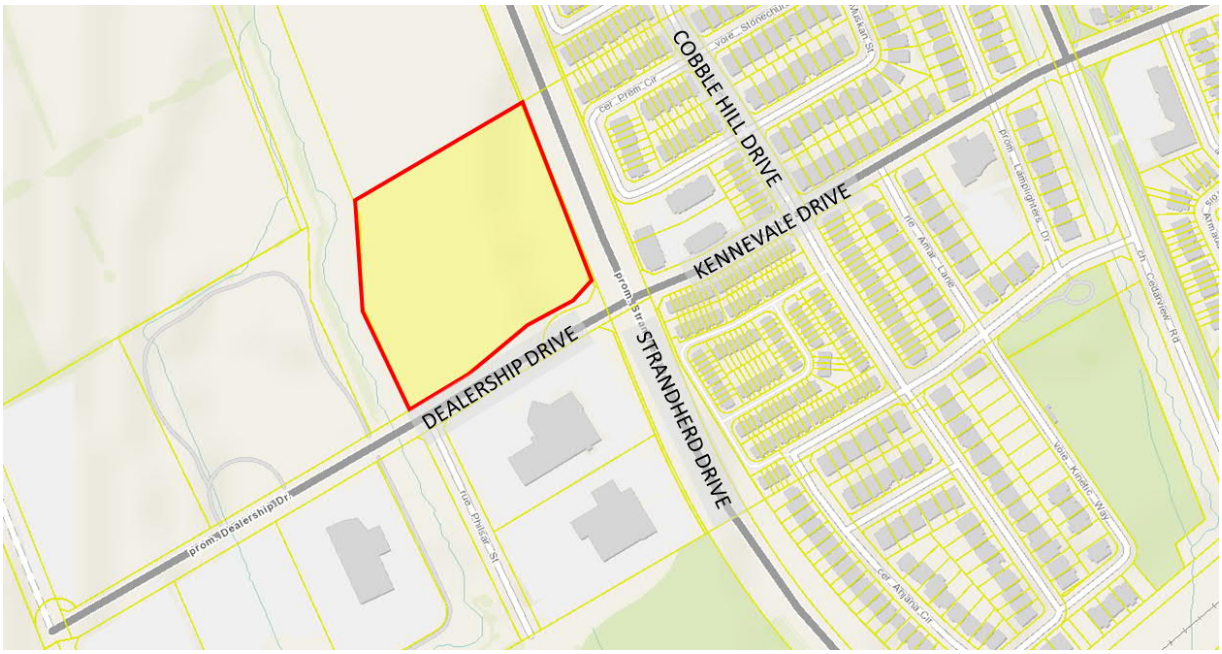

Figure 1: Site Map

The subject property, herein referred to as the site, is located at 4149 Strandherd Drive within the Barrhaven Ward. The site covers approximately 3.38 ha and is located at the northwest corner of Dealership Drive and Strandherd Drive. The site is zoned for Business Park Industrial Zone use (IP). See Site Location Plan in Appendix 'A' for more details.

1.3 Proposed Development and Statistics

A Site Plan Control application was previously submitted by Novatech Engineering (File No. #117148) with a phased development approach including a dealership, hotel, and office building. This design was approved on November 16th, 2020. The first phase, including the dealership (Building A) and above-ground parking areas, is currently under development.

The proposed amendment includes a revision to the phase two and phase three developments, which contemplated a hotel and an office building. As per the Site Plan, included in Appendix B, two additional dealerships (Building B & C) are now proposed for a total of three dealerships on site. Parking and drive aisles will continue to be provided throughout the site with access from Dealership Drive and Strandherd Drive.

1.4 Existing Conditions and Infrastructures

As noted in Section 1.3, the site is currently being developed with the phase one dealership and associated above-ground parking areas. The remainder of the site contains landscaped areas. The O'Keefe stormwater drain is located west of the site.

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):

- Dealership Drive
  - 254 mm diameter PVC watermain,
  - 450 mm diameter concrete sanitary sewer, tributary to the South Nepean Collector sewer, and a
  - 300/375 mm diameter concrete storm sewer tributary to the O'Keefe Drain.

- Strandherd Drive
  - 406 mm diameter PVC watermain,
  - 525 mm diameter concrete sanitary sewer, tributary to the South Nepean Collector sewer, and a
  - 1350 mm diameter concrete storm sewer, tributary to the Jock River.

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, provided concurrence and approve the engineering design package. Permits to construct can be requested once the City has issued a site plan agreement.

An Environmental Compliance Approval (ECA) Amendment through the Ministry of Environment, Conservation and Parks (MECP) is anticipated for the development due to the outlet to the watercourse and industrial zoning.

2.0 BACKROUND 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.

A topographic survey (19966-19) of the site was completed by Annis, O'Sullivan, Vollebekk Ltd and dated 2019.

The Site Plan (A010A) was prepared by KWC Architects Inc and dated August 18th, 2022 (Site Plan).

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 PIEDTB-2016-01 City of Ottawa, September 2016. (PIEDTB-2016-01)
  - Technical Bulletin ISTB-2018-01 City of Ottawa, January 2018. (ISTB-2018-01)
  - Technical Bulletin ISTB-2018-03 City of Ottawa, March 2018. (ISTB-2018-03)
  - Technical Bulletin ISTB-2019-01 City of Ottawa, January 2019. (ISTB-2019-01)
  - Technical Bulletin ISTB-2019-02 City of Ottawa, February 2019. (ISTB-2019-02)
- 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-2018-03 City of Ottawa, March 2018. (ISTB-2018-03)

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:

- Servicing and Stormwater Management Report – 4149 Strandherd Drive, Novatech, dated November 16th, 2020. (Previously Approved Design)
- Citi Gate Highway 416 Corporate Campus, Detailed Servicing Study and Stormwater Management Report (Phase 1), Novatech, dated January 9th, 2015. (Citi Gate Phase 1 Report)

3.0 PRE-CONSULTATION SUMMARY

A pre-consultation email was provided by City staff on December 22nd, 2021, regarding the proposed site servicing. Specific design parameters to be incorporated within this design include the following:

- Develop the site in accordance with the Citi Gate Development (Citi Gate 416 Corporate Campus, Detailed Servicing and Stormwater Management Report (Phase 1), prepared by Novatech, dated January 9th, 2015).
- An ECA amendment may be required if the properties are all under the same ownership.
- Provide the following Reports and Plans:
    - Site Servicing Plan,
    - Grading Plan,
    - Erosion and Sediment Control Plan,
    - Storm Drainage / Ponding Plan,
    - Stormwater Management and Site Servicing Report, and a
    - Geotechnical Investigation Report.

4.0 WATERMAIN

4.1 Existing Watermain

The site is located within the BARR pressure zone, as per the Water Distribution System mapping included in Appendix C. There are three municipal fire hydrants along Dealership Drive that are available to service the development. In accordance with the Previously Approved Design, three private hydrants are proposed within the site.

4.2 Proposed Watermain

The 203 mm diameter watermain network proposed in the Previously Approved Design, will be maintained. No changes are proposed to the internal 203 mm diameter watermain network nor the connection to Building A. Fire hydrants are proposed to be adjusted to accommodate the current Site Plan. The servicing strategy adheres to the Citi Gate Phase 1 Report.

In accordance with Section 4.3.1 of the Ottawa Water Guidelines, service areas with a basic day demand greater than 50 m^3/day require a dual connection to the municipal system. The total site demand exceeds 50 m^3/day, therefore a dual connection to the 254 mm diameter watermain within Dealership Drive and to the 406 mm diameter watermain within Strandherd Drive is proposed to provide a redundant connection to the site. The demands of Building B & C do not exceed 50 m^3/day independently, therefore, a single connection is proposed to each. Refer to drawing C102 for a detailed servicing layout.

The Fire Underwriters Survey 1999 (FUS) method was utilized to estimate the required fire flow for the site. Fire flow requirements were calculated per City of Ottawa Technical Bulletin ISTB-2018-02. The following parameters were coordinated with the architect.

- Type of construction – Non-Combustible Construction
- Occupancy Type – Limited Combustibility
- Sprinkler Protection – Supervised Sprinkler System

The results of the calculations yielded a required fire flow of 3,000 L/min (50 L/s) for Building B and 5,000 L/min (83.3 L/s) for Building C. Per the Previously Approved Design, a fire flow of 7,000 L/min (116.7 L/s) was estimated for Building A. The detailed calculations for the FUS can be found in Appendix C.

Table 1, below, summarizes the previously proposed and amendment fire flow demands.

Table 1: Fire Flow Demand Comparison

Building	Fire Flow Demand Previously Proposed * (L/min)	Fire Flow Demand Currently Proposed (L/min)
Building A (Existing Dealership)	7,000	7,000 *
Building B (Current Dealership, Previously Proposed Hotel)	8,000	3,000
Building C (Current Dealership, Previously Proposed Office)	12,000	5,000
* Per Previously Approved Design prepared by Novatech and Dated November 2020.		

As noted by Table 1, the proposed fire demands have been reduced since the Previously Approved Design which was designed to accommodate a maximum fire flow of 12,000 L/min. Therefore, the internal network is sufficient sized to accommodate the proposed amendment for fire fighting purposes. Refer to Appendix C for the approved water model.

The water demands for the development, as per the Previously Approved Design, have been summarized below for reference. Calculations and accompanying water model included in the Previously Approved Design has been included in Appendix C for reference.

Table 2: Water Demand Summary – Previously Approved

Building	Building A	Building B	Building C
Average Daily Demand (L/s)	0.321	0.732	0.731
Maximum Day Demand (L/s)	0.482	1.098	1.096
Peak Hour Demand (L/s)	0.867	1.977	1.973

The water demands for the proposed building have been calculated to adhere to the Ottawa Water Guidelines and can be found in Appendix C. The criteria and results have been summarized below in Table 3 and Table 4.

Table 3: Water Supply Design Criteria

Site Area	3.38 ha
Dealership – Car Wash	400 L/vehicle/day
Dealership – Employees	75 L/person/day
Dealership – Cars Serviced	40 L/car serviced/day
Commercial Maximum Daily Peaking Factor	1.5 x avg day
Commercial Maximum Hour Peaking Factor	1.8 x max day
Employee Maximum Daily Peaking Factor	9.5 x avg day
Employee Maximum Hour Peaking Factor	14.3 x max day

Table 4: Water Demand Summary

Building	Building A	Building B	Building C
Average Daily Demand (L/s)	0.321*	0.18	0.29
Maximum Day Demand (L/s)	0.482*	0.27	0.43
Maximum Day Demand + Fire Flow (L/s)	117.148*	50.27	83.76
Peak Hour Demand (L/s)	0.867*	0.49	0.78
* Per Previously Approved Design prepared by Novatech and Dated November 2020.			

The Previously Approved Design included a water model based on the demands and fire flow conditions summarized in Table 1 and Table 2, above. As per Table 4, the demands for Building B and C are proposed to be reduced from the original design. As a result, it is anticipated that the internal watermain network was sufficiently sized for the amendment development.

The City provided the estimated water pressures at both for the average day scenario, peak hour scenario and the max day plus fire flow scenario for the demands indicated by the correspondence in Appendix C. The resulting pressures for the boundary conditions results are shown in Table 5, below.

Table 5: Boundary Conditions Results

Scenario	Proposed Demands (L/s)	Connection 1 HGL (m H_2O)* / kPa	Connection 2 HGL (m H_2O)* / kPa
Average Day Demand	0.79	61.2 / 600.4	61.2 / 600.4
Maximum Daily + Fire Flow Demand (4,000 L/min)	67.85	57.8 / 567.0	59.0 / 578.8
Maximum Daily + Fire Flow Demand (5,000 L/min)	84.51	54.8 / 537.6	58.2 / 570.9
Peak Hourly Demand	2.14	53.8 / 527.8	53.8 / 527.8

* Adjusted for an estimated ground elevation of 95.6m at Dealership Drive (Connection 1) and 95.6m at Strandherd Drive (Connection 2) above the connection point for connection.

The normal operating pressure range is anticipated to be 528 kPa to 600 kPa and will not be less than 275 kPa (40 psi) or exceed 689 kPa (100 psi). The proposed watermains will meet the minimum required 20 psi (140 kPa) from the Ottawa Water Guidelines at the ground level under maximum day demand and fire flow conditions. A pressure reducing valves may required since the pressure will exceed 552 kPa (80 psi) in the average day scenario.

To confirm the adequacy of fire flow to protect the proposed development, public and private fire hydrants within 150 m of the proposed building were analysed per City of Ottawa ISTB 2018-02 Appendix I Table 1. The results are summarized below.

Table 6: Fire Protection Confirmation

Building	Fire Flow Demand (L/min.)	Fire Hydrant(s) within 75m	Fire Hydrant(s) within 150m	Combined Fire Flow (L/min.)
Building A	7,000	1 Private 1 Public	2 Private 1 Public	22,800
Building B	3,000	2 Private 1 Public	1 Private 2 Public	28,500
Building C	5,000	1 Private	2 Private	13,300

Based on City guidelines (ISTB-2018-02), the existing and proposed hydrants can provide adequate fire protection to the proposed development.

5.0 SANITARY DESIGN

5.1 Existing Sanitary Sewer

There is an existing 450 mm diameter sanitary sewer within Dealership Drive and an existing 525/600 mm diameter sanitary sewer within Strandherd, fronting the site. Both sanitary sewers converge at the Dealership Drive and Strandherd Drive intersection and are tributary to the South Nepean Collector sewer.

5.2 Proposed Sanitary Sewer

In accordance with the Citi Gate Phase 1 Report and Previously Approved Design, the site (Block 4) was contemplated to direct wastewater drainage towards Dealership Drive. The approved and current designs will maintain the connection to the 450 mm diameter sanitary sewer within Dealership Drive. In addition, flows for the site were contemplated to be 3.89 L/s, based on the following design criteria:

- Commercial Wastewater Flow = 50,000 L/ha/day
- Commercial Peaking Factor = 1.5
- Site Area = 3.39 ha
- Infiltration Allowance = 0.28 L/s/ha

As noted above, the 200 mm diameter sanitary sewer network within the site is proposed to be maintained. The sewer system is tributary to the 450 mm diameter sanitary sewer within Dealership Drive. No changes are proposed to the 200 mm diameter sanitary service to Building A. Minor changes are proposed to the Building B and C sanitary services in order to accommodate the Site Plan. Refer to drawing C102 for a detailed servicing layout.

Table 7, below, summarizes the wastewater design criteria identified by the Ottawa Sewer Guidelines.

Table 7: Sanitary Design Criteria

Design Parameter	Value
Site Area	1.18 ha (Building A)* 1.11 ha (Building B) 1.145 ha (Building C)
Dealership – Car Wash	400 L/vehicle/day
Dealership – Employees	75 L/person/day
Dealership – Cars Serviced	40 L/car serviced/day
Commercial Peaking Factor	1.5

Table 8, below, summarizes the estimated wastewater flow from the proposed development. Refer to Appendix D for detailed calculations.

Table 8: Summary of Estimated Sanitary Flow

Design Parameter	Building A (L/s)	Building B (L/s)	Building C (L/s)	Total Flow (L/s)
Total Estimated Average Dry Weather Flow	0.38	0.24	0.34	0.96
Total Estimated Peak Dry Weather Flow	0.54	0.33	0.49	1.36
Total Estimated Peak Wet Weather Flow	0.85	0.65	0.80	2.31

Per Table 8, above, the total peak wet weather flow leaving the site is estimated as 2.31 L/s. Therefore, the proposed amendment adheres to the sanitary servicing requirements indicated in the Citi Gate Phase 1 Report.

6.0 STORM SEWER DESIGN

6.1 Existing Storm Sewers

Stormwater runoff from the site is currently tributary to the O'Keefe Drain within the Jock River sub-watershed. The Previously Approved Design contemplated an internal storm sewer system which outlets directly to the O'Keefe drain.

6.2 Proposed Storm Sewers

A dry pipe was installed within the site as part of the Phase 1 development (Previously Approved Design), including the storm sewer system surrounding Building A. Stormwater flows within the dry pipe and outlets to the O'Keefe Drain at the north-west corner of the site.

There are six catchment areas within the site which propose independent controls and storages. Water is restricted using inlet control devices (ICD) and will release to the dry pipe within the site.

Runoff collected on the roof of the proposed buildings 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 maybe specified at detailed building design so long as release rates and storage volumes are respected. Drainage from the roof will be directed to the dry pipe within the site.

Foundation drainage is proposed to be conveyed via the storm service provided to each building. Water will be directed to the internal dry pipe without flow attenuation.

See CCO-22-2933 - POST include in Appendix F of this report for more details. The Stormwater Management design for the subject property will be outlined in Section 7.0 of this report.

7.0 PROPOSED STORMWATER MANAGEMENT

7.1 Design Criteria and Methodology

Stormwater management for the proposed site will be maintained through two methods. The first will store and control runoff collected on the roof of the proposed buildings. The second will control stormwater via an underground sewer system and will collect runoff from the at-grade areas within the site. The flow will be directed to the existing 900 mm diameter storm sewer at the north-west corner of the site, tributary to the O'Keefe Drain.

In summary, the following design criteria have been employed in developing the stormwater management design for the site as directed by the RVCA and City:

Quality Control

- Based on coordination with the RVCA, quality controls are required for the development due to the distance to the outlet, up to an enhanced level of treatment.

Quantity Control

- Any storm events greater than 5-year, up to 100-year, and including 100-year storm event must be detained on site.
- Post-development to be restricted to the stormwater release rate assigned to the site via the Citigate Phase 1 Report. The site, which was designated as Block 4, assigned a stormwater release rate based on a 3.41 ha area and an imperviousness of 85%. The site's allowable release rates identified by the Previously Approved Design are summarized below.

Design Event	Target Release Rate	
	L/s/ha	L/s
2-year	20	68
5-year	35	119
10-year	45	153
25-year	64	218
50-year	75	256
100-year	126	430

7.2 Runoff Calculations

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

$$Q = 2.78CIA \text{ (L/s)}$$

Where: 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. The following coefficients were used to develop an average C for each area:

Roofs/Concrete/Asphalt	0.90
Undeveloped and Grass	0.20

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.

7.3 Post-Development Drainage

To meet the stormwater objectives the development will contain a combination of flow attenuation with rooftop controls and subsurface storage. A dry pipe, between STM MH01 and STM MH08 is provided for footing drainage and to ensure all catchment areas are controlled independently.

Based on the criteria listed in Section 7.2.1, the development will be required to restrict flow based on a site area of 3.41 ha, an imperviousness of 85%, and the per hectare release rates specified by the Citigate Phase 1 Report. It is estimated that the target release rate during the 100-year event will be 426 L/s.

The proposed site drainage limits are demonstrated on the Post-Development Drainage Area Plan. See CCO-22-2933 - POST in Appendix F of this report for more details. A summary of the post-development runoff calculations can be found below and within Appendix G.

Table 9: Post-Development 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	0.083	1.90	3.45	33.92	34.17
B2	0.162	4.56	7.60	81.56	91.07
B3	0.473	16.44	17.02	190.78	190.93
B4	0.447	20.51	24.50	156.07	156.56
B5	0.675	10.30	16.27	284.92	289.84
B6	0.325	8.10	8.50	151.35	152.98
B7*	0.130	7.60	11.40	39.30	48.80
B8	0.727	14.00	18.20	323.53	334.55
B9	0.218	25.66	26.15	48.20	49.77
B10	0.139	8.03	17.21	-	-
Total	3.378	117.10	150.30	1,309.62	1,348.67

* Per Previously Approved Report by Novatech.

Runoff for area B1 will be stored on the roof of Building B (B1) and restricted using five Watts Accutrol roof drains (or equivalent product) to a maximum release rate of 3.45 L/s and will provide up to 34.2 m^3 of storage.

Runoff for area B2 will be stored on the roof of Building C (B2) and restricted using eight Watts Accutrol roof drains (or equivalent product) to a maximum release rate of 7.60 L/s and will provide up to 91.1 m^3 of storage.

Runoff for area B3 will be restricted before discharging to the existing storm system north of Building A. Changes to this area include minor updates to the catchment areas, ponding volumes, and the ICD size. It is proposed to restrict flow to a maximum release rate of 17.02 L/s using a 77 mm plug style ICD (or equivalent product) on the outlet side of CBMH113. This area contains up to 190.9 m^3 of surface and subsurface storage, including the existing 72 m^3 STC 740 chamber system (or equivalent product). Existing tank details are included in Appendix G for further details.

Runoff for area B4 will be restricted before discharging to the existing storm system south of Building A. Changes to this area include minor updates to the catchment areas, ponding volumes, and the ICD size. It is proposed to restrict flow to a maximum release rate of 24.50 L/s using a 94 mm plug style ICD (or equivalent product) on the outlet side of CBMH119. This area contains up to 156.6 m^3 of surface and subsurface storage, including the existing 67 m^3 STC 740 chamber system (or equivalent product). Existing tank details are included in Appendix G for further details.

Runoff for area B5, north of Building C, will be restricted before discharging to the internal dry pipe, noted above. The flow will be controlled within a catch basin (CBMH103) installed with a 78 mm plug style ICD. Drainage from B5 will be controlled to a maximum release rate of 16.27 L/s and will contain 289.84 m^3 of storage, including a new 160 m^3 Triton S-29 chamber system (or approved equivalent).

Runoff for area B6, south of Building C, will be restricted before discharging to the internal dry pipe, noted above. The flow will be controlled within a catch basin (CBMH108) installed with a Tempest LMF90 ICD (or equivalent product). Drainage from B6 will be controlled to a maximum release rate of 8.50 L/s and will contain 153 m^3 of surface storage.

Runoff for area B7 will be stored on the roof of existing Building A (B7) and restricted using six fully open Watts Accutrol roof drains to a maximum release rate of 11.4 L/s and will provide up to 48.8 m^3 of storage. This design is in accordance with the Previously Approved Design. No changes are proposed to the building controls.

Runoff for area B8, north of Building B, will be restricted before discharging to the internal dry pipe, noted above. The flow will be controlled within a catch basin (CBMH101) installed with a 75 mm plug style ICD. Drainage from B8 will be controlled to a maximum release rate of 18.20 L/s and will contain 334.6 m^3 of storage, including a new 163 m^3 Triton S-29 chamber system (or approved equivalent).

Runoff for area B9, south of Building B, will be restricted before discharging to the internal dry pipe, noted above. The flow will be controlled within a catch basin (CBMH117) installed with a 90 mm plug style ICD. Drainage from B9 will be controlled to a maximum release rate of 26.15 L/s and will contain 49.8 m^3 of surface storage.

The flow from Area B10 directed to either the O'Keefe Drain or towards municipal ROWs without restriction and will be compensated for in areas with attenuation.

7.4 Quality Control

In accordance with the Previously Approved Design, the development will treatment stormwater drainage via an existing STC4000 oil/grit separator (OGS) located at the north-west corner of the site. Stormwater falling on impervious areas will be collected by a series of catchbasin structures upstream of the OGS.

7.5 Thermal Mitigation

Based on coordination with the RVCA, thermal mitigation best management practices need to be incorporated into the stormwater management design. The following design elements were incorporated in order to cool water before discharging to the O'Keefe Drain:

- Underground chamber systems,
- Sections of perforated pipes, and
- High Albedo Rooftops

Refer to drawing C102 for a detailed servicing layout.

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 catch basins and filter fabric is to be placed under the grates of all existing catch basins 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 and Sediment & Erosion Control Plan for additional details regarding the temporary measures to be installed and their appropriate OPSD references.

8.2 Permanent Measures

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

- The proposed amendment includes a revision to the phase two and phase three developments, which contemplated a hotel and an office building. As per the Site Plan, two additional dealerships are now proposed for a total of three dealerships on site.
- An extension to the 200 mm internal watermain network is proposed to provide a redundant service to the site by connecting to the municipal infrastructure within Strandherd Drive and Dealership Drive. Minor adjustments are required to the service lateral lengths for Building B, Building C, and two on-site fire hydrants.
- An extension to the 200 mm diameter sanitary sewer network is proposed to service Building C. Minor updates are required to the service lateral lengths for Building B and Building C. The sewer system is connected to municipal infrastructure within Dealership Drive.
- The proposed storm sewer, ranging in diameter from 250 mm to 900 mm, will be installed throughout the site and drain to the O'Keefe Drain at the north-west corner.
- Storage for the 5- through 100-year storm events will be provided within the parking lot areas via surface and subsurface storage and on the proposed flat rooves.
- In accordance with the Previously Approved Design, the development will treatment stormwater drainage via an existing STC4000 oil/grit separator (OGS) located at the north-west corner of the site.

10.0 RECOMMENDATION

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 4149 Strandherd Drive.

This report is respectfully being submitted for approval.

Regards,

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11.0 STATEMENT OF LIMITATIONS

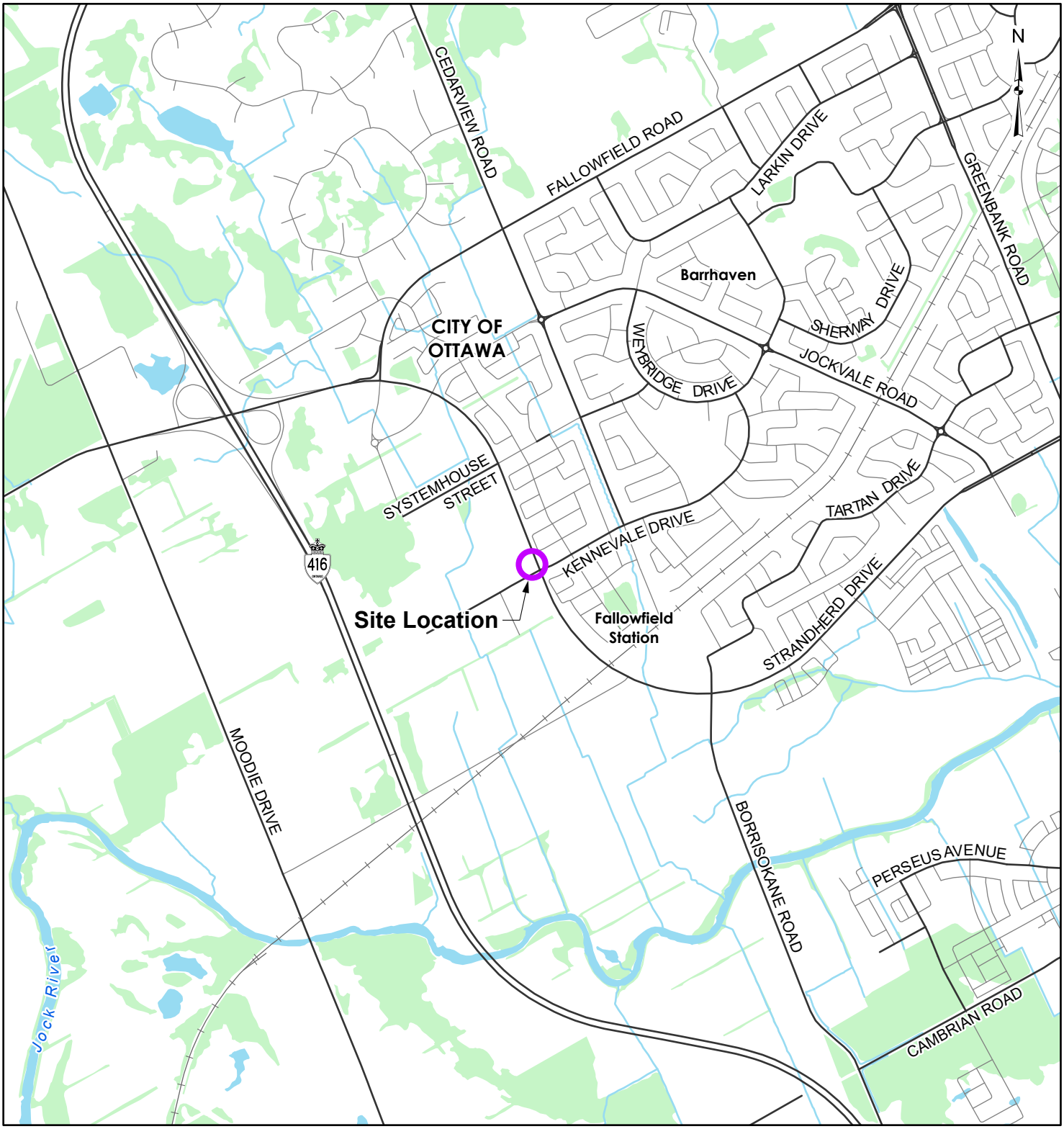
This report was produced for the exclusive use of BBS Construction Ltd. The purpose of the report is to assess the existing stormwater management system and provide recommendations and designs for the post-construction scenario that are in compliance with the guidelines and standards from the Ministry of the Environment, Parks and Climate Change, City of Ottawa and local approval agencies. McIntosh Perry reviewed the site information and background documents listed in Section 2.0 of this report. While the previous data was reviewed by McIntosh Perry 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. McIntosh Perry 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, McIntosh Perry should be requested to re-evaluate the conclusions presented in this report, and provide amendments, if required.

APPENDIX A
KEY PLAN

McINTOSH PERRY



LEGEND

- Site Location
- Local Road
- Major Road
- Railroad
- Watercourse
- Waterbody
- Wooded Area

800 400 0 800

Scale 1:25,000 Metres

REFERENCE

GIS data provided by the Ontario Ministry of Northern Development, Mines, Natural Resources and Forestry, 2022.

CLIENT: FRITS BOSMAN BBS CONSTRUCTION LTD.

PROJECT: MYERS NISSAN & SUBARU

TITLE: SITE LOCATION PLAN

McINTOSH PERRY
115 Walgreen Road, RR3, Carp, ON K0A1L0
Tel: 613-836-2184 Fax: 613-836-3742
www.mcintoshperry.com

PROJECT NO:	CCO-22-2933
Date	Feb., 08, 2022
GIS	EU
Checked By	MS

FIGURE: 00

APPENDIX B
BACKGROUND DOCUMENTS

McINTOSH PERRY

Formal Pre-Application Consultation Meeting Minutes
PC2021-0440
4149 Strandherd Drive
Wednesday, December 22, 2021 at 2:00 pm to 3:00 pm

Attendees

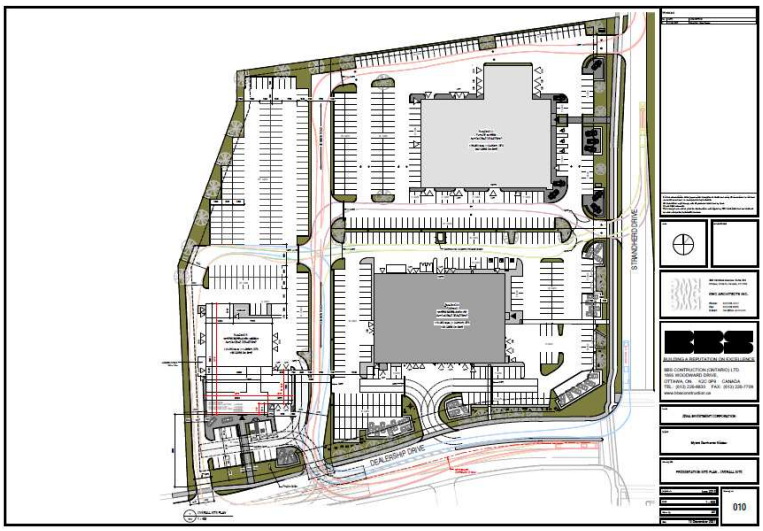
City of Ottawa
Urja Modi, File Lead – Planner I
Kelsey Charie, Engineering Intern
Eric Harrold, Infrastructure Project Manager
Christopher Moise, Urban Design
Eric Lalande, Rideau Valley Conservation Area
Katie O'Callaghan, Planner I

Applicant Team
Adam Thompson
Geoff Publow
Curtis Melanson

Please note the City's Environmental Planner, Sami Rehman, the Transportation Project Manager, Mike Giampa, the City's Forester, Mark Richardson, and the City's Parks Planner, Jeannete Krabicka, were not able to attend the meeting; their comments have been added to the meeting notes.

Proposal Overview

Proposal to revise a recently approved Site Plan to remove approved hotel and office buildings and replace them with two additional mobile dealerships on the site. This will result in three automobile dealerships being located on the site.



Notes & Comments

Urja Modi, *File Lead*

1. In the current Official Plan and as per the Official Plan Amendment adopted in 2020, the south east corner of the site (location of approved automobile dealership) is designated as Business Park, however the portion of the site impacted by this application is

designated Prestige Business Park. The site is also located South Nepean Secondary Plan Areas 9 and 10.
    a. The proposed use is not permitted in the relevant Secondary Plan.
2. In the New Official Plan, the site is located in the Southwest Suburban Transect, and designated as Mixed Industrial on Schedule 6.
    a. This designation permits automotive sales and services.
3. The portion of the site that is impacted by this application is currently zoned Business Park Industrial Zone, Exception 2636 with a Height Restriction of 22 metres ("IP[2636] H(22)").
    a. Exception 2636 specifically prohibits automobile dealerships.
    b. A ***Major Zoning By-Law Amendment*** will be required to permit the development of automobile dealerships on the site. Please ensure your proposal highlights and discusses the relevant policies of the current Official Plan and New Official Plan for review.
    c. Additionally, a ***Complex Site Plan Control Revision*** application will need to be submitted as well.
4. Please note: At this time the more restrictive policies, being the South Nepean Areas 9 & 10 Secondary Plan policies, would apply. However once the Ministry approves the New Official Plan, the policies of the Mixed Industrial designation would apply to this site and an automobile dealership would be a permitted use in the New Official Plan. Amongst other criteria, the approval of the Zoning By-Law Amendment is subject to the approval of the New Official Plan, AND specifically, the clauses of the New Official Plan that are relevant to your proposal; This includes the site being designated as Mixed-Industrial and that designation permitting automotive sales and services as primary uses.
5. As the proposed development is larger than 1,860 square metres, the application triggers a ***Complex Site Plan Control Revision***.

Kelsey Charie, *Engineering Intern*

1. *The site should be developed in accordance with the design criteria and information provided in the Citi Gate 416 Corporate Campus, Detailed Servicing and Stormwater Management Report. If modification(s) to the servicing arrangement approved for the previous Site Plan application are proposed, please consult with the City's Infrastructure Approvals Project Manager, Kelsey Charie, for concurrence*
2. *Please also update the following List of Reports and Plans (Site Plan Control):*
    a. Site Servicing Plan
    b. Grading Plan
    c. Erosion and Sediment Control Plan
    d. Storm Drainage / Ponding Plan
    e. Stormwater Management and Site Servicing Report
    f. Geotechnical Investigation Report
3. A new ECA will be required, unless all the properties are under the same ownership then they could amend the existing ECA.
    If a phased construction of the two buildings is proposed, then interim and final conditions should be covered in the updated reports and separate drawings should be prepared.

Christopher Moise, *Urban Design*

1. This proposal does not run along 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;
2. **Landscaping**: Although we appreciate that some landscaping has been proposed internal to the site, maximizing the amount of soft surface will benefit the permeability and the heat island impact of the proposal;
3. **Trees**: We recommend that new trees are proposed in all areas internal to the site and wherever possible to help moderate the heat island effect of so much asphalt. We recommend that the entire perimeter of the site is treed as much as possible;
4. **Pedestrian access and mobility**: Safe and clear access from the public right of way to the various buildings and between the buildings should be fully considered;
5. A scoped Design Brief is a required submittal for all Site Plan/Re-zoning applications and can be combined with the Planning Rationale. Please see the Design Brief Terms of Reference provided.

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.

Jeanette Krabicka, *Parks Planner*

1. Parkland Dedication:
    a. The amount of parkland dedication that is required is to be calculated as per the City of Ottawa Parkland Dedication By-law No 2009-95 (as amended or superseded).
    b. Section 14 (2) (b) of the By-law states that no conveyance of land or payment of money in-lieu is required for a change of use from commercial or industrial to another commercial or industrial use, or for the alteration of an existing building resulting in a change of use from commercial or industrial to another commercial or industrial use.
    c. The site is currently developed with a commercial use which includes an automobile dealership.
    d. The proposed development maintains the existing commercial use and includes an additional two automobile dealership buildings.
    e. Therefore, this proposal would be considered exempt from a parkland dedication requirement.
    f. Please note that the park comments are preliminary and will be finalized (and subject to change) upon receipt of the development application. Additionally, if the proposed land use changes, then the parkland dedication requirement be re-evaluated accordingly.

Mike Giampa, *Transportation Project Manager*

1. If a TIA is warranted proceed to scoping. The application will not be deemed complete until the submission of the draft step 2-4, including the functional draft RMA package (if applicable) and/or monitoring report (if applicable).
   Although a full review of the TIA Strategy report (Step 4) is not required prior to an application, it is strongly recommended.
   Synchro files are required at Step 4.
2. ROW protection on Strandherd is 44.5 m.

3. **No loading/unloading operations will be permitted on Dealership nor Strandherd. Ensure that the gated access on Strandherd doesn't cause any on-road queuing.**

Sami Rehman, *Environmental Planner*

1. Please note an upstream part of the adjacent watercourse (O'Keefe drain to the east of the property) has been deemed significant habitat for threatened or endangered species. It is recommended that wildlife exclusion fencing be erected along the O'Keefe Drain, which should be built to the satisfaction of the MECP's standards. At the same time, this fencing should be consulted with the City's Drain Team to ensure their access is not restricted.
2. Please include a greater setback from the adjacent watercourse and the setback should be enhanced with locally appropriate native species of trees, shrubs and perennials. In general, it is recommended more locally appropriate native vegetation be planted along the western property boundary along the watercourse. This will not only contribute to the urban canopy but also contribute to local biological diversity, reduce impacts of the urban heat island effect, offer shading for the parking spots along the western property edge, improve the local air quality by removing particulate matter and reduce the energy demands for cooling.
3. Please review and draw design elements from the City's Bird-Safe Design Guidelines into their design to reduce bird collisions. The City's bird-safe design guidelines address glass reflectivity, transparency, lighting and landscaping, which are all common to dealership's design.
   https://documents.ottawa.ca/sites/documents/files/birdsafedesign_guidelines_en.pdf
4. Please consult with the local Conservation Authority to determine if any permits or approvals are required under their regulations.

Mark Richardson, *Forester*

1. IF trees are present on the site, a Tree Conservation Report (TCR) must be supplied for review along with the suite of other plans/reports required by the City
   a. an approved TCR is a requirement of Site Plan approval.
   b. The TCR may be combined with the LP provided all information is supplied
2. As of January 1 2021, any removal of privately-owned trees 10cm or larger in diameter, or publicly (City) owned trees of any diameter requires a tree permit issued under the Tree Protection Bylaw (Bylaw 2020 – 340); the permit will be based on an approved TCR and made available at or near plan approval.
3. The Planning Forester from Planning and Growth Management as well as foresters from Forestry Services will review the submitted TCR
   a. If tree removal is required, both municipal and privately-owned trees will be addressed in a single permit issued through the Planning Forester
   b. Compensation may be required for city owned trees – if so, it will need to be paid prior to the release of the tree permit
4. the TCR must list all trees on site within the developable area, as well as off-site trees if the CRZ extends into the developed area, by species, diameter and health condition
5. please identify trees by ownership – private onsite, private on adjoining site, city owned, co-owned (trees on a property line)
6. the TCR must list all trees on adjacent sites if they have a critical root zone that extends onto the development site
7. If trees are to be removed, the TCR must clearly show where they are, and document the reason they cannot be retained

8. All retained trees must be shown and all retained trees within the area impacted by the development process must be protected as per City guidelines available at Tree Protection Specification or by searching Ottawa.ca
    a. the location of tree protection fencing must be shown on a plan
    b. show the critical root zone of the retained trees
    c. if excavation will occur within the critical root zone, please show the limits of excavation
9. the City encourages the retention of healthy trees; if possible, please seek opportunities for retention of trees that will contribute to the design/function of the site.
10. For more information on the process or help with tree retention options, contact Mark Richardson mark.richardson@ottawa.ca or on City of Ottawa

LP tree planting requirements:

For additional information on the following please contact tracy.smith@Ottawa.ca

Minimum Setbacks

- Maintain 1.5m from sidewalk or MUP/cycle track.
- Maintain 2.5m from curb
- Coniferous species require a minimum 4.5m setback from curb, sidewalk or MUP/cycle track/pathway.
- Maintain 7.5m between large growing trees, and 4m between small growing trees. Park or open space planting should consider 10m spacing.
- Adhere to Ottawa Hydro's planting guidelines (species and setbacks) when planting around overhead primary conductors.

Tree specifications

- Minimum stock size: 50mm tree caliper for deciduous, 200cm height for coniferous.
- Maximize the use of large deciduous species wherever possible to maximize future canopy coverage
- Tree planting on city property shall be in accordance with the City of Ottawa's Tree Planting Specification; and include watering and warranty as described in the specification (can be provided by Forestry Services).
- Plant native trees whenever possible
- No root barriers, dead-man anchor systems, or planters are permitted.
- No tree stakes unless necessary (and only 1 on the prevailing winds side of the tree)

Hard surface planting

- Curb style planter is highly recommended
- No grates are to be used and if guards are required, City of Ottawa standard (which can be provided) shall be used.
- Trees are to be planted at grade

Soil Volume

- Please ensure adequate soil volumes are met:

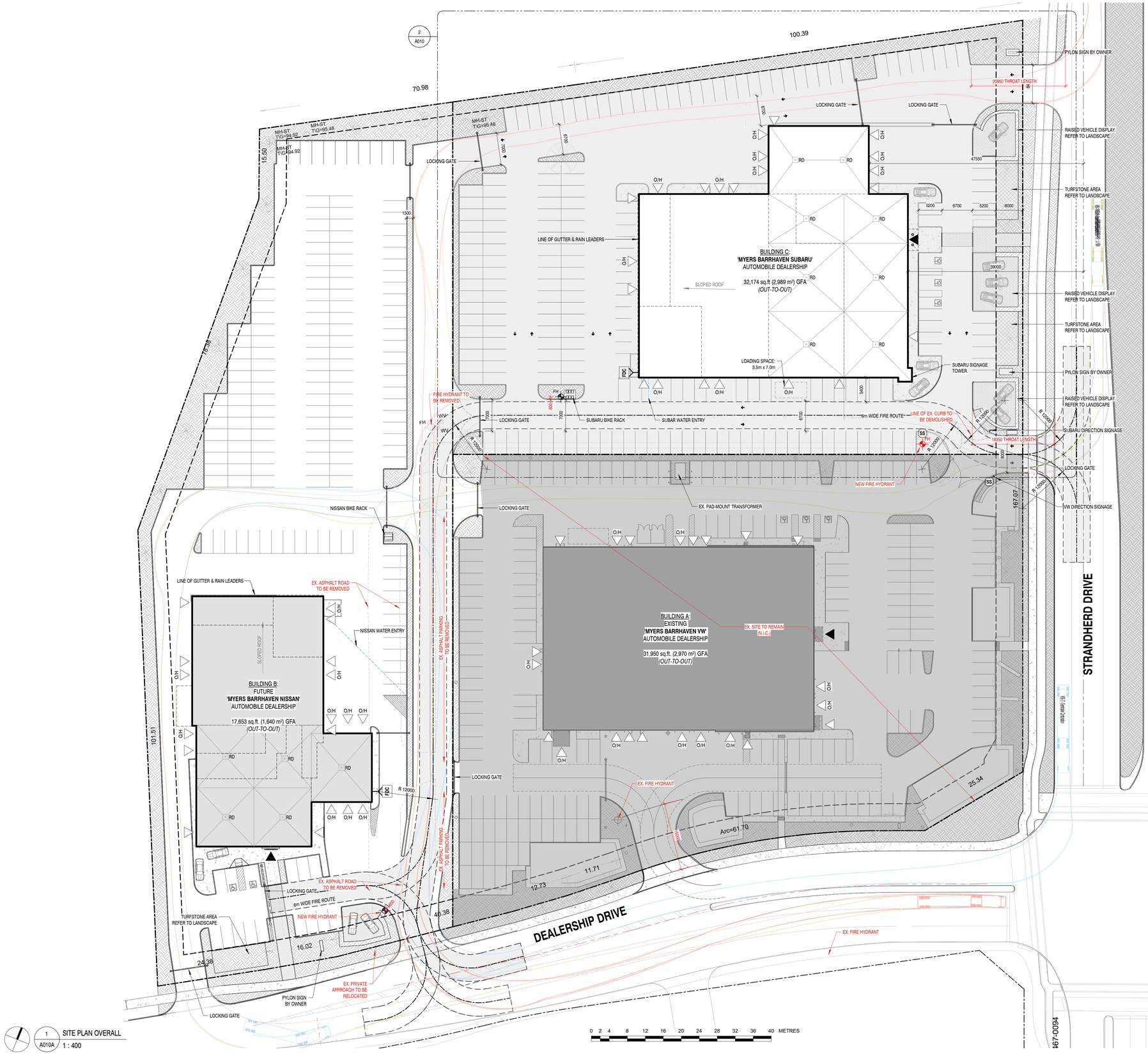
Tree Type/Size	Single Tree Soil Volume (m3)	Multiple Tree Soil Volume (m3/tree)
Ornamental	15	9
Columnar	15	9
Small	20	12
Medium	25	15

Large	30	18
Conifer	25	15

Please note that these soil volumes are not applicable in cases with Sensitive Marine Clay.

Sensitive Marine Clay

- Please follow the City's 2017 Tree Planting in Sensitive Marine Clay guidelines



1 / A010A SITE PLAN OVERALL
1 : 400

SITE / BUILDING / PARKING SUMMARY:

TOTAL SITE AREA = 33,784 m² (8.35 acres)

VW SITE	= 11,259 m² (2.78 acres)
SUBARU SITE	= 11,071 m² (2.74 acres)
NISSAN SITE	= 11,453 m² (2.83 acres)
	= 33,784 m² (8.35 acres)

BUILDING AREAS: *(OUT-TO-OUT)*

VW SITE	= 2,970 m²
SUBARU SITE	= 2,989 m²
NISSAN SITE	= 1,640 m²
	= 7,599 m²

OVERALL FLOOR SPACE INDEX = 0.25

LOT COVERAGE:

VW SITE	= 2,448 m²
SUBARU SITE	= 2,781 m²
NISSAN SITE	= 1,525 m²
	= 6,754 m²

TOTAL LOT COVERAGE = 20.0%

MINIMUM WIDTH OF LANDSCAPING:

ABUTTING STRANDHERD DR.	= 6.0m
ABUTTING STREET	= 3.2m
ABUTTING O'KEEFE DRAINAGE CORRIDOR	= 3.0m
OTHER CASES	= 0.0m

TOTAL LANDSCAPE AREA:

VW SITE	= 9,105 m²
SUBARU SITE	= 1,128 m²
NISSAN SITE	= 1,743 m²
	= 11,976 m²

% LANDSCAPE AREA = 35.4%

PARKING ON SITE:

	REQ'D	PROV'D
VW SITE	59 spaces	183 spaces
SUBARU SITE	xx	203 spaces
NISSAN SITE	37 spaces	170 spaces
	= xx	**558 spaces**

BARRIER-FREE PARKING:

	REQ'D	PROV'D
VW SITE	1 x 'A', 2x 'B'	3x 'A'
SUBARU SITE	xx	2x 'A', 1x 'B'
NISSAN SITE	1 x 'A', 1x 'B'	1x 'A', 1x 'B'

'A' = 3.4m x 5.2m
'B' = 2.6m x 5.2m

BICYCLE PARKING:

	REQ'D	PROV'D
VW SITE	2	2
SUBARU SITE	3	3
NISSAN SITE	2	2
TOTAL	**7**	**7**

SITE PLAN SYMBOLS

ICON	DESCRIPTION
	Existing Buildings
	Proposed Buildings
	Property Lines
	Setback Lines
	Fence
	Road Lanes
	Existing Concrete Curb
	Proposed Concrete Curb
	Depressed Concrete Curb
	Concrete Sidewalk
	Proposed Concrete Pavers
	Sawcut Asphalt
	Existing Landscape Area
	Proposed Landscape Area
	Proposed Turfstone Area
	Barrier Free Parking Space
	Exterior Bicycle Parking Spot with Bollard Style Bike Rack
	Two Way Vehicle Circulation
	Principal Entrance Door
	Exterior Door ("O/H" indicates Overhead Door)
	Exterior 6m Wide Fire Route (12m centerline radius on all turns, TYP.)
FDC	Fire Department Connection
FH	Fire Hydrant
SS	Stop Sign

TOPOGRAPHICAL SKETCH OF ELEVATIONS OVER PART OF

BLOCK 4
REGISTERED PLAN 4M-1538
CITY OF OTTAWA

ANNIS, O'SULLIVAN, VOLLEBEKK Ltd.
E.H. Herweyer O.L.S.
Field Work Completed: Sept. 2019

REVISIONS

No.	DATE	DESCRIPTION
0	11 Jan 2022	Issued for Coordination
1	22 Apr 2022	Issued for Coordination
2	20 July 2022	Progress for Review
3	09 Aug 2022	Revised per SPA City Comments 1
4	18 Aug 2022	Issued for Consultant Coordination

north

architect's seal

KWC ARCHITECTS INC.
383 Parkdale Avenue, Suite 201
Ottawa, Ontario, Canada, K1Y 4R4
Phone: 613 238-2217
Fax: 613 238-6595
E-Mail: kwc@kwc-arch.com

owner
ZENA INVESTMENT CORPORATION

project
MYERS BARRHAVEN SUBARU AUTOMOBILE DEALSHIP
4149 Strandherd Drive

drawing title
SITE PLAN - OVERALL COMPOSITE PLAN

project no. **kwc 2174**
scale **As indicated**
drawn by **CM / AK**
date **11 JANUARY 2022**
drawing no. **A010A**

Project Zoning Review/Statistics

Municipality: City of Ottawa
Municipal Address: 4149 Strandherd Drive
Registered Owner: Zena Investment Corp.
Lot Area: 11,454 sq.m. (2.83 acres)

Zoning Analysis
Ottawa
Zoning By-law: 2008-250
Zone: IP[2636] H(22)
Proposed Use: Automobile Dealership

Building Areas

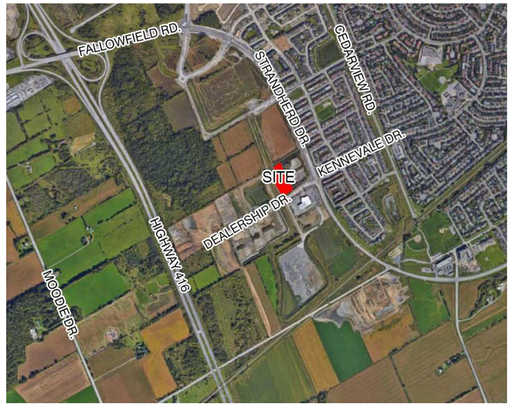
	Gross Floor Area (Zoning By-Law Definition) Sq.m.	Sq.ft
Ground Floor		
Sales/Showroom	221	2,379
Parts	114	1,227
Service Garage / Drive-Thru	1012	10,893
	1,347	14,499
Second Floor		
Admin / Office Space	69	743
Parts	52	560
	121	1,302
Mezzanine		
Other (Storage)	172	1,851
	172	1,851
Totals	1,640	17,653

Development Standards

	Required	Provided
Minimum Lot Area	4,000m²	11,454m²
Minimum Lot Width	No min.	66.228m
Maximum Lot Coverage	55%	14%
Minimum Required Yard		
Front Yard	6m	27.05m
Corner Side Yard	6m	N/A
Interior Side Yard		
Abutting a residential or institutional zone	6m	N/A
All other cases	3m	10.0m
Rear Yard	6m	106.63m
Maximum Building Height		
Within 20m from a residential or institutional zone	11m	N/A
All other cases	22m	7.65m
Minimum Width of Landscaping		
Abutting a residential or institutional zone	3m	N/A
Abutting a street	3m	5.375m
All other cases	No min.	0m

Parking Spaces	Area 'C' on Schedule 1A	
Sales/Showroom		
- 2/100 sq.m @ 221 sq.m.	6	
Service Area		
- 2/bay @ 13 bays	26	
Other		
- 1/100 sq.m @ 407 sq.m.	5	
Total	**37**	**37**
Inventory Parking on Site		**133**
Grand Total:		**170**

Loading Spaces (3.5m x 9m)	1	1	Table 113A
Bicycle Parking (1/ 1500 sq.m.)	1	2	Land Use Group (i) as per Table 111A
Parking for Physically Disabled	2	2	1x Type A; 1x Type B



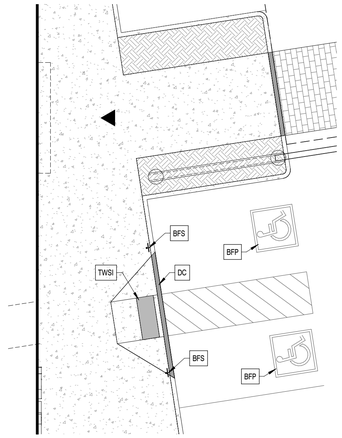
1 / A010 LOCATION PLAN
N.T.S.

TOPOGRAPHICAL SKETCH OF ELEVATIONS OVER PART OF

BLOCK 4
REGISTERED PLAN 4M-1538
CITY OF OTTAWA

ANNIS, O'SULLIVAN, VOLLEBEKK Ltd.

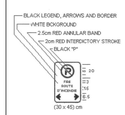
E.H. Herweyer O.L.S.
Field Work Completed: Sept. 2019



3 / A010 BF PARKING DETAIL
1 : 100

FIRE ROUTE SIGNAGE:

1. FIRE ROUTE TO BE IDENTIFIED BY VERTICALLY MOUNTED SIGNS PROHIBITING PARKING, AND SHALL:



A. BE NOT LESS THAN 45cm IN HEIGHT AND NOT LESS THAN 30cm IN WIDTH;

B. BEAR THE MARKINGS AND MESSAGE THAT THE AREA IS A FIRE ROUTE WHERE PARKING IS PROHIBITED AND INCLUDE DOUBLE ARROWS, EXCEPT AT THE ENDS OF THE FIRE ROUTE WHERE A SINGLE ARROW SHALL BE INCLUDED;

C. INCLUDE, IN BLACK LETTERS OF A MINIMUM HEIGHT OF 3cm, THE ENGLISH LANGUAGE MESSAGE "FIRE ROUTE" AND THE FRENCH LANGUAGE MESSAGE "ROUTE DES POMPIER" OR "ROUTE D'INCENDIE", BELOW THE ENGLISH MESSAGE, AND;

D. HAVE THE DESIGN AND DIMENSIONS DESCRIBED IN THE FOLLOWING FIGURE:

2. FIRE ROUTE SIGNS SHALL BE LOCATED NO MORE THAN 25m APART UNLESS OTHERWISE SPECIFICALLY APPROVED BECAUSE OF UNUSUAL SITE CONDITIONS OR THE FIRE ROUTE CONFIGURATION, AND THE LOWER EDGE OF EACH SIGN SHALL BE BETWEEN 2m AND 2.5m ABOVE THE GROUND.

SITE PLAN NOTES

NOTE#	NOTE
(D)CC	Line of existing concrete curb to be demolished to suit.
BFP	Barrier-Free parking space pavement marking; Min. 1525mm x 1525mm; White Yellow 'International Symbol of Accessibility' and border with blue background; Locate as shown on drawings.
BFS	Barrier-Free parking signage; Provide vertically mounted sign (minimum 300mm W x 600mm H) marked with International Symbol of Accessibility; Mounted not less than 1500mm and not more than 2000mm from ground. Ensure tonal contrast between BF Parking Signage and background environment. Provide information text compliant with City by-law requirements. Provide additional building signage that identifies Type 'A' spaces as 'Van Accessible / Fourgonnette Accessible'.
BR	Bike Rack - See Landscape Plan
CP	Concrete Pad
DC	Depressed Curb
HCP	Heated Concrete Pad
PS	Pylon Sign, by Owner
RVD	Raised Vehicle Display; Refer to Landscape
SG	Steel Gate with locking mechanism
TA	Turfstone Areas - refer to Landscape
TWSI	Tactile Walking Surface Indicator, recessed into walking surface. Minimum 600mm deep x full width of stair or walkway; Locate TWSI one tread-depth back from ledging edge of nosing at top of stairs or 150mm from back edge of curb for walkways. Colour-contrasted to walking surface, slip-resistant and non-glare; truncated dome patterns as per AODA standard.

SITE PLAN SYMBOLS

ICON	DESCRIPTION
	Existing Buildings
	Proposed Buildings
	Property Lines
	Setback Lines
	Overhead Wires
	Fence
	Existing Concrete Curb
	Proposed Concrete Curb
	Depressed Concrete Curb
	Existing Concrete
	Proposed Concrete
	Proposed Concrete Pavers
	Existing Landscape Area
	Proposed Landscape Area
	Proposed Turfstone Area
	Barrier Free Parking Space
	Exterior Bicycle Parking Spot with Bollard Style Bike Rack
	Two Way Vehicle Circulation
	Principal Entrance Door
	Exterior Door ('O/H' indicates Overhead Door)
	Exterior 6m Wide Fire Route (12m centerline radius on all turns, TYP.)
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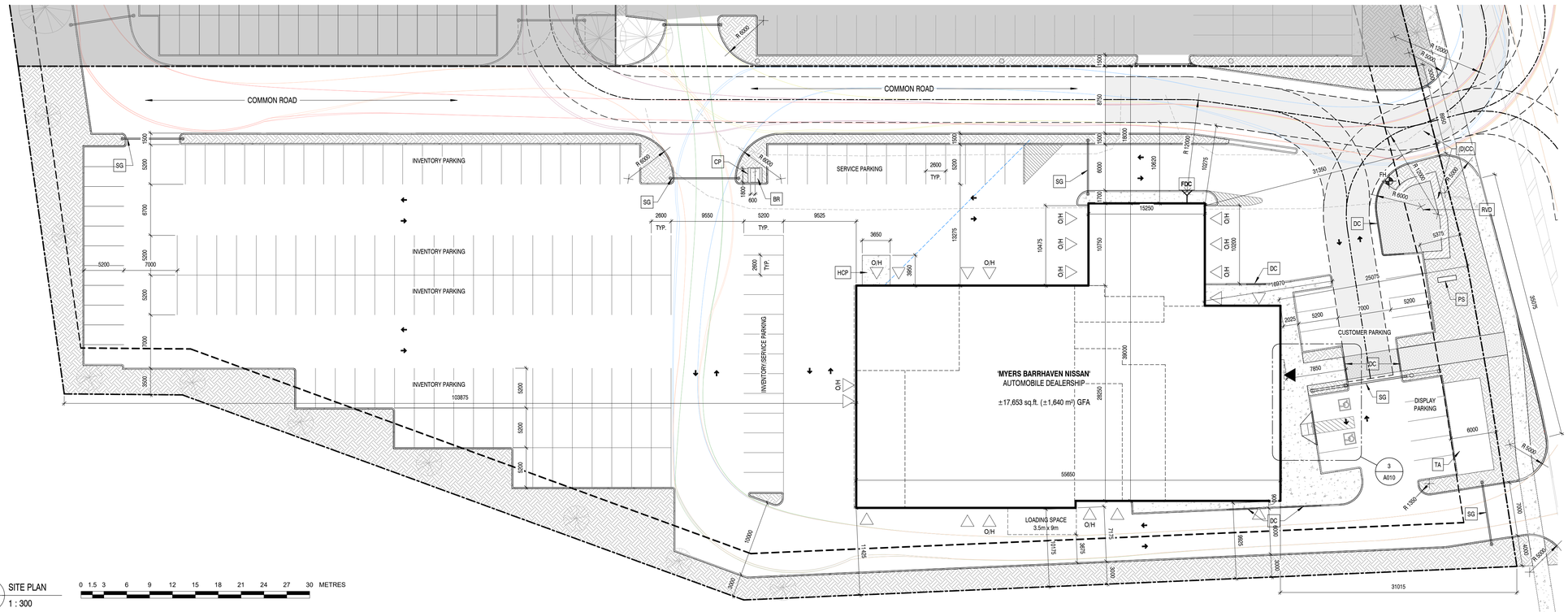

2 / A010 SITE PLAN
1 : 300

0 1.5 3 6 9 12 15 18 21 24 27 30 METRES

REVISIONS

No.	DATE	DESCRIPTION
0	08 Feb 2022	Issued for Client Review
1	18 Aug 2022	Issued for Consultant Coordination

It is the responsibility of the appropriate contractor to check and verify all dimensions on site and report all errors and / or omissions to the Architect.
All contractors must comply with all pertinent codes and by-laws.
Do not scale drawings.
This drawing may not be used for construction until signed by KWC Architects Inc. and shall not be used without the Architect's consent.

north

architect's seal

383 Parkdale Avenue, Suite 201
Ottawa, Ontario, Canada, K1Y 4R4

KWC ARCHITECTS INC.

Phone: 613 238-2217
Fax: 613 238-6595
E-Mail: kwc@kwc-arch.com

BUILDING A REPUTATION ON EXCELLENCE

BBS CONTRUCTION (ONTARIO) LTD.
1805 WOODWARD DRIVE,
OTTAWA, ON. K2C 0P9 CANADA
TEL: (613) 226-8830 FAX: (613) 226-7709
www.bbsconstruction.ca

owner
ZENA INVESTMENT CORPORATION

project
MYERS BARRHAVEN NISSAN AUTOMOBILE DEALERSHIP
4149 Strandherd Drive, Ottawa, ON.

drawing title
SITE PLAN - NISSAN SITE

project no.	kwc 2216
scale	As indicated
drawn by	AK
date	14 March 2022

drawing no.
A010

1 / A010 LOCATION PLAN
N.T.S.

TOPOGRAPHICAL SKETCH OF ELEVATIONS OVER PART OF

BLOCK 4
REGISTERED PLAN 4M-1538
CITY OF OTTAWA

ANNIS, O'SULLIVAN, VOLLEBEKK Ltd.

E.H. Herweyer O.L.S.

Field Work Completed: Sept. 2019

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Registered Owner: Zena Investment Corp.
Lot Area: 11,071 sq.m. (2.74 acres)

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Ottawa
Zoning By-law: 2008-250
Zone: IP[2636] H(22)
Proposed Use: Automobile Dealership & Service Garage

Building Areas

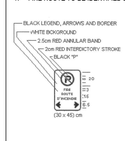
	Gross Floor Area (Zoning Bylaw Definition) Sq.m.	Sq.ft
Ground Floor		
Sales/Showroom	636	6,846
Retail/Service Parts	254	2,734
Service Garage / Drive-Thru	1499	16,135
	2,389	25,715
Second Floor		
Admin/Office Space	133	1,432
Parts	155	1,668
	288	3,100
Mezzanine		
Other (Storage)	312	3,358
	312	3,358
Totals	2,989	32,174

Development Standards

	Required	Provided	
Minimum Lot Area	4,000m²	11,071m²	
Minimum Lot Width	No min.	95.398m	
Maximum Lot Coverage	55%	29%	
Minimum Required Yard			
Front Yard	6m	24.6m	
Corner Side Yard	6m	N/A	
Interior Side Yard			
Abutting a residential or institutional zone	6m	N/A	
All other cases	3m	13.5m	
Rear Yard	6m	41.4m	
Maximum Building Height			
Within 20m from a residential or institutional zone	11m	N/A	
All other cases	22m	7.3m	
Minimum Width of Landscaping			
Abutting a residential or institutional zone	3m	N/A	
Abutting a street	3m	6m	
All other cases	No min.	0m	
Parking Spaces	Area 'C' on Schedule 1A		
Sales/Showroom			
- 2/100 sq.m @ 636 sq.m.	14	41	
Service Area			
- 2/bay @ 18 bays	36	72	
Other			
- 1/100 sq.m @ 854 sq.m.	9	90	
Total	**59**	**203**	
Loading Spaces (3.5m x 7m)	1	1	Table 113A
Bicycle Parking (1/ 1500 sq.m.)	3	3	Land Use Group (G) as per Table 111A
Parking for Physically Disabled	3	3	1x Type A; 2x Type B

FIRE ROUTE SIGNAGE:

1. FIRE ROUTE TO BE IDENTIFIED BY VERTICALLY MOUNTED SIGNS PROHIBITING PARKING, AND SHALL:



   A. BE NOT LESS THAN 45cm IN HEIGHT AND NOT LESS THAN 30cm IN WIDTH;
   B. BEAR THE MARKINGS AND MESSAGE THAT THE AREA IS A FIRE ROUTE WHERE PARKING IS PROHIBITED AND INCLUDE DOUBLE ARROWS, EXCEPT AT THE ENDS OF THE FIRE ROUTE WHERE A SINGLE ARROW SHALL BE INCLUDED;
   C. INCLUDE, IN BLACK LETTERS OF A MINIMUM HEIGHT OF 3cm, THE ENGLISH LANGUAGE MESSAGE 'FIRE ROUTE' AND THE FRENCH LANGUAGE MESSAGE 'ROUTE DES POMPIER' OR 'ROUTE D'INCENDIE', BELOW THE ENGLISH MESSAGE, AND;
   D. HAVE THE DESIGN AND DIMENSIONS DESCRIBED IN THE FOLLOWING FIGURE:

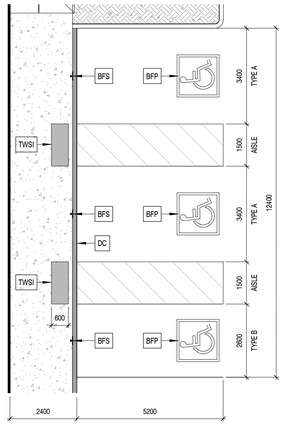
2. FIRE ROUTE SIGNS SHALL BE LOCATED NO MORE THAN 25m APART UNLESS OTHERWISE SPECIFICALLY APPROVED BECAUSE OF UNUSUAL SITE CONDITIONS OR THE FIRE ROUTE CONFIGURATION, AND THE LOWER EDGE OF EACH SIGN SHALL BE BETWEEN 2m AND 2.5m ABOVE THE GROUND.

SITE PLAN SYMBOLS

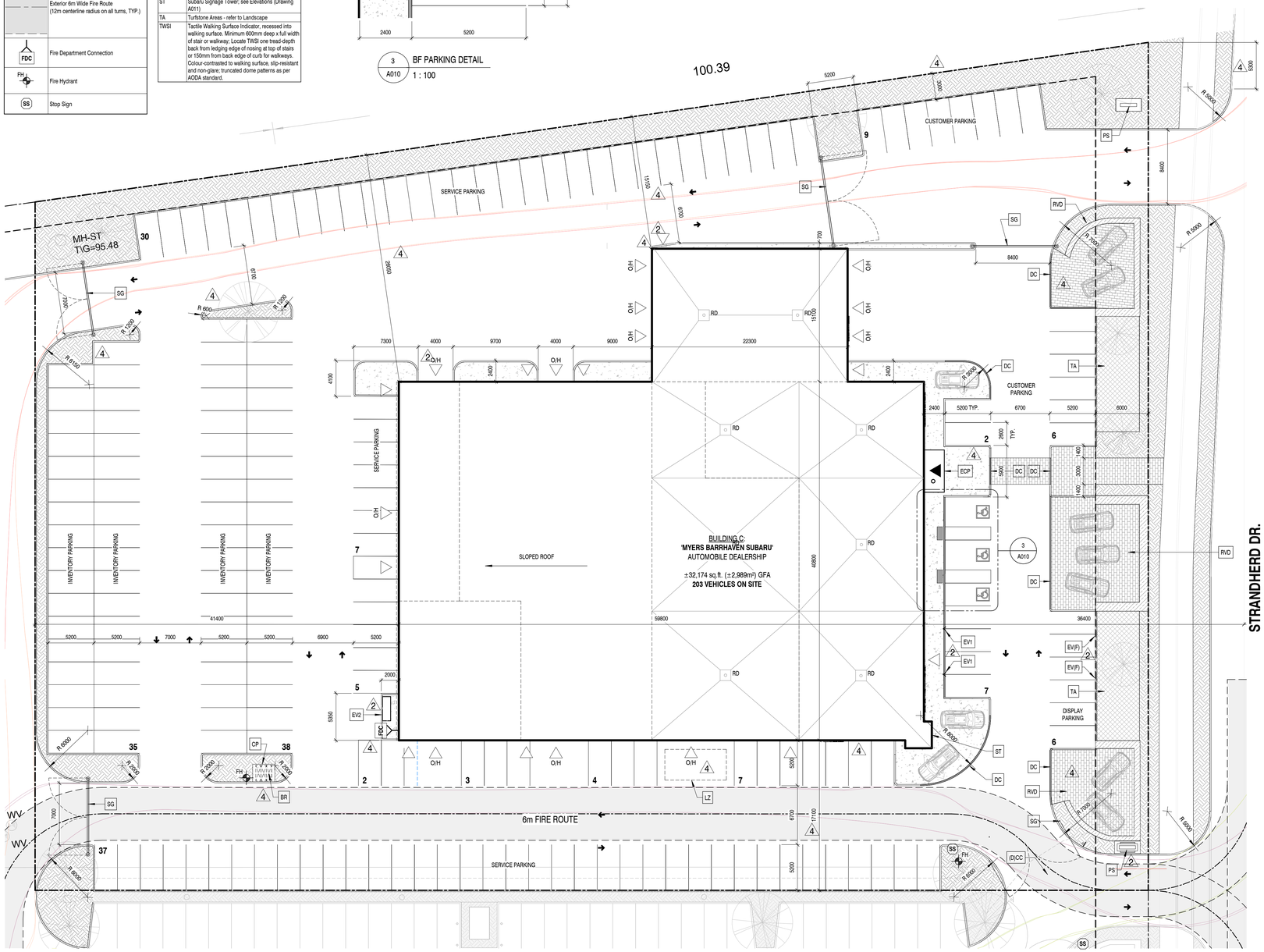
ICON	DESCRIPTION
	Existing Buildings
	Proposed Buildings
	Property Lines
	Setback Lines
	Fence
	Road Lanes
	Existing Concrete Curb
	Proposed Concrete Curb
	Depressed Concrete Curb
	Concrete Sidewalk
	Proposed Concrete Pavers
	Sawcut Asphalt
	Existing Landscape Area
	Proposed Landscape Area
	Proposed Turfstone Area
	Barrier Free Parking Space
	Exterior Bicycle Parking Spot with Bollard Style Bike Rack
	Two Way Vehicle Circulation
	Principal Entrance Door
	Exterior Door ("O.H" indicates Overhead Door)
	Exterior 6m Wide Fire Route (12m centerline radius on all turns, TYP.)
FDC	Fire Department Connection
FH	Fire Hydrant
SS	Stop Sign

SITE PLAN NOTES

NOTE#	NOTE
(D)CC	Line of existing concrete curb to be demolished to suit.
BFP	Barrier-Free parking space pavement marking; Min. 1525mm x 1525mm; White Yellow 'International Symbol of Accessibility' and border with blue background; Locate as shown on drawings.
BFS	Barrier-Free parking signage; Provide vertically mounted sign (minimum 300mm W x 600mm H) marked with International Symbol of Accessibility; Mounted not less than 1500mm and not more than 2000mm from ground. Ensure tonal contrast between BF Parking Signage and background environment. Provide information text compliant with City by-law requirements. Provide additional building signage that identifies Type 'A' spaces as 'Van Accessible / Fourgonnette Accessible'.
BR	Bike Rack - See Landscape Plan
CP	Concrete Pad
DC	Depressed Curb
ECP	Entrance Canopy and Posts
EV1	Electric Vehicle Charger; dual-charger station to serve 2 parked electric vehicles. By Owner.
EV2	Electric Vehicle Charger; 50kW charging station. By Owner.
EV(F)	Future Electric Vehicle Charger; dual-charger station to serve 2 parked electric vehicles. By Owner.
LZ	Loading Zone; 3.5m x 9m
PS	Pylon Sign, by Owner
RVD	Raised Vehicle Display; Refer to Landscape
SG	Steel Gate with locking mechanism
ST	Subaru Signage Tower; see Elevations (Drawing A011)
TA	Turfstone Areas - refer to Landscape
TWSI	Tactile Walking Surface Indicator, recessed into walking surface. Minimum 600mm deep x full width of stair or walkway; Locate TWSI one tread-depth back from ledging edge of nosing at top of stairs or 150mm from back edge of curb for walkways. Colour-contrasted to walking surface, slip-resistant and non-glare; truncated dome patterns as per AODA standard.



3 / A010 BF PARKING DETAIL
1 : 100



2 / A010 SITE PLAN
1 : 250

0 2.5 5 10 15 20 25 METRES

REVISIONS

No.	DATE	DESCRIPTION
0	08 Feb 2022	Issued for Client Review
1	22 Apr 2022	Issued for Coordination
2	24 May 2022	Issued for Client Review & Consultant Coordination
3	20 July 2022	Progress for Review
4	09 Aug 2022	Revised per SPA City Comments 1
5	18 Aug 2022	Issued for Consultant Coordination

GENERAL SITE PLAN NOTES:

1. Exterior site lighting shall be directed onto the site away from adjacent properties. See Electrical Drawings.
2. Read this drawing in conjunction with the Landscape Drawings, Civil Engineering Drawings and Electrical Drawings.

It is the responsibility of the appropriate contractor to check and verify all dimensions on site and report all errors and / or omissions to the Architect.
All contractors must comply with all pertinent codes and by-laws.
Do not scale drawings.
This drawing may not be used for construction until signed by KWC Architects Inc. and shall not be used without the Architect's consent.

north

architect's seal

KWC ARCHITECTS INC.
383 Parkdale Avenue, Suite 201
Ottawa, Ontario, Canada, K1Y 4R4
Phone: 613 238-2217
Fax: 613 238-6595
E-Mail: kwc@kwc-arch.com

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TEL: (613) 226-8830 FAX: (613) 226-7709
www.bbsconstruction.ca

owner
ZENA INVESTMENT CORPORATION

project
MYERS BARRHAVEN SUBARU AUTOMOBILE DEALSHIP
4149 Strandherd Drive

drawing title
SITE PLAN - SUBARU SITE

project no. **kwc 2174**
scale **As indicated**
drawn by **CM / AK / TC**
date **11 JANUARY 2022**
drawing no. **A010**

FLOW CONTROL ROOF DRAINAGE DECLARATION

THIS FORM TO BE COMPLETED BY THE MECHANICAL AND STRUCTURAL ENGINEERS RESPONSIBLE FOR DESIGN

Permit Application No.

Project Name: MYERS BARRHAVEN SUBARU AUTOMOBILE DEALSHIP
ZENA INVESTMENT CORPORATION

Building Location: 4149 Strandherd Drive Municipality:

The roof drainage system has been designed in accordance with the following criteria: (please check one of the following).

M1. ☐ Conventionally drained roof (no flow control roof drains used).

M2. ☒ Flow control roof drains meeting the following conditions have been incorporated in this design:

(a) the maximum drain down time does not exceed 24h,
(b) one or more scuppers are installed so that the maximum depth of water on the roof cannot exceed 150mm,
(c) drains are located not more than 15m from the edge of roof and not more than 30m from adjacent drains, and
(d) there is at least one drain for each 900 sq.m

M3. ☐ A flow control drainage system that does not meet the minimum drainage criteria described in M2 has been incorporated in this design

PROFESSIONAL SEAL APPLIED BY:

Practitioner's Name: Massoud Yazdai

Firm: Miriton Ltd.

Phone#: 613-618-6993

City: Ottawa Province: Ontario

Mechanical Engineer's Seal

S1. ☐ The design parameters incorporated into the overall structural design are consistent with the information provided by the Mechanical Engineer in M2. Loads due to rain are not considered to act simultaneously with loads due to snow as per Sentence 4.1.7.3 (3) OBC.

S2. ☐ The structure has been designed incorporating the additional structural loading due to rain acting simultaneously with the snow load. The design parameters are consistent with the control flow drainage system designed by the mechanical engineer.

PROFESSIONAL SEAL APPLIED BY:

Practitioner's Name:

Firm:

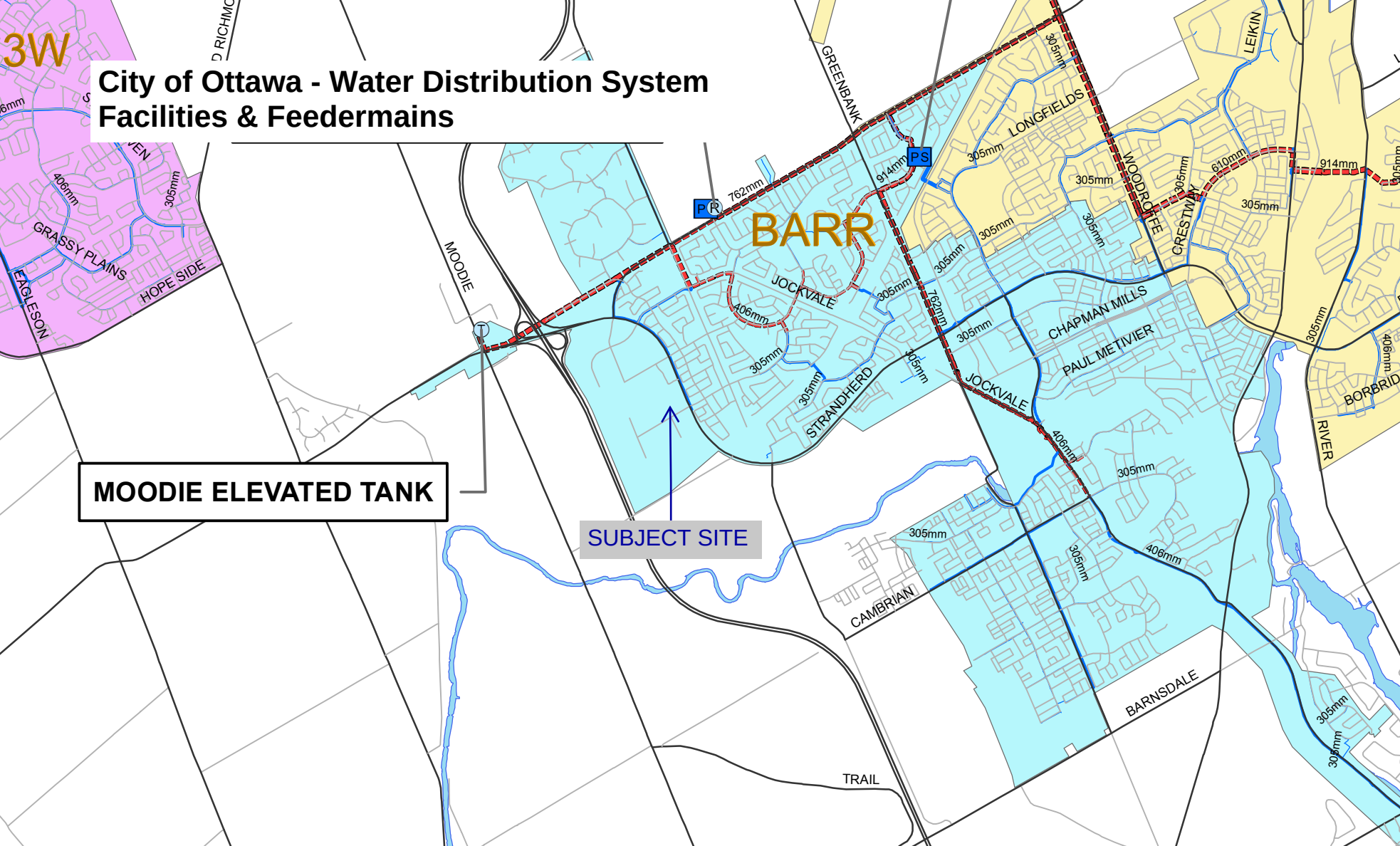
Phone#:

City: Province:

Structural Engineer's Seal

APPENDIX C
WATERMAIN CALCULATIONS

McINTOSH PERRY


3W
City of Ottawa - Water Distribution System
Facilities & Feedermains
MOODIE ELEVATED TANK
SUBJECT SITE
BARR
PR
PS
762mm
914mm
406mm
305mm
610mm
MOODIE
GREENBANK
LONGFIELDS
WOODROFFE
CRESTWAY
LEIKIN
JOCKVALE
STRANDHERD
CHAPMAN MILLS
PAUL METIVIER
CAMBRIAN
BARNSDALE
TRAIL
RIVER
BORBRID
GRASSY PLAINS
HOPE SIDE
EAGLESON

McINTOSH PERRY

CCO-22-2933 - MYERS - PHASE 2 - BUILDING C - WATER DEMANDS

Project:	MYERS - PHASE 2 - BUILDING C
Project No.:	CCO-22-2933
Designed By:	M.M.
Checked By:	A.G.
Date:	August 18, 2022
Site Area:	1.11 gross ha

COMMERCIAL		**UNIT RATE**
Employees	40	persons/day
Total Population	**40**	**persons**
Commercial		ha
Car Wash	**50**	**Veh**
Car Service	**50**	**Car Serviced**
Industrial - Light		m2
Industrial - Heavy		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/(1000m² /d	
Hospital	900	L/(bed/day)	
Schools	70	L/(Student/d)	
Car wash	400	L/Veh/d	
Car Service	40	L/Car Serviced/d	
Employees	75	L/Person/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	**Commerical Employees**	**0.03**	**L/s**
	Commerical	**0.25**	**L/s**

115 Walgreen Road, R.R.3. Carp, ON K0A 1L0 | T. 613-836-2184 | F. 613-836-3742
info@mcintoshperry.com | www.mcintoshperry.com

McINTOSH PERRY

CCO-22-2933 - MYERS - PHASE 2 - BUILDING C - WATER DEMANDS

Project:	MYERS - PHASE 2 - BUILDING C
Project No.:	CCO-22-2933
Designed By:	M.M.
Checked By:	A.G.
Date:	August 18, 2022
Site Area:	1.11 gross ha

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	**Commerical Employees**	**0.05**	**L/s**
	Commerical	**0.38**	**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	**Commerical Employees**	**0.09**	**L/s**
	Commerical	**0.69**	**L/s**

WATER DEMAND DESIGN FLOWS PER UNIT COUNT
CITY OF OTTAWA - WATER DISTRIBUTION GUIDELINES, JULY 2010

AVERAGE DAILY DEMAND	0.29	L/s
MAXIMUM DAILY DEMAND	0.43	L/s
MAXIMUM HOUR DEMAND	0.78	L/s

McINTOSH PERRY

CCO-22-2933 - MYERS - FUTURE PHASE - BUILDING B - WATER DEMANDS

Project:	MYERS - FUTURE PHASE - BUILDING B
Project No.:	CCO-22-2933
Designed By:	M.M.
Checked By:	A.G.
Date:	August 18, 2022
Site Area:	1.15 gross ha

COMMERCIAL		**UNIT RATE**
Employees	35	persons/day
Total Population	**35**	**persons**
Commercial		ha
Car Wash	**30**	**Veh**
Car Service	**30**	**Car Serviced**
Industrial - Light		m2
Industrial - Heavy		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/(1000m² /d	
Hospital	900	L/(bed/day)	
Schools	70	L/(Student/d)	
Car wash	400	L/Veh/d	
Car Service	40	L/Car Serviced/d	
Employees	75	L/Person/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	**Commerical Employees**	**0.03**	**L/s**
	Commerical	**0.15**	**L/s**

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info@mcintoshperry.com | www.mcintoshperry.com

McINTOSH PERRY

CCO-22-2933 - MYERS - FUTURE PHASE - BUILDING B - WATER DEMANDS

Project:	MYERS - FUTURE PHASE - BUILDING B
Project No.:	CCO-22-2933
Designed By:	M.M.
Checked By:	A.G.
Date:	August 18, 2022
Site Area:	1.15 gross ha

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	**Commerical Employees**	**0.05**	**L/s**
	Commerical	**0.23**	**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	**Commerical Employees**	**0.08**	**L/s**
	Commerical	**0.41**	**L/s**

WATER DEMAND DESIGN FLOWS PER UNIT COUNT
CITY OF OTTAWA - WATER DISTRIBUTION GUIDELINES, JULY 2010

AVERAGE DAILY DEMAND	0.18	L/s
MAXIMUM DAILY DEMAND	0.27	L/s
MAXIMUM HOUR DEMAND	0.49	L/s

McINTOSH PERRY

CCO-22-2933 - MYERS - PHASE 2 - BUILDING C - FIRE UNDERWRITERS SURVEY

Project:	MYERS - PHASE 2 - BUILDING C
Project No.:	CCO-22-2933
Designed By:	M.M.
Checked By:	A.G.
Date:	August 18, 2022

From the Fire Underwriters Survey (1999)

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

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** **2,989.0** m^2

Caluclated Fire Flow	**9,622.2 L/min**
	10,000.0 L/min

B. REDUCTION FOR OCCUPANCY TYPE (No Rounding)

From note 2, Page 18 of the Fire Underwriter Survey:

Limited Combustible -15%

Fire Flow	**8,500.0 L/min**

C. REDUCTION FOR SPRINKLER TYPE (No Rounding)

Fully Supervised Sprinklered -50%

Reduction	**-4,250.0 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	>45	Wood frame	15	2	30.0	0%
Exposure 2	>45	Wood frame	15	2	30.0	0%
Exposure 3	30.1 to 45	Non-Combustible	60	1	60.0	5%
Exposure 4	>45	Non-Combustible	30	1	30.0	0%
					% Increase*	**5%**

Increase*	**425.0 L/min**

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

Fire Flow	**4,675.0 L/min**
Fire Flow Required**	**5,000.0 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

McINTOSH PERRY

CCO-22-2933 - MYERS - FUTURE PHASE - BUILDING B - FIRE UNDERWRITERS SURVEY

Project:	MYERS - FUTURE PHASE - BUILDING B
Project No.:	CCO-22-2933
Designed By:	M.M.
Checked By:	A.G.
Date:	August 18, 2022

From the Fire Underwriters Survey (1999)

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

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** **1,640.0** m^2

Caluclated Fire Flow	**7,127.5 L/min**
	7,000.0 L/min

B. REDUCTION FOR OCCUPANCY TYPE (No Rounding)

From note 2, Page 18 of the Fire Underwriter Survey:

Limited Combustible -15%

Fire Flow	**5,950.0 L/min**

C. REDUCTION FOR SPRINKLER TYPE (No Rounding)

Fully Supervised Sprinklered -50%

Reduction	**-2,975.0 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	>45	Non-Combustible	40	1	40.0	0%
Exposure 2	30.1 to 45	Non-Combustible	40	1	40.0	5%
Exposure 3	>45	Non-Combustible	80	2	160.0	0%
Exposure 4	>45	Non-Combustible	30	1	30.0	0%
					% Increase*	**5%**

Increase*	**297.5 L/min**

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

Fire Flow	**3,272.5 L/min**
Fire Flow Required**	**3,000.0 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

McINTOSH PERRY

CCO-22-2933 - 4149 Strandherd - Boundary Condition Unit Conversion

Project:	4149 Strandherd
Project No.:	CCO-22-2933
Designed By:	M.M.
Checked By:	A.G.
Date:	August 18, 2022

Boundary Conditions Unit Conversion

DEALERSHIP DRIVE

Scenario	Height (m)	Elevation (m)	m H_2O	PSI	kPa
Avg. DD	154.4	93.2	61.2	87.1	600.4
Fire Flow (66.7 L/s or 4,000 L/min)	151.0	93.2	57.8	82.2	567.0
Fire Flow (83.3 L/s or 5,000 L/min)	148.0	93.2	54.8	78.0	537.6
Peak Hour	147.0	93.2	53.8	76.5	527.8

STRANDHERD DRIVE

Scenario	Height (m)	Elevation (m)	m H_2O	PSI	kPa
Avg. DD	154.4	93.2	61.2	87.1	600.4
Fire Flow (66.7 L/s or 4,000 L/min)	152.2	93.2	59.0	83.9	578.8
Fire Flow (83.3 L/s or 5,000 L/min)	151.4	93.2	58.2	82.8	570.9
Peak Hour	147.0	93.2	53.8	76.5	527.8

Appendix A:
Water Servicing Information

Project No. 117148
Project Name: 4149 Strandherd Drive
Project Location: 4149 Strandherd Drive

NOVATECH
Engineers, Planners & Landscape Architects

Date: February, 2020

Proposed Development Conditions

	Office	Hotel	Dealership	Totals
Total Floor Area (m²)	7830	N/A	N/A	
No. Beds	N/A	170	N/A	
Restaurant Seats	N/A	200	N/A	
Carwash	N/A	N/A	55	
Car Service	N/A	N/A	50	
Employees	N/A	N/A	50	
Lot Area (ha)			1.19	
Total Daily Volume (Liters)	63145.2	63250.0	27750	154145.2
Avg Day Demand (L/s)	0.731	0.732	0.321	1.78
Max Day Demand (L/s)	1.096	1.098	0.482	2.68
Peak Hour Demand (L/s)	1.973	1.977	0.867	4.82

Establishment	Daily Demand Volume		Source
Office:	75	l/9.3m² /day	Daily Demands from OBC Table 8.2.1.3
Hotel:	225	l/bed/day	City of Ottawa Sewer Design Guidelines
	125	l/restaurant seat/day	
Industrial/Commercial:	28000	l/ha/day	
Car Wash	400	l/veh/day	(Truck wash of 400 l/vehicle/d to achieve a conservative value)
Car Service:	40	l/car serviced/day	
Employee	75	l/person/day	
Retail:	6	l/parking space/day	
	40	l/employee/day	
	2000	l/toilet room/day	

Commercial / Industrial Peaking Factors City of Ottawa Water Distrubution Guidelines

Conditions	Peaking Factor	
Maximum Day	1.5	x avg day
Peak Hour	1.8	x max day

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 117148
Project Name: 4149 Strandherd
Date: 2/28/2020
Input By: Anthony Mestwarp
Reviewed By: Cara Ruddle

Legend: Input by User; No Information or Input Required

Building Description: Dealership
Non-combustible construction

Step			Input		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction **C**	Wood frame		1.5	0.8	
		Ordinary construction		1		
		Non-combustible construction	Yes	0.8		
		Modified Fire resistive construction (2 hrs)		0.6		
		Fire resistive construction (> 3 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	3583			
		Number of Floors/Storeys	1			
		Area of structure considered (m^2)			**3,583**	
	F	**Base fire flow without reductions**				**11,000**
		F = 220 **C** (**A**)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**			**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	0%	**11,000**
		Limited combustible		-15%		
		Combustible	Yes	0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**			**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	Yes	-30%	-30%	**-4,400**
		Standard Water Supply	Yes	-10%	-10%	
		Fully Supervised System	No	-10%		
				Cumulative Total	**-40%**	
5	**Exposure Surcharge (cumulative %)**				**Surcharge**	
	(3)	North Side	30.1- 45 m		5%	**550**
		East Side	> 45.1m		0%	
		South Side	> 45.1m		0%	
		West Side	> 45.1m		0%	
				Cumulative Total	**5%**	
Results						
6	**(1) + (2) + (3)**	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**7,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**117**
				or	USGPM	1,849
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	2
		Required Volume of Fire Flow (m^3)			m^3	840

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 117148
Project Name: 4149 Strandherd
Date: 2/28/2020
Input By: Anthony Mestwarp
Reviewed By: Cara Ruddle

Legend: Input by User; No Information or Input Required

Building Description: 6 Storey Hotel
Non-combustible construction

Step			Input		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction C	Wood frame		1.5	0.8	
		Ordinary construction		1		
		Non-combustible construction	Yes	0.8		
		Modified Fire resistive construction (2 hrs)		0.6		
		Fire resistive construction (> 3 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	1013			
		Number of Floors/Storeys	6			
		Area of structure considered (m^2)			**6,078**	
	F	**Base fire flow without reductions**				**14,000**
		F = 220 C (A)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**			**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	0%	**14,000**
		Limited combustible		-15%		
		Combustible	Yes	0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**			**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	Yes	-30%	-30%	**-5,600**
		Standard Water Supply	Yes	-10%	-10%	
		Fully Supervised System	No	-10%		
				Cumulative Total	**-40%**	
5	**Exposure Surcharge (cumulative %)**				**Surcharge**	
	(3)	North Side	> 45.1m		0%	**0**
		East Side	> 45.1m		0%	
		South Side	> 45.1m		0%	
		West Side	> 45.1m		0%	
				Cumulative Total	**0%**	
Results						
6	(1) + (2) + (3)	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**8,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**133**
				or	USGPM	2,114
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	2
		Required Volume of Fire Flow (m^3)			m^3	960

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 117148
Project Name: 4149 Strandherd
Date: 2/28/2020
Input By: Anthony Mestwarp
Reviewed By: Cara Ruddle

Legend: Input by User; No Information or Input Required

Building Description: 5 Storey Office Building
Non-combustible construction

Step			Input		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction C	Wood frame		1.5	0.8	
		Ordinary construction		1		
		Non-combustible construction	Yes	0.8		
		Modified Fire resistive construction (2 hrs)		0.6		
		Fire resistive construction (> 3 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	1566			
		Number of Floors/Storeys	5			
		Area of structure considered (m^2)			**7,830**	
	F	**Base fire flow without reductions**				**16,000**
		F = 220 C (A)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**			**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	0%	**16,000**
		Limited combustible		-15%		
		Combustible	Yes	0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**			**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	Yes	-30%	-30%	**-6,400**
		Standard Water Supply	Yes	-10%	-10%	
		Fully Supervised System	No	-10%		
				Cumulative Total	**-40%**	
5	**Exposure Surcharge (cumulative %)**				**Surcharge**	
	(3)	North Side	20.1 - 30 m		10%	**2,400**
		East Side	> 45.1m		0%	
		South Side	30.1- 45 m		5%	
		West Side	> 45.1m		0%	
				Cumulative Total	**15%**	
Results						
6	(1) + (2) + (3)	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**12,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**200**
				or	USGPM	3,170
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	2.5
		Required Volume of Fire Flow (m^3)			m^3	1800

CONNECTION AT JOCKVALE AND CEDARVIEW

JOCKVALE ROAD
MARAVISTA DRIVE
KENNEVALE DRIVE
STRANDHERD DRIVE
CN RAIL LINE
MCKENNA CASEY DRIVE
FALLOWFIELD ROAD
O'KEEFE COURT
CROSSKEY PLACE
SYSTEMHOUSE STREET
DEALERSHIP STREET
PHILSAR STREET
NORTEL DRIVE
FUTURE CROSSKEY PLACE
CN RAIL LINE
VETERANS MEMORIAL HIGHWAY NO. 416

BLOCK 1
BLOCK 2
BLOCK 3
BLOCK 4
BLOCK 5
BLOCK 6
BLOCK 7
BLOCK 8
BLOCK 9
BLOCK 10
BLOCK 11
BLOCK 12
BLOCK 14
BLOCK 16
BLOCK 17
BLOCK 18
BLOCK 19

O'KEEFE DRAIN

STORMWATER MANAGEMENT FACILITY BLOCK 12

FUTURE DEVELOPMENT (BY OTHERS)

FUTURE PHASE (BY OWNER)

STRANDHERD SNOW DISPOSAL FACILITY

LEGEND

- 9 — PROPOSED FEEDERMAIN (250mm dia) AND PIPE NUMBER
- 6 — PROPOSED DISTRIBUTION WATERMAIN (200mm dia) AND PIPE NUMBER
- 5 — PROPOSED BACKBONE WATERMAIN (400mm dia) BY OTHERS AND PIPE NUMBER
- 6 — WATERMAIN NODE AND NUMBER
- 2 — RESERVOIR AND NUMBER (BOUNDARY CONDITION LOCATION)
- 3 — EXISTING DISTRIBUTION / FEEDERMAIN (300mm dia) AND PIPE NUMBER
- PHASE LINE (PHASE 1)

NOVATECH ENGINEERING CONSULTANTS LTD.
ENGINEERS & PLANNERS
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K2M 1P6
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Facsimile (613) 254-5867
Email: novainfo@novatech-eng.com

CITI GATE
416 CORPORATE CAMPUS

Water Servicing (Phase 1)

SCALE: N.T.S

DATE: AUG 2014 | JOB: 109203-CG | FIGURE: FIG D1

SHT11X17.DWG - 279mmX432mm

Table 2
Phase 1
Water Demand

Node	Block #	Area (ha)	Demand (L/s)		
			High Pressure (Average Day)	Max. Daily	Peak Hour
14	16	2.2	0.89	1.34	1.60
15	1	3.7	1.50	2.25	2.70
16	2	12.2	4.94	7.41	8.90
17	3	6.2	2.51	3.77	4.52
18	4	3.2	1.30	1.94	2.33
19	5	1.8	0.73	1.09	1.31
20	6	1.6	0.65	0.97	1.17
21	8	1.3	0.53	0.79	0.95
22	9	1.3	0.53	0.79	0.95
23	10	3.0	1.22	1.82	2.19
24	11	3.0	1.22	1.82	2.19
			16.00	24.00	28.80

Notes:

1. All water demand calculations based on the City of Ottawa Design Guidelines for Water Distribution Table 4.2.
2. Water Demand is based assuming all lands to be Industrial - Light with a demand of 35,000L/gross ha/d.
3. Peaking Factors: Maximum Daily Demand = 1.5 average daily demand (High Pressure); Peak Hour = 1.8 average daily

Table 3
Phase 1
Peak Hour Check

Node	Block #	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m)	Pressure (PSI)
1		95.0	0.0	148.1	53.1	75.3
2		96.0	0.0	148.0	52.1	73.8
3		96.2	0.0	148.0	51.8	73.4
4		95.7	0.0	147.7	52.0	73.7
5		96.1	0.0	147.7	51.7	73.2
6		94.1	0.0	147.5	53.4	75.8
7		93.9	0.0	147.5	53.6	76.0
8		93.5	0.0	147.5	54.1	76.7
9		92.4	0.0	147.5	55.1	78.1
10		94.0	0.0	147.5	53.5	75.9
11		94.0	0.0	147.5	53.5	75.9
12		93.8	0.0	147.5	53.7	76.1
13		94.0	0.0	147.5	53.5	75.9
14	16	96.0	1.6	148.1	52.1	73.9
15	1	96.0	2.7	148.1	52.1	73.9
16	2	97.2	8.9	147.7	50.5	71.7
17	3	97.1	4.5	147.7	50.6	71.8
18	4	95.1	2.3	147.5	52.4	74.4
19	5	94.5	1.3	147.5	53.0	75.2
20	6	93.5	1.2	147.5	54.0	76.6
21	8	95.0	1.0	147.5	52.5	74.5
22	9	95.0	1.0	147.5	52.5	74.4
23	10	95.0	2.2	147.5	52.5	74.4
24	11	95.3	2.2	147.5	52.2	74.0
25*		147.7	28.4	147.7	0.0	0.0
26*		147.6	18.2	147.6	0.0	0.0
27*		148.0	22.8	148.0	0.0	N/A
28*		148.2	-98.2	148.2	0.0	N/A

*** Boundary Condition**

Minimum Pressure

Prepared By:
NOVATECH ENGINEERING CONSULTANTS LTD.
Date: August 9, 2012
Rev: November 20, 2012
Rev: August 9, 2013
Rev: March 31, 2014
Rev: July 18, 2014
Rev: August 6, 2014

Table 4
Phase 1
High Pressure Check (Average Day)

Node	Block #	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m)	Pressure (PSI)	Age (hrs)
1		95.0	0.0	154.6	59.6	84.5	1.2
2		96.0	0.0	154.7	58.7	83.3	0.9
3		96.2	0.0	154.7	58.5	82.9	0.3
4		95.7	0.0	154.7	59.0	83.6	0.5
5		96.1	0.0	154.7	58.6	83.2	0.3
6		94.1	0.0	154.7	60.6	85.9	0.4
7		93.9	0.0	154.7	60.8	86.2	0.7
8		93.5	0.0	154.7	61.2	86.8	1.4
9		92.4	0.0	154.7	62.3	88.3	2.4
10		94.0	0.0	154.7	60.7	86.0	1.2
11		94.0	0.0	154.7	60.7	86.0	2.0
12		93.8	0.0	154.7	60.9	86.3	4.8
13		94.0	0.0	154.7	60.7	86.0	5.0
14	16	96.0	0.9	154.6	58.6	83.1	2.3
15	1	96.0	1.5	154.6	58.6	83.1	2.6
16	2	97.2	4.9	154.7	57.5	81.5	1.1
17	3	97.1	2.5	154.7	57.6	81.7	1.4
18	4	95.1	1.3	154.7	59.6	84.5	1.7
19	5	94.5	0.7	154.7	60.2	85.3	3.3
20	6	93.5	0.7	154.7	61.2	86.7	4.5
21	8	95.0	0.5	154.7	59.7	84.6	3.9
22	9	95.0	0.5	154.7	59.7	84.6	4.6
23	10	95.0	1.2	154.7	59.7	84.6	6.2
24	11	95.3	1.2	154.7	59.4	84.2	6.2
25*		154.7	-5.5	154.7	0.0	0.0	N/A
26*		154.7	-6.2	154.7	0.0	0.0	N/A
27*		154.7	-66.9	154.7	0.0	N/A	N/A
28*		154.6	62.6	154.6	0.0	N/A	N/A

*** Boundary Condition**

Maximum Pressure
Maximum Time

Prepared By:
NOVATECH ENGINEERING CONSULTANTS LTD.
Date: August 9, 2012
Rev: November 20, 2012
Rev: August 9, 2013
Rev: March 31, 2014
Rev: August 6, 2014

Table 5E
Phase 1
Max Daily Demand and Fire at Node 18 - Block 4

Node	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m)	Pressure (PSI)
1	95.0	0.0	145.3	50.3	71.3
2	96.0	0.0	144.9	49.0	69.5
3	96.2	0.0	144.8	48.6	68.9
4	95.7	0.0	143.3	47.6	67.4
5	96.1	0.0	143.2	47.1	66.8
6	94.1	0.0	132.1	38.0	53.8
7	93.9	0.0	132.0	38.1	54.1
8	93.5	0.0	132.0	38.6	54.7
9	92.4	0.0	132.0	39.6	56.2
10	94.0	0.0	132.0	38.0	53.9
11	94.0	0.0	132.0	38.0	53.9
12	93.8	0.0	132.0	38.2	54.2
13	94.0	0.0	132.0	38.0	53.9
14	96.0	1.3	145.3	49.3	69.8
15	96.0	2.3	145.3	49.3	69.8
16	97.2	7.4	143.9	46.7	66.2
17	97.1	3.8	143.2	46.1	65.4
18	95.1	166.2	127.6	32.5	46.0
19	94.5	1.1	132.0	37.5	53.2
20	93.5	1.0	132.0	38.5	54.6
21	95.0	0.8	132.0	37.0	52.5
22	95.0	0.8	132.0	37.0	52.5
23	95.0	1.8	132.0	37.0	52.5
24	95.3	1.8	132.0	36.7	52.1
25*	143.1	37.8	143.1	N/A	N/A
26*	141.5	-42.7	141.5	N/A	N/A
27*	144.9	-8.2	144.9	N/A	N/A
28*	145.5	-175.2	145.5	N/A	N/A

*** Boundary Condition**

Minimum Pressure

Prepared By:
NOVATECH ENGINEERING CONSULTANTS LTD.
Date: August 9, 2012
Rev: November 20, 2012
Rev: August 9, 2013
Rev: March 31, 2014
Rev: August 6, 2014

Table 5
Phase 1
Max Daily Demand and Fire Flow Summary

Fire Location	Node Block #	Min Pressure	Fire Flow (LPS)	Pressure (m)	Pressure (PSI)
14	16	14	164.3	39.2	55.6
15	1	15	164.3	36.2	51.4
16	2	16	164.3	36.4	51.6
17	3	17	164.3	35.0	49.7
18	4	18	164.3	32.5	46.0
19	5	19	164.3	23.1	32.8
20	6	20	164.3	22.2	31.5
21	8	21	164.3	22.9	32.4
22	9	22	164.3	20.8	29.5
23	10	23	164.3	18.1	25.7
24	11	24	164.3	17.8	25.2

Melanie Riddell

From: Melanie Riddell
Sent: July-16-14 10:10 AM
To: Mark Bowen
Subject: FW: Strandherd Drive - 416 Lands Watermain Boundary Conditions

Melanie E. Riddell, P.Eng.
Project Manager

NOVATECH
Engineers, Planners & Landscape Architects

240 Michael Cowpland Drive, Suite 200, Ottawa ON K2M 1P6

Tel: 613.254.9643 Cel: 613.276.7240 Fax: 613.254.5867

From: Shillington, Jeffrey [mailto:jeff.shillington@ottawa.ca]
Sent: May-26-14 4:02 PM
To: Melanie Riddell
Subject: FW: Strandherd Drive - 416 Lands Watermain Boundary Conditions

Attached are the updated boundary conditions that should be used in the Citi Gate design.

Regards,

Jeff Shillington, P.Eng.
Project Manager, Infrastructure Approvals, Suburban West
Planning and Growth Management Department
City of Ottawa
tel: 580-2424 x 16960
email: jeff.shillington@ottawa.ca

From: Rogers, Christopher
Sent: January 28, 2014 11:00 AM
To: Shillington, Jeffrey; Diduch, Roman
Subject: RE: Strandherd Drive - 416 Lands Watermain Boundary Conditions

Jeff,

Here are boundary conditions, based on existing system plus proposed Strandherd 406mm watermain, from Fallowfield/O'Keefe to Kennevale only, with connections at Fallowfield, Jockvale, Maravista and Kennevale.

Regards,

Chris

Strandherd at Kennevale
PKHR = 147.6m
Max HGL = 154.7m
MXDY+Fire (125 L/s) = 143.7m
MXDY+Fire (165 L/s) = 141.5m

Strandherd at Marivista
PKHR = 147.7m
Max HGL = 154.7m
MXDY+Fire (125 L/s) = 144.9m
MXDY+Fire (165 L/s) = 143.1m

Strandherd at Jockvale
PKHR = 148.0m
Max HGL = 154.7m
MXDY+Fire (125 L/s) = 146.3m
MXDY+Fire (165 L/s) = 144.9m

Strandherd at Fallowfield
PKHR = 148.2m
Max HGL = 154.6m
MXDY+Fire (125 L/s) = 146.7m
MXDY+Fire (165 L/s) = 145.5m

From: Shillington, Jeffrey
Sent: 2014/01/07 11:57
To: Diduch, Roman
Cc: Rogers, Christopher
Subject: FW: Strandherd Drive - 416 Lands Watermain Boundary Conditions

Roman,

Please see the email from Novatech. Could you please confirm that the previously provided boundary conditions are still applicable.

Thanks,

Jeff Shillington, P.Eng.
Project Manager, Infrastructure Approvals, Suburban West
Planning and Growth Management Department
City of Ottawa
tel: 580-2424 x 16960
email: jeff.shillington@ottawa.ca

From: Drew Blair [mailto:D.Blair@novatech-eng.com]
Sent: December 18, 2013 1:04 PM
To: Shillington, Jeffrey
Cc: Marc St.Pierre
Subject: Strandherd Drive - 416 Lands Watermain Boundary Conditions

Hi Jeff,

Can you please confirm the watermain boundary conditions that will be utililized for the Strandherd Drive - 416 Lands project we are currently working on. Roman had provided watermain boundary conditions in 2012 (see below) however there may be some changes to the system since then. As per the attached plan, there will be four connection points for the proposed 400mm backbone watermain on Strandherd Drive:

1) Strandherd at Kennevale (stub size from Kennevale to be confirmed)
2) Strandherd at Maravista (stub size from Maravista to be confirmed)
3) Strandherd at Jockvale (400mm stub from Claridge Lands to be confirmed)
4) Strandherd at Fallowfield (400mm watermain will have to extend up Fallowfield to connect to 400mm stub at O'Keefe Court entrance)

We appreciate your help in providing this boundary condition information in order that we can update the hydraulic analysis for the Strandherd Drive project.

Regards,

Drew

Drew D. Blair, P.Eng.
Project Engineer
****

Novatech Engineering Consultants Ltd.
200 - 240 Michael Cowpland Drive
Kanata, Ontario K2M 1P6

Tel: 613.254.9643
Fax: 613.254.5867

From: Diduch, Roman [mailto:Roman.Diduch@ottawa.ca]
Sent: November-21-12 8:55 AM
To: Mark Bowen
Subject: RE: 416 Business Park Required Boundary Conditions

Mark
The boundary locations for the 2012 condition should be for Cobble Hill instead of Strandherd. The Cobble Hill @ Kennevale HGL for 165l/s fire for current conditions should have been 137.5 not 147.5 m. For the future condition the locations were at Strandherd because of the proposed 406mm watermain.

Fire flows were located at Strandherd @ Marvista.

The corrected table is shown below.

	HGL (Meter)		
Current			
	Cedarview @ Jockvale	Cobble Hill @ Marvista	Cobble Hill@ Kennevale
Peak Hr	151.5	150.8	150.6
Max Day & 125 l/s fire	149.0	139.0	141.6
Max Day & 165 l/s fire	149.0	133.0	**137.5**
	Cedarview @ Jockvale	Strandherd@ Marvista	Strandherd@ Kennevale
Future			
Peak Hr	151.5	150.8	150.6
Max Day & 125 l/s fire	149.1	148.1	148.2
Max Day & 165 l/s fire	149.0	147.0	147.5

Watermain sizes for the business park are governed by fire flow conditions. A 250mm pipe is an acceptable size.

I apologize for any confusion created.

Roman Diduch, P.Eng

Program Manager
Infrastructure Policy Unit
Planning and Growth Management
110 Laurier Ave. W, 4th Floor, Ontario K1P 1J1

tel: 613-580-2424 ext 22625
fax: 613-580-2459

From: Mark Bowen [mailto:M.Bowen@novatech-eng.com]
Sent: November 19, 2012 3:18 PM
To: Diduch, Roman
Cc: Mike Petepiece; John Riddell
Subject: RE: 416 Business Park Required Boundary Conditions

Hi Roman,

Reviewing the boundary conditions of the “Peak Hr” and “Max Day & 165 l/s fire” conditions for the “current” and “future” watermain conditions listed below, the HGL at Cedar/Jockville and Strandherd/Kennevale is exactly the same and the Strandherd/Marvista boundary is similar. Currently there is no watermain on Strandherd between Kennevale and Marvista. Can you please confirm the conditions provided below are accurate? In addition can you please confirm the City will accept the design of a business park with a maximum proposed watermain size of 250mm, assuming the watermain meets all design criteria for performance (i.e. operating pressures)?

Mark Bowen
Junior Engineer
****
Novatech Engineering Consultants Ltd.

Suite 200, 240 Michael Cowpland Drive
Kanata, Ontario
K2M 1P6

Tel: (613) 254-9643 x 231
Fax: (613) 254-5867

http://www.novatech-eng.com

From: Diduch, Roman [mailto:Roman.Diduch@ottawa.ca]
Sent: Thursday, August 09, 2012 1:05 PM
To: Mark Bowen
Subject: RE: 416 Business Park Required Boundary Conditions

These boundary conditions were created with a different model and updated conditions from that previously provided to IBI

	HGL (Meter)		
Current			
	Cedarview @ Jockvale	Strandherd@ Marvista	Strandherd@ Kennevale
Peak Hr	151.5	150.8	150.6
Max Day & 125 l/s fire	149.0	139.0	141.6
Max Day & 165 l/s fire	149.0	133.0	147.5
Future			
Peak Hr	151.5	150.8	150.6
Max Day & 125 l/s fire	149.1	148.1	148.2
Max Day & 165 l/s fire	149.0	147.0	147.5

Roman Diduch, P.Eng

Program Manager
Infrastructure Policy Unit
Planning and Growth Management
110 Laurier Ave. W, 4th Floor, Ontario K1P 1J1

tel: 613-580-2424 ext 22625
fax: 613-580-2459

From: Mark Bowen [mailto:M.Bowen@novatech-eng.com]
Sent: August 08, 2012 2:57 PM
To: Diduch, Roman
Cc: Tremblay, Marc (PGM); John Riddell
Subject: 416 Business Park Required Boundary Conditions
Importance: High

Hi Roman,

Marc Tremblay and John Riddell have requested that I contact you directly for the required watermain boundary conditions for the proposed 416 Business Park in Barrhaven. The attached NECL PDF highlights the limits of the proposed site and connection points to the existing watermain.

For your reference I've attached the previously issued watermain boundary conditions to IBI for the Conceptual Site Servicing Report for the Tartan Lands in west Barrhaven (IBI.pdf). The first page of the IBI.pdf shows the location of IBI's site in relation to the proposed site and Standherd Drive. The second page shows the proposed watermain within IBI's site and the connections to the existing watermain. The third page highlights the City provided watermain boundary conditions.

The proposed site will be construction in phases over several years; therefore, can you please provide the existing and future (400mm w/m) boundary conditions for the proposed connection points to Strandherd Drive.

FYI – preliminary fire flow calculations range from 125L/s to 165L/s.

We are working towards submitting to the City this Friday so a quick response would be greatly appreciated. Don't hesitate to call if you have questions.

Regards,

Mark Bowen
Junior Engineer
****
Novatech Engineering Consultants Ltd.

Suite 200, 240 Michael Cowpland Drive
Kanata, Ontario
K2M 1P6

Tel: (613) 254-9643 x 231
Fax: (613) 254-5867

http://www.novatech-eng.com

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Boundary Conditions
4149 Strandherd

Provided Information

Scenario	Demand	
	L/min	L/s
Average Daily Demand	47	0.79
Maximum Daily Demand	71	1.18
Peak Hour	128	2.14
Fire Flow Demand #1	4,000	66.67
Fire Flow Demand #2	7,000	116.67

Location

Results

Connection 1 – Dealership Dr.

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	154.4	83.5
Peak Hour	147.0	73.0
Max Day plus Fire 1	151.0	78.7
Max Day plus Fire 2	148.0	74.4

Ground Elevation = 95.6 m

Connection 2 – Strandherd Dr.

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	154.4	83.7
Peak Hour	147.0	73.2
Max Day plus Fire 1	152.2	80.6
Max Day plus Fire 2	151.4	79.5

Ground Elevation = 95.5 m

Notes

1. As per the Ontario Building Code in areas that may be occupied, the static pressure at any fixture shall not exceed 552 kPa (80 psi.) Pressure control measures to be considered are as follows, in order of preference:
    a. If possible, systems to be designed to residual pressures of 345 to 552 kPa (50 to 80 psi) in all occupied areas outside of the public right-of-way without special pressure control equipment.
    b. Pressure reducing valves to be installed immediately downstream of the isolation valve in the home/ building, located downstream of the meter so it is owner maintained.

Disclaimer

The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation. Fire Flow analysis is a reflection of available flow in the watermain; there may be additional restrictions that occur between the watermain and the hydrant that the model cannot take into account.

APPENDIX D
SANITARY CALCULATIONS

McINTOSH PERRY

McINTOSH PERRY

CCO-22-2933 - MYERS - PHASE 1 - EXISTING BUILDING - SANITARY DEMANDS

Project:	MYERS - PHASE 1 - EXISTING BUILDING
Project No.:	CCO-22-2933
Designed By:	M.M.
Checked By:	A.G.
Date:	March 1, 2022

Site Area	1.13	Gross ha	* Area revised from 1.18 ha (Previously Approved Design)
Employee	50	Persons	* Per Previously Approved Design
Total Population	50	Persons	
Car Wash	55	Cars/day	
Car Service	50	Cars/day	

DESIGN PARAMETERS

Institutional/Commercial Peaking Factor	1.5	
Residential Peaking Factor	3.65	* Using Harmon Formula = 1+(14/(4+P^0.5))*0.8 where P = population in thousands, Harmon's Correction Factor = 0.8
Mannings coefficient (n)	0.013	
Demand (per capita)	280	L/day
Infiltration allowance	0.33	L/s/Ha

EXTRANEOUS FLOW ALLOWANCES

Infiltration / Inflow	Flow (L/s)
Dry	0.06
Wet	0.32
Total	0.37

AVERAGE DAILY DEMAND

DEMAND TYPE	AMOUNT	UNITS	POPULATION / AREA	Flow (L/s)
Residential	280	L/c/d		0
Industrial - Light**	35,000	L/gross ha/d		0
Industrial - Heavy**	55,000	L/gross ha/d		0
Commercial / Amenity	2,800	L/(1000m² /d)		0
Hospital	900	L/(bed/day)		0
Schools	70	L/(Student/d)		0
Car wash	400	L/Veh/d	55	0.255
Car Service	40	L/Car Serviced/d	50	0.023
Employees	75	L/Person/d	50	0.043
Mobile Home Parks	1,000	L/(Space/d)		0
Motels	150	L/(bed-space/d)		0
Hotels	225	L/(bed-space/d)		0
Office	75	L/7.0m^2/d		0
Tourist Commercial	28,000	L/gross ha/d		0
Other Commercial	28,000	L/gross ha/d		0

AVERAGE RESIDENTIAL FLOW	0.00	L/s
PEAK RESIDENTIAL FLOW	0.00	L/s
AVERAGE ICI FLOW	0.32	L/s
PEAK INSTITUTIONAL/ COMMERCIAL FLOW	0.48	L/s
PEAK INDUSTRIAL FLOW	0.00	L/s
TOTAL PEAK ICI FLOW	0.48	L/s

TOTAL SANITARY DEMAND

TOTAL ESTIMATED AVERAGE DRY WEATHER FLOW	0.38	L/s
TOTAL ESTIMATED PEAK DRY WEATHER FLOW	0.54	L/s
TOTAL ESTIMATED PEAK WET WEATHER FLOW	0.85	L/s

McINTOSH PERRY

CCO-22-2933 - MYERS - BUILDING C - SANITARY DEMANDS

Project:	MYERS - BUILDING C
Project No.:	CCO-22-2933
Designed By:	M.M.
Checked By:	A.G.
Date:	March 1, 2022

Site Area	1.11	Gross ha	* Area revised from 1.44 ha (Previously Approved Design)
Employee	40	Persons	
Total Population	40	Persons	
Car Wash	50	Cars/day	
Car Service	50	Cars/day	

DESIGN PARAMETERS

Institutional/Commercial Peaking Factor	1.5	
Residential Peaking Factor	3.67	* Using Harmon Formula = 1+(14/(4+P^0.5))*0.8 where P = population in thousands, Harmon's Correction Factor = 0.8
Mannings coefficient (n)	0.013	
Demand (per capita)	280	L/day
Infiltration allowance	0.33	L/s/Ha

EXTRANEOUS FLOW ALLOWANCES

Infiltration / Inflow	Flow (L/s)
Dry	0.06
Wet	0.31
Total	0.37

AVERAGE DAILY DEMAND

DEMAND TYPE	AMOUNT	UNITS	POPULATION / AREA	Flow (L/s)
Residential	280	L/c/d		0
Industrial - Light**	35,000	L/gross ha/d		0
Industrial - Heavy**	55,000	L/gross ha/d		0
Commercial / Amenity	2,800	L/(1000m² /d)		0
Hospital	900	L/(bed/day)		0
Schools	70	L/(Student/d)		0
Car wash	400	L/Veh/d	50	0.231
Car Service	40	L/Car Serviced/d	50	0.023
Employees	75	L/Person/d	40	0.035
Mobile Home Parks	1,000	L/(Space/d)		0
Motels	150	L/(bed-space/d)		0
Hotels	225	L/(bed-space/d)		0
Office	75	L/7.0m^2/d		0
Tourist Commercial	28,000	L/gross ha/d		0
Other Commercial	28,000	L/gross ha/d		0

AVERAGE RESIDENTIAL FLOW	0.00	L/s
PEAK RESIDENTIAL FLOW	0.00	L/s
AVERAGE ICI FLOW	0.29	L/s
PEAK INSTITUTIONAL/ COMMERCIAL FLOW	0.43	L/s
PEAK INDUSTRIAL FLOW	0.00	L/s
TOTAL PEAK ICI FLOW	0.43	L/s

TOTAL SANITARY DEMAND

TOTAL ESTIMATED AVERAGE DRY WEATHER FLOW	0.34	L/s
TOTAL ESTIMATED PEAK DRY WEATHER FLOW	0.49	L/s
TOTAL ESTIMATED PEAK WET WEATHER FLOW	0.80	L/s

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info@mcintoshperry.com | www.mcintoshperry.com

McINTOSH PERRY

CCO-22-2933 - MYERS - BUILDING B - SANITARY DEMANDS

Project:	MYERS - BUILDING B
Project No.:	CCO-22-2933
Designed By:	M.M.
Checked By:	A.G.
Date:	March 1, 2022

Ste Area	1.145	Gross ha	* Area revised from 0.75 ha (Previously Approved Design)
Employee	35	Persons	
Total Population	35	Persons	
Car Wash	30	Cars/day	
Car Service	30	Cars/day	

DESIGN PARAMETERS

Institutional/Commercial Peaking Factor	1.5	
Residential Peaking Factor	3.67	* Using Harmon Formula =
Mannings coefficient (n)	0.013	
Demand (per capita)	280	L/day
Infiltration allowance	0.33	L/s/Ha

EXTRANEOUS FLOW ALLOWANCES

Infiltration / Inflow	Flow (L/s)
Dry	0.06
Wet	0.32
Total	0.38

AVERAGE DAILY DEMAND

DEMAND TYPE	AMOUNT	UNITS	POPULATION / AREA	Flow (L/s)
Residential	280	L/c/d		0
Industrial - Light**	35,000	L/gross ha/d		0
Industrial - Heavy**	55,000	L/gross ha/d		0
Commercial / Amenity	2,800	L/(1000m² /d)		0
Hospital	900	L/(bed/day)		0
Schools	70	L/(Student/d)		0
Car wash	400	L/Veh/d	30	0.139
Car Service	40	L/Car Serviced/d	30	0.014
Employees	75	L/Person/d	35	0.030
Mobile Home Parks	1,000	L/(Space/d)		0
Motels	150	L/(bed-space/d)		0
Hotels	225	L/(bed-space/d)		0
Office	75	L/7.0m^2/d		0
Tourist Commercial	28,000	L/gross ha/d		0
Other Commercial	28,000	L/gross ha/d		0

AVERAGE RESIDENTIAL FLOW	0.00	L/s
PEAK RESIDENTIAL FLOW	0.00	L/s
AVERAGE ICI FLOW	0.18	L/s
PEAK INSTITUTIONAL/ COMMERCIAL FLOW	0.27	L/s
PEAK INDUSTRIAL FLOW	0.00	L/s
TOTAL PEAK ICI FLOW	0.27	L/s

TOTAL SANITARY DEMAND

TOTAL ESTIMATED AVERAGE DRY WEATHER FLOW	0.24	L/s
TOTAL ESTIMATED PEAK DRY WEATHER FLOW	0.33	L/s
TOTAL ESTIMATED PEAK WET WEATHER FLOW	0.65	L/s

SANITARY SEWER DESIGN SHEET

PROJECT: CCO-22-2933 - MYERS
LOCATION: 4149 STRANDHERD DRIVE, OTTAWA
CLIENT: BBS

McINTOSH PERRY

LOCATION				RESIDENTIAL									ICI AREAS						INFILTRATION ALLOWANCE			FLOW	SEWER DATA						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	20	21	22	23	24	25	26	27	28	29	30	31
STREET	AREA ID	FROM MH	TO MH	UNIT TYPES				AREA (ha)	POPULATION		PEAK FACTOR	PEAK FLOW (L/s)	AREA (ha)					PEAK FLOW (L/s)	AREA (ha)		FLOW (L/s)	DESIGN FLOW (L/s)	CAPACITY (L/s)	LENGTH (m)	DIA (mm)	SLOPE (%)	VELOCITY (full) (m/s)	AVAILABLE CAPACITY	
				SF	SD	TH	APT		IND	CUM			INSTITUTIONAL		COMMERCIAL		INDUSTRIAL		IND	CUM								L/s	(%)
													IND	CUM	IND	CUM	IND												
BUILDING C	A	BLDG C	MH1					0.00	0.0	0.0	3.80	0.00		0.00	1.11	1.11		0.43	1.11	1.11	0.37	0.80	34.22	20.83	200	1.00	1.055	33.42	97.68
BUILDING C	A	MH1	MH2					0.00	0.0	0.0	3.80	0.00		0.00		1.11		0.43	0.00	1.11	0.37	0.80	48.39	17.46	200	2.00	1.492	47.59	98.36
BUILDING C	A	MH2	MH3					0.00	0.0	0.0	3.80	0.00		0.00		1.11		0.43	0.00	1.11	0.37	0.80	24.19	85.10	200	0.50	0.746	23.40	96.71
EXISTING BUILDING A	B	BLDG A	MH3					0.00	0.0	0.0	3.80	0.00		0.00	1.13	1.13		0.48	1.13	1.13	0.37	0.85	83.81	19.10	200	6.00	2.584	46.30	98.98
BUILDING B	C	BLDG B	MH128					0.00	0.0	0.0	3.80	0.00		0.00	1.15	1.15		0.27	1.15	1.15	0.38	0.65	34.22	13.06	200	1.00	1.055	33.57	98.11
BUILDING B	C	MH128	MH3					0.00	0.0	0.0	3.80	0.00		0.00		1.15		0.27	0.00	1.15	0.38	0.65	34.22	15.00	200	1.00	1.055	33.57	98.11
DEALERSHIP DRIVE		MH3	MH4					0.00	0.0	0.0	3.80	0.00		0.00	0.00	3.38		1.18	0.00	3.38	1.12	2.30	24.19	57.60	200	0.50	0.746	21.90	90.51
DEALERSHIP DRIVE		MH4	T.V.S. CONC.					0.00	0.0	0.0	3.80	0.00		0.00		3.38		1.18	0.00	3.38	1.12	2.30	34.22	12.50	200	1.00	1.055	31.92	93.29

Design Parameters:

Residential			ICI Areas			
SF	3.4	p/p/u				Peak Factor
TH/SD	2.7	p/p/u	INST	28,000	L/Ha/day	1.5
APT	2.3	p/p/u	COM	28,000	L/Ha/day	1.5
Other	60	p/p/Ha	IND	35,000	L/Ha/day	MOE Chart

Notes:
1. Mannings coefficient (n) = 0.013
2. Demand (per capita): 280 L/day
3. Infiltration allowance: 0.33 L/s/Ha
4. Residential Peaking Factor:
Harmon Formula = 1+(14/(4+P^0.5)*0.8)
where P = population in thousands

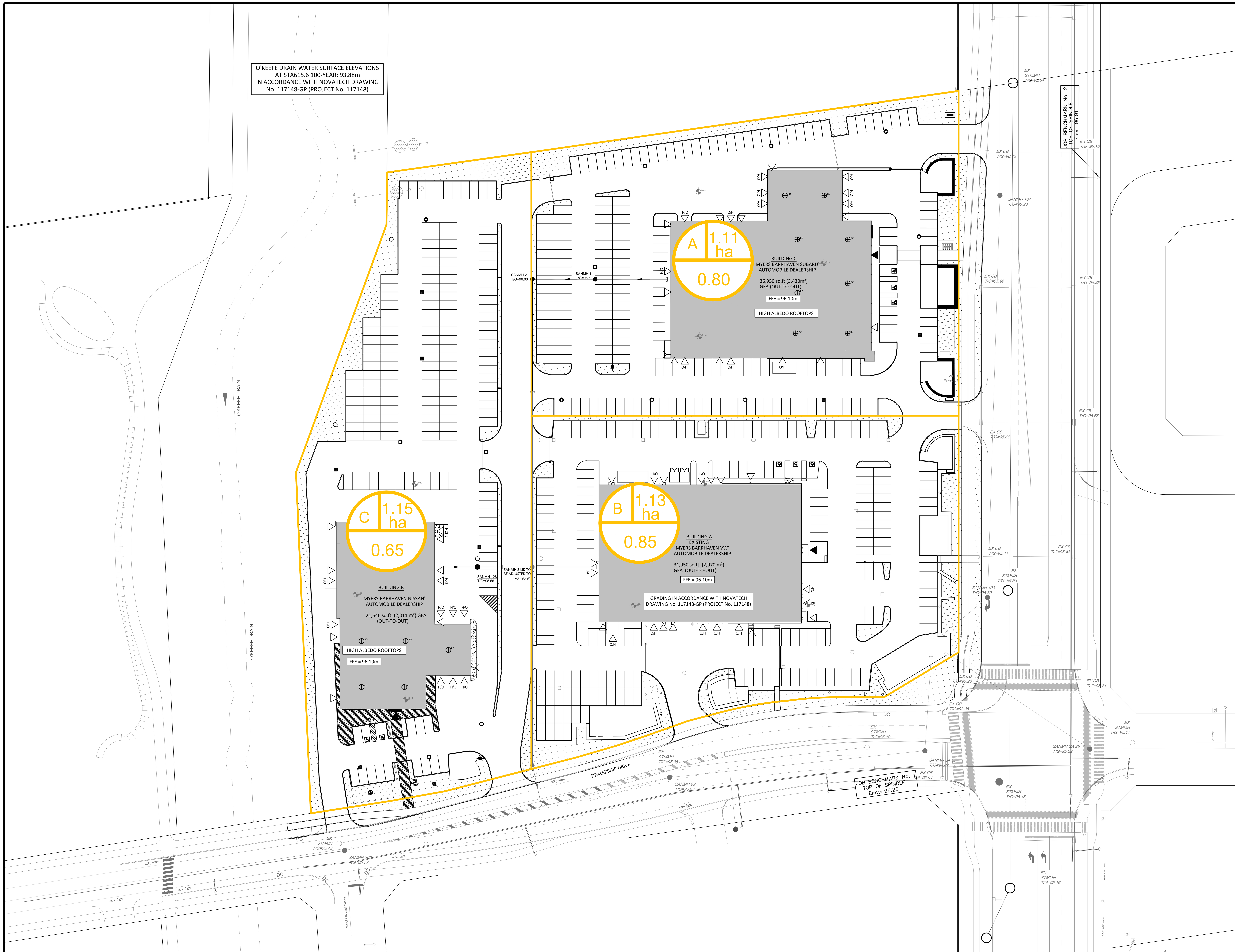
Designed: M.M.
Checked: A.G.
Project No.: CCO-22-2933

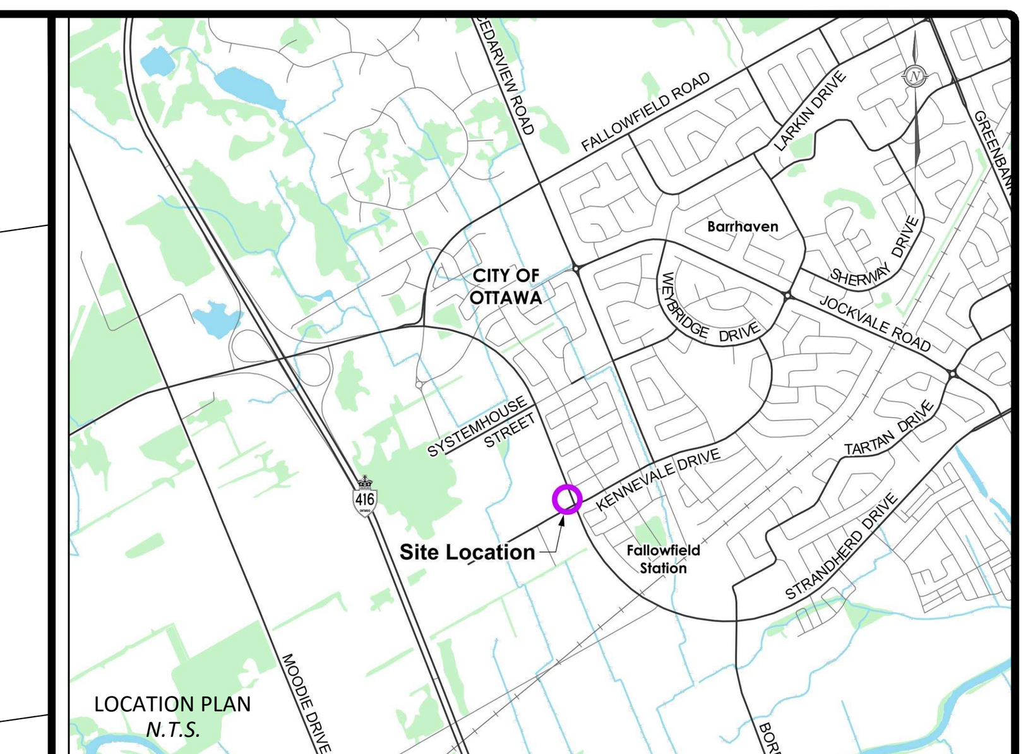
No.	Revision	Date
1	ISSUED FOR REVIEW	2022-03-01
2	ISSUED FOR REVIEW	2022-08-19

Sheet No: 1 of 1

APPENDIX E
SANITARY DRAINAGE PLAN

McINTOSH PERRY





BENCHMARKS:

No.	DESCRIPTION	ELEVATION
1	TOP OF SPINDLE	96.26m
2	TOP OF SPINDLE	96.91m

SCALE 1 : 500

0 10 20 30 40 50 Metres

No.	Revision/Issue	Date
01	ISSUED FOR REVIEW	08/23/2022
00	ISSUED FOR REVIEW	03/02/2022

Check and verify all dimensions before proceeding with the work

Do not scale drawings

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Stamp:

Client:
ZENA INVESTMENTS CORPORATION
1200 BASELINE ROAD, OTTAWA, ON K2C 0A6

Project:
4149 STANDHERD DRIVE
MYERS NISSAN & SUBARU

NEPEAN ONTARIO

Drawing Title:
SANITARY DRAINAGE PLAN

Scale:	1:500	Project Number:	CCO-22-2933
Drawn by:	M.M.		
Checked By:	A.G.	Drawing Number:	SAN
Designed By:	M.M.		

D07-12-22-0040

18069

APPENDIX F
POST-DEVELOPMENT DRAINAGE PLAN

McINTOSH PERRY

O'KEEFE DRAIN WATER SURFACE ELEVATIONS
AT STA615.6 100-YEAR: 93.88m
IN ACCORDANCE WITH NOVATECH DRAWING
No. 117148-GP (PROJECT No. 117148)

B1 0.083 ha 0.90

B2 0.162 ha 0.90

B3 0.473 ha 0.85

B4 0.447 ha 0.86

B5 0.675 ha 0.80

B6 0.325 ha 0.88

B7 0.130 ha 0.90

B8 0.727 ha 0.88

B9 0.218 ha 0.82

B10 0.139 ha 0.20

BUILDING:B
'MYERS BARRHAVEN NISSAN'
AUTOMOBILE DEALERSHIP
21,646 sq.ft. (2,011 m²) GFA
(OUT-TO-OUT)
FFE = 96.10m
HIGH ALBEDO ROOFTOPS

BUILDING:C
'MYERS BARRHAVEN SUBARU'
AUTOMOBILE DEALERSHIP
36,150 sq.ft (3,430m²)
GFA (OUT-TO-OUT)
FFE = 96.10m
HIGH ALBEDO ROOFTOPS

BUILDING:A
EXISTING
'MYERS BARRHAVEN VW'
AUTOMOBILE DEALERSHIP
31,950 sq.ft. (2,970 m²)
GFA (OUT-TO-OUT)
FFE = 96.10m

GRADING IN ACCORDANCE WITH NOVATECH
DRAWING No. 117148-GP (PROJECT No. 117148)

5-YEAR FLOW = 1.90 L/S
100-YEAR FLOW = 3.45 L/S
5-YEAR REQUIRED STORAGE = 17.74m³
100-YEAR REQUIRED STORAGE = 33.92m³
STORAGE AVAILABLE = 34.17m³

5-YEAR FLOW = 4.56 L/S
100-YEAR FLOW = 7.60 L/S
5-YEAR REQUIRED STORAGE = 43.06m³
100-YEAR REQUIRED STORAGE = 81.56m³
STORAGE AVAILABLE = 91.07m³

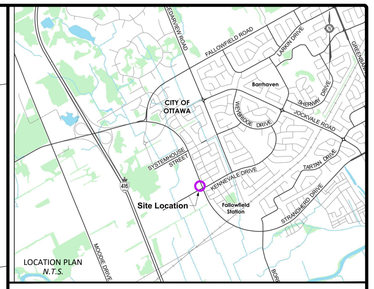
UNCONTROLLED AREA
INCLUDED IN AREA B10

JOB BENCHMARK No. 1
TOP OF SPINDLE
Elev.=96.26

JOB BENCHMARK No. 2
TOP OF SPINDLE
Elev.=96.91

O'KEEFE DRAIN

DEALERSHIP DRIVE



LOCATION PLAN
N.T.S.

AREA I.D
AREA SIZE (HECTARES)
B1 x.xx ha
X.XX
RUNOFF COEFFICIENT (5-YR)

BENCHMARKS:

No.	DESCRIPTION	ELEVATION
1	TOP OF SPINDLE	96.26m
2	TOP OF SPINDLE	96.91m

SCALE 1 : 500
0 10 20 30 40 50 Metres

No.	Revision/Issue	Date
01	ISSUED FOR REVIEW	08/23/2022
00	ISSUED FOR REVIEW	03/02/2022

Check and verify all dimensions before proceeding with the work — Do not scale drawings

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Stamp: LICENSED PROFESSIONAL ENGINEER A.J. GOSLING 100220726 PROVINCE OF ONTARIO

Client:
ZENA INVESTMENTS CORPORATION
1200 BASELINE ROAD, OTTAWA, ON K2C 0A6

Project:
4149 STANDHERD DRIVE
MYERS NISSAN & SUBARU
NEPEAN ONTARIO

Drawing Title:
POST-DEVELOPMENT DRAINAGE PLAN

Scale:	1:500	Project Number:	CCO-22-2933
Drawn by:	M.M.		
Checked By:	A.G.	Drawing Number:	POST
Designed By:	M.M.		

D07-12-22-0040

18069

FILENAME: U:\Ottawa\01 Project - Proposals\2022 jobs\CCO\CCO-22-2933 886_Nissan & Subaru_4149 Strandherd Dr\Civil\12 - Drawings\CCO-22-2933 - 886 Nissan & Subaru - Design.dwg
LAST SAVED: Monday, August 22, 2022 LAST SAVED BY: r.robineau
LAST PLOTTED: Monday, August 22, 2022 CTB FILE USED: —

APPENDIX G
STORMWATER MANAGEMENT CALCULATIONS

McINTOSH PERRY

CCO-22-2933 - 4149 Standherd - Runoff Calculations

Pre-Development Runoff Coefficient

Drainage Area	Area (ha)	Impervious Area (m^2)	C	Gravel Area (m^2)	C	Pervious Area (m^2)	C	C_{AVG} 5-Year	C_{AVG} 100-Year
A1	3.378	9,952.11	0.90	0.00	0.60	23,831.52	0.20	0.41	0.47

Pre-Development Runoff Calculations

Drainage Area	Area (ha)	C 5-Year	C 100-Year	Tc (min)	I (mm/hr)		Q (L/s)	
					5-Year	100-Year	5-Year	100-Year
A1	3.378	0.41	0.47	10	104.2	178.6	397.50	789.76
Total	3.378						397.50	789.76

Post-Development Runoff Coefficient

Drainage Area	Area (ha)	Impervious Area (m^2)	C	Gravel Area (m^2)	C	Pervious Area (m^2)	C	C_{AVG} 5-Year	C_{AVG} 100-Year	
B1	0.083	828.46	0.90	0.00	0.60	0.00	0.20	0.90	1.00	Nissan Flat Roof Area
B2	0.162	1,618.98	0.90	0.00	0.60	0.00	0.20	0.90	1.00	Subaru Flat Roof Area
B3	0.473	4,429.43	0.90	0.00	0.60	305.20	0.20	0.85	0.95	VW North Parking Lot
B4	0.447	4,222.68	0.90	0.00	0.60	251.84	0.20	0.86	0.96	VW South Parking Lot
B5	0.675	5,805.05	0.90	0.00	0.60	940.49	0.20	0.80	0.90	Subaru North Parking Lot
B6	0.325	3,177.34	0.90	0.00	0.60	75.00	0.20	0.88	0.98	Subaru South Parking Lot
B7	0.130	1,300.00	0.90	0.00	0.60	0.00	0.20	0.90	1.00	VW Roof
B8	0.727	6,724.02	0.90	0.00	0.60	442.88	0.20	0.84	0.94	Nissan North Parking Lot
B9	0.218	1,926.25	0.90	0.00	0.60	249.56	0.20	0.82	0.91	Nissan South Parking Lot
B10	0.139	0.00	0.90	0.00	0.60	1,386.45	0.20	0.20	0.25	Uncontrolled Area

Post-Development Runoff Calculations

Drainage Area	Area (ha)	C 5-Year	C 100-Year	Tc (min)	I (mm/hr)		Q (L/s)		
					5-Year	100-Year	5-Year	100-Year	
B1	0.083	0.90	1.00	10	104.2	178.6	21.60	41.12	Nissan Flat Roof Area
B2	0.162	0.90	1.00	10	104.2	178.6	42.21	80.37	Subaru Flat Roof Area
B3	0.473	0.85	0.95	10	104.2	178.6	117.24	223.66	VW North Parking Lot
B4	0.447	0.86	0.96	10	104.2	178.6	111.54	212.74	VW South Parking Lot
B5	0.675	0.80	0.90	10	104.2	178.6	156.78	299.83	Subaru North Parking Lot
B6	0.325	0.88	0.98	10	104.2	178.6	83.26	158.65	Subaru South Parking Lot
B7	0.130	0.90	1.00	10	104.2	178.6	33.89	64.53	VW Roof
B8	0.727	0.84	0.94	10	104.2	178.6	177.85	339.27	Nissan North Parking Lot
B9	0.218	0.82	0.91	10	104.2	178.6	51.66	98.71	Nissan South Parking Lot
B10	0.139	0.20	0.25	10	104.2	178.6	8.03	17.21	Uncontrolled Area
Total	3.378						804.07	1,536.09	

Required Restricted Flow

Drainage Area	Area (ha)	Q 5-Year		Q 100-Year	
		L/s/ha	L/s	L/s/ha	L/s
A1	3.378	35	118.2	126	425.7

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	21.60	41.12	1.90	3.45	17.74	33.92	18.64	34.17	Nissan Flat Roof Area
B2	42.21	80.37	4.56	7.60	43.06	81.56	48.57	91.07	Subaru Flat Roof Area
B3	117.24	223.66	16.44	17.02	79.86	190.78	82.41	190.93	VW North Parking Lot
B4	111.54	212.74	20.51	24.50	67.00	156.07	67.00	156.56	VW South Parking Lot
B5	156.78	299.83	10.30	16.27	142.41	284.92	160.00	289.84	Subaru North Parking Lot
B6	83.26	158.65	8.10	8.50	65.97	151.35	68.85	152.98	Subaru South Parking Lot
B7	33.89	64.53	7.60	11.40	18.40	39.30	48.80	48.80	VW Roof
B8	177.85	339.27	14.00	18.20	152.04	323.53	163.00	334.55	Nissan North Parking Lot
B9	51.66	98.71	25.66	26.15	15.54	48.20	20.89	49.77	Nissan South Parking Lot
B10	8.03	17.21	8.03	17.21	-	-	-	-	Uncontrolled Area
Total	804.07	1,536.09	117.10	150.30	602.02	1,309.62	678.16	1,348.67	

Storage Requirements for Area B1

5-Year Storm Event

Tc (min)	I (mm/hr)	B1 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
10	104.2	21.60	1.90	19.70	11.82
20	70.3	14.56	1.90	12.66	15.19
30	53.9	11.18	1.90	9.28	16.70
40	44.2	9.16	1.90	7.26	17.42
50	37.7	7.80	1.90	5.90	17.71
60	32.9	6.83	1.90	4.93	17.74
70	29.4	6.09	1.90	4.19	17.59
80	26.6	5.51	1.90	3.61	17.31
90	24.3	5.03	1.90	3.13	16.93
100	22.4	4.64	1.90	2.74	16.47

Maximum Storage Required 5-Year (m^3) =	17.74

100-Year Storm Event

Tc (min)	I (mm/hr)	B1 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
10	178.6	41.12	3.45	37.67	22.60
20	120.0	27.63	3.45	24.18	29.01
30	91.9	21.16	3.45	17.71	31.88
40	75.1	17.31	3.45	13.86	33.26
50	64.0	14.73	3.45	11.28	33.84
60	55.9	12.87	3.45	9.42	33.92
70	49.8	11.47	3.45	8.02	33.67
80	45.0	10.36	3.45	6.91	33.18

Maximum Storage Required 100-Year (m^3) =	33.92

Storage Occupied In Area B1

5-Year Storm Event

Roof Storage			
Location	Area*	Depth	Volume (m^3)
Roof	621.35	0.030	18.64
		Total	18.64

Storage Available (m^3) =	18.64
Storage Required (m^3) =	17.74

100-Year Storm Event

Roof Storage			
Location	Area*	Depth	Volume (m^3)
Roof	621.35	0.055	34.17
		Total	34.17

Storage Available (m^3) =	34.17
Storage Required (m^3) =	33.92

* Storage area is 75% of the total roof area

Nissan

Roof Drain Flow (B1)

Roof Drains Summary		
Type of Control Device	Watts Drainage - Accutrol Weir	
Number of Roof Drains	5	
	5-Year	100-Year
Rooftop Storage (m^3)	18.64	34.17
Storage Depth (m)	0.030	0.055
Flow (Per Roof Drain) (L/s)	0.38	0.69
Total Flow (L/s)	1.90	3.45

Flow Rate Vs. Build-Up (One Weir)	
Depth (mm)	Flow (L/s)
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

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

* Roof Drain Flow information taken from Watts Drainage website

CALCULATING ROOF FLOW EXAMPLES

2 roof drains during a 5 year storm
elevation of water = 30mm
Flow leaving 2 roof drains = (2 x 0.36 L/s) = 0.72 L/s

2 roof drains during a 100 year storm
elevation of water = 45mm
Flow leaving 2 roof drains = (2 x 0.54 L/s) = 1.08 L/s

	Roof Drain Flow		
	Flow (l/s)	Storage Depth (mm)	Drains Flow (l/s)
	0.19	15	0.95
	0.25	20	1.25
	0.32	25	1.60
5-Year	0.38	30	1.90
	0.44	35	2.20
	0.50	40	2.50
	0.57	45	2.85
	0.63	50	3.15
100-Year	0.69	55	3.45
	0.76	60	3.80
	0.82	65	4.10
	0.88	70	4.40
	0.95	75	4.75
	1.01	80	5.05
	1.07	85	5.35
	1.13	90	5.65
	1.20	95	6.00
	1.26	100	6.30
	1.32	105	6.60
	1.39	110	6.95
	1.45	115	7.25
	1.51	120	7.55
	1.58	125	7.90
	1.64	130	8.20
	1.70	135	8.50
	1.76	140	8.80
	1.83	145	9.15
	1.89	150	9.45

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

Subaru

Storage Requirements for Area B2

5-Year Storm Event

Tc (min)	I (mm/hr)	B1 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
10	104.2	42.21	1.90	40.31	24.18
40	44.2	17.90	1.90	16.00	38.39
70	29.4	11.90	1.90	10.00	41.99
100	22.4	9.08	1.90	7.18	43.06
130	18.3	7.41	1.90	5.51	42.98
160	15.6	6.30	1.90	4.40	42.25
190	13.6	5.50	1.90	3.60	41.09
220	12.1	4.90	1.90	3.00	39.62
250	10.9	4.43	1.90	2.53	37.94
280	10.0	4.05	1.90	2.15	36.07

Maximum Storage Required 5-Year (m^3) =	43.06

100-Year Storm Event

Tc (min)	I (mm/hr)	B1 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
10	178.6	80.37	3.45	76.92	46.15
50	64.0	28.78	3.45	25.33	76.00
90	41.1	18.50	3.45	15.05	81.29
130	30.9	13.91	3.45	10.46	81.56
170	25.0	11.26	3.45	7.81	79.63
210	21.1	9.52	3.45	6.07	76.44
250	18.4	8.28	3.45	4.83	72.44
290	16.3	7.35	3.45	3.90	67.86

Maximum Storage Required 100-Year (m^3) =	81.56

Storage Occupied In Area B2

5-Year Storm Event

Roof Storage			
Location	Area*	Depth	Volume (m^3)
Roof	1214.23	0.040	48.57
		Total	48.57

Storage Available (m^3) =	48.57
Storage Required (m^3) =	43.06

100-Year Storm Event

Roof Storage			
Location	Area*	Depth	Volume (m^3)
Roof	1214.23	0.075	91.07
		Total	91.07

Storage Available (m^3) =	91.07
Storage Required (m^3) =	81.56

* Storage area is 75% of the total roof area

Subaru

Roof Drain Flow (B2)

Roof Drains Summary		
Type of Control Device	Watts Drainage - Accutrol Weir	
Number of Roof Drains	8	
	5-Year	100-Year
Rooftop Storage (m^3)	48.57	91.07
Storage Depth (m)	0.040	0.075
Flow (Per Roof Drain) (L/s)	0.57	0.95
Total Flow (L/s)	4.56	7.60

Flow Rate Vs. Build-Up (One Weir)	
Depth (mm)	Flow (L/s)
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

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

* Roof Drain Flow information taken from Watts Drainage website

CALCULATING ROOF FLOW EXAMPLES

3 roof drains during a 5 year storm
elevation of water = 25mm
Flow leaving 3 roof drains = (3 x 0.32 L/s) = 0.96L/s

3 roof drains during a 100 year storm
elevation of water = 50mm
Flow leaving 3 roof drains = (3 x 0.54 L/s) = 1.89L/s

	Roof Drain Flow		
	Flow (l/s)	Storage Depth (mm)	Drains Flow (l/s)
	0.19	15	1.52
	0.25	20	2.00
	0.32	25	2.56
	0.38	30	3.04
	0.44	35	3.52
5-Year	0.50	40	4.00
	0.57	45	4.56
	0.63	50	5.04
	0.69	55	5.52
	0.76	60	6.08
	0.82	65	6.56
100-Year	0.88	70	7.04
	0.95	75	7.60
	1.01	80	8.08
	1.07	85	8.56
	1.13	90	9.04
	1.20	95	9.60
	1.26	100	10.08
	1.32	105	10.56
	1.39	110	11.12
	1.45	115	11.60
	1.51	120	12.08
	1.58	125	12.64
	1.64	130	13.12
	1.70	135	13.60
	1.76	140	14.08
	1.83	145	14.64
	1.89	150	15.12

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

VW North Parking Lot

5-Year Storm Event

Tc (min)	I (mm/hr)	B3 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
10	104.2	117.24	16.44	100.80	60.48
20	70.3	79.05	16.44	62.61	75.13
30	53.9	60.68	16.44	44.24	79.63
40	44.2	49.72	16.44	33.28	79.86
50	37.7	42.37	16.44	25.93	77.78
60	32.9	37.07	16.44	20.63	74.26
70	29.4	33.05	16.44	16.61	69.76
80	26.6	29.89	16.44	13.45	64.55
90	24.3	27.33	16.44	10.89	58.80
100	22.4	25.21	16.44	8.77	52.64

Maximum Storage Required 5-Year (m^3) =	79.86

100-Year Storm Event

Tc (min)	I (mm/hr)	B3 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
30	91.9	115.07	17.02	98.05	176.50
40	75.1	94.13	17.02	77.11	185.06
50	64.0	80.11	17.02	63.09	189.27
60	55.9	70.01	17.02	52.99	190.78
70	49.8	62.37	17.02	45.35	190.45
80	45.0	56.36	17.02	39.34	188.81
90	41.1	51.50	17.02	34.48	186.17
100	37.9	47.48	17.02	30.46	182.74

Maximum Storage Required 100-Year (m^3) =	190.78

Storage Occupied In Area B3

5-Year Storm Event

Water Elev. (m) =			95.62		
Structure	T/G (m)	INV. (out)	Depth (m)	Head (m)	Volume (m^3)
CBHM113	95.50	93.77	0.12	1.81	10.41 *
Tank					72.00
				Total	82.41

Storage Available (m^3) =	82.41
Storage Required (m^3) =	79.86

100-Year Storm Event

Water Elev. (m) =			95.75		
Structure	T/G (m)	INV. (out)	Depth (m)	Head (m)	Volume (m^3)
CBHM113	95.50	93.77	0.25	1.94	118.93 *
Tank					72.00
				Total	**190.93**

Storage Available (m^3) =	190.93
Storage Required (m^3) =	190.78

4149 Standherd - Storage Requirements for Area B3

For Orifice Flow, C= 0.60
For Weir Flow, C= 1.84

	Orifice 1	Orifice 2	Weir 1	Weir 2
invert elevation	93.77	X	X	X
center of crest elevation	93.81	X		X
orifice width / weir length	77 mm	X	X	X
weir height	N/A			X
orifice area (m^2)	0.005	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]	Q [L/s]	
95.62	1.81	0.02	x	x	x	x	x	x	16.44	5-Year
95.63	1.82	0.02	x	x	x	x	x	x	16.49	
95.64	1.83	0.02	x	x	x	x	x	x	16.53	
95.65	1.84	0.02	x	x	x	x	x	x	16.58	
95.66	1.85	0.02	x	x	x	x	x	x	16.62	
95.67	1.86	0.02	x	x	x	x	x	x	16.67	
95.68	1.87	0.02	x	x	x	x	x	x	16.71	
95.69	1.88	0.02	x	x	x	x	x	x	16.76	
95.70	1.89	0.02	x	x	x	x	x	x	16.80	
95.71	1.90	0.02	x	x	x	x	x	x	16.85	
95.72	1.91	0.02	x	x	x	x	x	x	16.89	
95.73	1.92	0.02	x	x	x	x	x	x	16.93	
95.74	1.93	0.02	x	x	x	x	x	x	16.98	
95.75	1.94	0.02	x	x	x	x	x	x	17.02	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 centroide of the orifice.
6. H for weir equations is depth of water above the weir crest.

VW South Parking Lot

5-Year Storm Event

Tc (min)	I (mm/hr)	B4 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
10	104.2	111.54	20.51	91.03	54.62
20	70.3	75.20	20.51	54.69	65.63
30	53.9	57.73	20.51	37.22	67.00
40	44.2	47.30	20.51	26.79	64.30
50	37.7	40.31	20.51	19.80	59.40
60	32.9	35.27	20.51	14.76	53.12
70	29.4	31.44	20.51	10.93	45.92
80	26.6	28.44	20.51	7.93	38.04
90	24.3	26.00	20.51	5.49	29.65
100	22.4	23.99	20.51	3.48	20.86

Maximum Storage Required 5-Year (m^3) =	67.00

100-Year Storm Event

Tc (min)	I (mm/hr)	B4 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
10	178.6	212.74	24.50	188.24	112.94
20	120.0	142.91	24.50	118.41	142.09
30	91.9	109.45	24.50	84.95	152.91
40	75.1	89.53	24.50	65.03	156.07
50	64.0	76.20	24.50	51.70	155.09
60	55.9	66.59	24.50	42.09	151.54
70	49.8	59.32	24.50	34.82	146.24
80	45.0	53.60	24.50	29.10	139.69

Maximum Storage Required 100-Year (m^3) =	156.07

Storage Occupied In Area B4

5-Year Storm Event

Water Elev. (m) =			95.21		
Structure	T/G (m)	INV. (out)	Depth (m)	Head (m)	Volume (m^3)
CBHM119	95.43	93.93	-	1.23	0.00 *
Tank					67.00
				Total	67.00

Storage Available (m^3) =	67.00
Storage Required (m^3) =	67.00

100-Year Storm Event

Water Elev. (m) =			95.73		
Structure	T/G (m)	INV. (out)	Depth (m)	Head (m)	Volume (m^3)
CBHM119	95.43	93.93	0.30	1.75	89.56 *
Tank					67.00
				Total	156.56

Storage Available (m^3) =	156.56
Storage Required (m^3) =	156.07

4149 Standherd - Storage Requirements for Area B4

For Orifice Flow, C= 0.60
For Weir Flow, C= 1.84

	Orifice 1	Orifice 2	Weir 1	Weir 2
invert elevation	93.93	X	X	X
center of crest elevation	93.98	X		X
orifice width / weir length	94 mm	X	X	X
weir height	N/A			X
orifice area (m^2)	0.007	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]	Q [L/s]	
93.93	x	x	x	x	x	x	x	x	0	
95.21	1.23	0.02	x	x	x	x	x	x	20.51	5-Year
95.33	1.35	0.02	x	x	x	x	x	x	21.48	
95.49	1.51	0.02	x	x	x	x	x	x	22.72	
95.50	1.52	0.02	x	x	x	x	x	x	22.79	
95.51	1.53	0.02	x	x	x	x	x	x	22.86	
95.52	1.54	0.02	x	x	x	x	x	x	22.94	
95.69	1.71	0.02	x	x	x	x	x	x	24.17	
95.70	1.72	0.02	x	x	x	x	x	x	24.24	
95.71	1.73	0.02	x	x	x	x	x	x	24.31	
95.72	1.74	0.02	x	x	x	x	x	x	24.38	
95.73	1.75	0.02	x	x	x	x	x	x	24.45	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 centroide of the orifice.
6. H for weir equations is depth of water above the weir crest.

Subaru North Parking Lot

5-Year Storm Event

Tc (min)	I (mm/hr)	B5 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
10	104.2	156.78	10.30	146.48	87.89
20	70.3	105.71	10.30	95.41	114.49
30	53.9	81.15	10.30	70.85	127.52
40	44.2	66.48	10.30	56.18	134.84
50	37.7	56.66	10.30	46.36	139.07
60	32.9	49.57	10.30	39.27	141.37
70	29.4	44.20	10.30	33.90	142.36
80	26.6	39.97	10.30	29.67	142.41
90	24.3	36.55	10.30	26.25	141.73
100	22.4	33.72	10.30	23.42	140.50

Maximum Storage Required 5-Year (m^3) =	142.41

100-Year Storm Event

Tc (min)	I (mm/hr)	B5 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
40	75.1	126.18	16.27	109.91	263.79
50	64.0	107.39	16.27	91.12	273.36
60	55.9	93.86	16.27	77.59	279.31
70	49.8	83.61	16.27	67.34	282.81
80	45.0	75.55	16.27	59.28	284.53
90	41.1	69.03	16.27	52.76	284.92
100	37.9	63.65	16.27	47.38	284.25
110	35.2	59.11	16.27	42.84	282.75

Maximum Storage Required 100-Year (m^3) =	284.92

Storage Occupied In Area B5

5-Year Storm Event

Water Elev. (m) =			94.82		
Structure	T/G (m)	INV. (out)	Depth (m)	Head (m)	Volume (m^3)
CBHM103	95.60	94.12	-	0.66	0.00 *
Tank					160.00
				Total	160.00

Storage Available (m^3) =	160.00
Storage Required (m^3) =	142.41

100-Year Storm Event

Water Elev. (m) =			95.8		
Structure	T/G (m)	INV. (out)	Depth (m)	Head (m)	Volume (m^3)
CBHM103	95.60	94.12	0.20	1.64	129.84 *
Tank					160.00
				Total	289.84

Storage Available (m^3) =	289.84
Storage Required (m^3) =	284.92

4149 Standherd - Storage Requirements for Area B5

For Orifice Flow, C= 0.60
For Weir Flow, C= 1.84

	Orifice 1	Orifice 2	Weir 1	Weir 2
invert elevation	94.12	X	X	X
center of crest elevation	94.16	X		X
orifice width / weir length	78 mm	X	X	X
weir height	N/A			X
orifice area (m^2)	0.005	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]	Q [L/s]	
94.12	x	x	x	x	x	x	x	x	0	
94.82	0.66	0.01	x	x	x	x	x	x	10.30	5-Year
95.61	1.45	0.02	x	x	x	x	x	x	15.30	
95.62	1.46	0.02	x	x	x	x	x	x	15.35	
95.63	1.47	0.02	x	x	x	x	x	x	15.40	
95.64	1.48	0.02	x	x	x	x	x	x	15.45	
95.65	1.49	0.02	x	x	x	x	x	x	15.51	
95.66	1.50	0.02	x	x	x	x	x	x	15.56	
95.67	1.51	0.02	x	x	x	x	x	x	15.61	
95.68	1.52	0.02	x	x	x	x	x	x	15.66	
95.69	1.53	0.02	x	x	x	x	x	x	15.71	
95.70	1.54	0.02	x	x	x	x	x	x	15.76	
95.71	1.55	0.02	x	x	x	x	x	x	15.82	
95.72	1.56	0.02	x	x	x	x	x	x	15.87	
95.73	1.57	0.02	x	x	x	x	x	x	15.92	
95.74	1.58	0.02	x	x	x	x	x	x	15.97	
95.75	1.59	0.02	x	x	x	x	x	x	16.02	
95.76	1.60	0.02	x	x	x	x	x	x	16.07	
95.77	1.61	0.02	x	x	x	x	x	x	16.12	
95.78	1.62	0.02	x	x	x	x	x	x	16.17	
95.79	1.63	0.02	x	x	x	x	x	x	16.22	
95.80	1.64	0.02	x	x	x	x	x	x	16.27	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 centroide of the orifice.
6. H for weir equations is depth of water above the weir crest.

Subaru South Parking Lot

5-Year Storm Event

Tc (min)	I (mm/hr)	B6 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
10	104.2	83.26	8.10	75.16	45.10
20	70.3	56.14	8.10	48.04	57.65
30	53.9	43.10	8.10	35.00	62.99
40	44.2	35.31	8.10	27.21	65.30
50	37.7	30.09	8.10	21.99	65.97
60	32.9	26.33	8.10	18.23	65.62
70	29.4	23.47	8.10	15.37	64.56
80	26.6	21.23	8.10	13.13	63.01
90	24.3	19.41	8.10	11.31	61.07
100	22.4	17.91	8.10	9.81	58.84

Maximum Storage Required 5-Year (m^3) =	65.97

100-Year Storm Event

Tc (min)	I (mm/hr)	B6 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
80	45.0	39.98	8.50	31.48	151.08
90	41.1	36.53	8.50	28.03	151.35
100	37.9	33.68	8.50	25.18	151.06
110	35.2	31.28	8.50	22.78	150.33
120	32.9	29.23	8.50	20.73	149.24
130	30.9	27.45	8.50	18.95	147.84
140	29.2	25.90	8.50	17.40	146.18
150	27.6	24.53	8.50	16.03	144.29

Maximum Storage Required 100-Year (m^3) =	151.35

Storage Occupied In Area B6

5-Year Storm Event

Water Elev. (m) =			95.73			
Structure	T/G (m)	INV. (out)	Depth (m)	Head (m)	Volume (m^3)	
CBHM108	95.50	94.12	0.23	1.31	68.85	*
				Total	68.85	

Storage Available (m^3) =	68.85
Storage Required (m^3) =	65.97

100-Year Storm Event

Water Elev. (m) =			95.8			
Structure	T/G (m)	INV. (out)	Depth (m)	Head (m)	Volume (m^3)	
CBHM108	95.50	94.12	0.30	1.38	152.98	*
				Total	152.98	

Storage Available (m^3) =	152.98
Storage Required (m^3) =	151.35

* Storage Calculated in AutoCAD

Nissan North Parking Lot

5-Year Storm Event

Tc (min)	I (mm/hr)	B8 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
10	104.2	177.85	14.00	163.85	98.31
20	70.3	119.92	14.00	105.92	127.10
30	53.9	92.05	14.00	78.05	140.50
40	44.2	75.42	14.00	61.42	147.41
50	37.7	64.27	14.00	50.27	150.82
60	32.9	56.23	14.00	42.23	152.04
70	29.4	50.14	14.00	36.14	151.78
80	26.6	45.34	14.00	31.34	150.44
90	24.3	41.46	14.00	27.46	148.28
100	22.4	38.25	14.00	24.25	145.49

Maximum Storage Required 5-Year (m^3) =	152.04

100-Year Storm Event

Tc (min)	I (mm/hr)	B8 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
70	49.8	94.60	18.20	76.40	320.89
80	45.0	85.49	18.20	67.29	322.97
90	41.1	78.11	18.20	59.91	323.53
100	37.9	72.02	18.20	53.82	322.91
110	35.2	66.89	18.20	48.69	321.33
120	32.9	62.50	18.20	44.30	318.98
130	30.9	58.71	18.20	40.51	315.97
140	29.2	55.39	18.20	37.19	312.40

Maximum Storage Required 100-Year (m^3) =	323.53

Storage Occupied In Area B8

5-Year Storm Event

Water Elev. (m) =			94.66		
Structure	T/G (m)	INV. (out)	Depth (m)	Head (m)	Volume (m^3)
CBMH101	95.35	93.20	-	1.42	0.00 *
Tank					163.00
				Total	163.00

Storage Available (m^3) =	163.00
Storage Required (m^3) =	152.04

100-Year Storm Event

Water Elev. (m) =			95.64		
Structure	T/G (m)	INV. (out)	Depth (m)	Head (m)	Volume (m^3)
CBMH101	95.35	93.20	0.29	2.40	171.55 *
Tank					163.00
				Total	171.55

Storage Available (m^3) =	334.55
Storage Required (m^3) =	323.53

4149 Standherd - Storage Requirements for Area B8

For Orifice Flow, C= 0.60
For Weir Flow, C= 1.84

	Orifice 1	Orifice 2	Weir 1	Weir 2
invert elevation	93.20	X	X	X
center of crest elevation	93.24	X		X
orifice width / weir length	75 mm	X	X	X
weir height	N/A			X
orifice area (m^2)	0.004	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]	Q [L/s]	
93.20	x	x	x	x	x	x	x	x	0	
94.66	1.42	0.01	x	x	x	x	x	x	14.00	5-Year
95.36	2.12	0.02	x	x	x	x	x	x	17.11	
95.37	2.13	0.02	x	x	x	x	x	x	17.15	
95.38	2.14	0.02	x	x	x	x	x	x	17.19	
95.39	2.15	0.02	x	x	x	x	x	x	17.23	
95.40	2.16	0.02	x	x	x	x	x	x	17.27	
95.41	2.17	0.02	x	x	x	x	x	x	17.31	
95.42	2.18	0.02	x	x	x	x	x	x	17.35	
95.43	2.19	0.02	x	x	x	x	x	x	17.39	
95.44	2.20	0.02	x	x	x	x	x	x	17.42	
95.45	2.21	0.02	x	x	x	x	x	x	17.46	
95.46	2.22	0.02	x	x	x	x	x	x	17.50	
95.47	2.23	0.02	x	x	x	x	x	x	17.54	
95.48	2.24	0.02	x	x	x	x	x	x	17.58	
95.49	2.25	0.02	x	x	x	x	x	x	17.62	
95.50	2.26	0.02	x	x	x	x	x	x	17.66	
95.51	2.27	0.02	x	x	x	x	x	x	17.70	
95.52	2.28	0.02	x	x	x	x	x	x	17.74	
95.53	2.29	0.02	x	x	x	x	x	x	17.78	
95.54	2.30	0.02	x	x	x	x	x	x	17.82	
95.55	2.31	0.02	x	x	x	x	x	x	17.85	
95.56	2.32	0.02	x	x	x	x	x	x	17.89	
95.57	2.33	0.02	x	x	x	x	x	x	17.93	
95.58	2.34	0.02	x	x	x	x	x	x	17.97	
95.59	2.35	0.02	x	x	x	x	x	x	18.01	
95.60	2.36	0.02	x	x	x	x	x	x	18.05	
95.61	2.37	0.02	x	x	x	x	x	x	18.08	
95.62	2.38	0.02	x	x	x	x	x	x	18.12	
95.63	2.39	0.02	x	x	x	x	x	x	18.16	
95.64	2.40	0.02	x	x	x	x	x	x	18.20	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 centroide of the orifice.
6. H for weir equations is depth of water above the weir crest.

Nissan South Parking Lot

5-Year Storm Event

Tc (min)	I (mm/hr)	B9 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
1	203.5	100.90	25.66	75.24	4.51
3	166.1	82.35	25.66	56.69	10.20
5	141.2	70.00	25.66	44.34	13.30
7	123.3	61.14	25.66	35.48	14.90
9	109.8	54.44	25.66	28.78	15.54
11	99.2	49.18	25.66	23.52	15.52
13	90.6	44.94	25.66	19.28	15.04
15	83.6	41.43	25.66	15.77	14.19
17	77.6	38.48	25.66	12.82	13.08
19	72.5	35.96	25.66	10.30	11.74

Maximum Storage Required 5-Year (m^3) =	15.54

100-Year Storm Event

Tc (min)	I (mm/hr)	B9 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
10	178.6	98.71	26.15	72.56	43.54
20	120.0	66.31	26.15	40.16	48.20
30	91.9	50.79	26.15	24.64	44.35
40	75.1	41.54	26.15	15.39	36.94
50	64.0	35.36	26.15	9.21	27.62
60	55.9	30.90	26.15	4.75	17.10
70	49.8	27.53	26.15	1.38	5.78
80	45.0	24.87	26.15	0.00	0.00

Maximum Storage Required 100-Year (m^3) =	48.20

Storage Occupied In Area B9

5-Year Storm Event

Water Elev. (m) =			95.60		
Structure	T/G (m)	INV. (out)	Depth (m)	Head (m)	Volume (m^3)
CBHM117	95.40	93.96	0.20	2.36	20.89 *
				Total	20.89

Storage Available (m^3) =	20.89
Storage Required (m^3) =	15.54

100-Year Storm Event

Water Elev. (m) =			95.65		
Structure	T/G (m)	INV. (out)	Depth (m)	Head (m)	Volume (m^3)
CBHM117	95.40	93.96	0.25	2.45	49.77 *
				Total	49.77

Storage Available (m^3) =	49.77
Storage Required (m^3) =	48.20

* Storage Calculated in AutoCAD

4149 Standherd - Storage Requirements for Area B8

For Orifice Flow, C= 0.60
For Weir Flow, C= 1.84

	Orifice 1	Orifice 2	Weir 1	Weir 2
invert elevation	93.20	X	X	X
center of crest elevation	93.24	X		X
orifice width / weir length	90 mm	X	X	X
weir height	N/A			X
orifice area (m^2)	0.006	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]	Q [L/s]	
93.20	x	x	x	x	x	x	x	x	0	
95.40	2.16	0.02	x	x	x	x	x	x	24.55	
95.41	2.17	0.02	x	x	x	x	x	x	24.60	
95.42	2.18	0.02	x	x	x	x	x	x	24.66	
95.43	2.19	0.02	x	x	x	x	x	x	24.72	
95.44	2.20	0.02	x	x	x	x	x	x	24.77	
95.45	2.21	0.02	x	x	x	x	x	x	24.83	
95.46	2.22	0.02	x	x	x	x	x	x	24.89	
95.47	2.23	0.02	x	x	x	x	x	x	24.94	
95.48	2.24	0.02	x	x	x	x	x	x	25.00	
95.49	2.25	0.03	x	x	x	x	x	x	25.05	
95.50	2.26	0.03	x	x	x	x	x	x	25.11	
95.51	2.27	0.03	x	x	x	x	x	x	25.16	
95.52	2.28	0.03	x	x	x	x	x	x	25.22	
95.53	2.29	0.03	x	x	x	x	x	x	25.28	
95.54	2.30	0.03	x	x	x	x	x	x	25.33	
95.55	2.31	0.03	x	x	x	x	x	x	25.39	
95.56	2.32	0.03	x	x	x	x	x	x	25.44	
95.57	2.33	0.03	x	x	x	x	x	x	25.50	
95.58	2.34	0.03	x	x	x	x	x	x	25.55	
95.59	2.35	0.03	x	x	x	x	x	x	25.61	
95.60	2.36	0.03	x	x	x	x	x	x	25.66	5-Year
95.61	2.37	0.03	x	x	x	x	x	x	25.71	
95.62	2.38	0.03	x	x	x	x	x	x	25.77	
95.63	2.39	0.03	x	x	x	x	x	x	25.82	
95.64	2.40	0.03	x	x	x	x	x	x	25.88	
95.65	2.41	0.03	x	x	x	x	x	x	25.93	
95.66	2.42	0.03	x	x	x	x	x	x	25.98	
95.67	2.43	0.03	x	x	x	x	x	x	26.04	
95.68	2.44	0.03	x	x	x	x	x	x	26.09	
95.69	2.45	0.03	x	x	x	x	x	x	26.15	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 centroide of the orifice.
6. H for weir equations is depth of water above the weir crest.

Time of Concentration Pre-Development

Drainage Area ID	Sheet Flow Distance (m)	Slope of Land (%)	Tc (min) (5-Year)	Tc (min) (100-Year)
A1	23	2.80	8	2

* Therefore, a Tc of 10 can be used

Tc= (3.26(1.1-c)L^0.5/S^0.33)

c= Balanced Runoff Coefficient

L= Length of Drainage Area

S= Average Slope of Watershed

STORM SEWER DESIGN SHEET

PROJECT: CCO-22-2933 - MYERS
LOCATION: 4149 STRANDHERD DRIVE, OTTAWA
CLIENT: BBS

McINTOSH PERRY

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)	FIXED FLOW (L/s)	DESIGN FLOW (L/s)	CAPACITY (L/s)	LENGTH (m)	PIPE SIZE (mm) DIA	W	H	SLOPE (%)	VELOCITY (m/s)	AVAIL CAP (5yr) (L/s)	(%)
BUILDING C	B9	CB13	CMBH118	0.82	0.077	0.06	0.06	10.00	0.38	10.38	104.19	122.14	178.56	18.28				18.28	43.87	19.69	250			0.50	0.866	25.59	58.32%
BUILDING C	B9	CMBH118	CBMH117	0.82	0.041	0.03	0.10	10.38	0.37	10.75	102.23	119.83	175.17	27.54				27.54	91.46	17.84	375			0.25	0.802	63.92	69.89%
BUILDING C	B9	CBMH117	STMMH08	0.82	0.104	0.09	0.18	10.75	0.12	10.86	100.39	117.67	171.98	50.77				50.77	148.72	6.26	450			0.25	0.906	97.95	65.86%
BUILDING A	B4	CB10	CBMH122	0.89	0.100	0.09	0.09	10.00	0.37	10.37	104.19	122.14	178.56	25.78				25.78	43.87	19.30	250			0.50	0.866	18.09	41.23%
BUILDING A	B4	CBMH122	CBMH121	0.81	0.040	0.03	0.12	10.37	0.43	10.80	102.27	119.88	175.23	34.52				34.52	133.02	20.90	450			0.20	0.810	98.50	74.05%
BUILDING A	B4	CBMH121	CBMH120	0.90	0.050	0.05	0.17	10.80	0.61	11.41	100.14	117.37	171.55	46.32				46.32	133.02	29.60	450			0.20	0.810	86.69	65.17%
BUILDING A	B4	CBMH120	CBMH119	0.80	0.070	0.06	0.22	11.41	0.77	12.18	97.29	114.01	166.62	60.15				60.15	133.02	37.40	450			0.20	0.810	72.86	54.78%
BUILDING A	B4	CB11	CBMH119	0.85	0.039	0.03	0.03	10.00	0.45	10.45	104.19	122.14	178.56	9.60				9.60	43.87	23.40	250			0.50	0.866	34.27	78.11%
BUILDING A	B4	CBMH119	STMMH08	0.89	0.108	0.10	0.35	12.18	0.11	12.29	93.94	110.06	160.82	91.84				91.84	133.02	5.50	450			0.20	0.810	41.18	30.96%
		STMMH08	STMMH06			0.00	0.53	12.29	0.60	12.90	93.46	109.51	160.00	138.64				138.64	392.18	38.50	675			0.20	1.062	253.54	64.65%
BUILDING A	B7	BLDG A	STMH06	0.90	0.130	0.12	0.12	10.00	0.18	10.18	104.19	122.14	178.56	33.89				33.89	48.39	16.50	200			2.00	1.492	14.50	29.96%
BUILDING B	B1	BLDG B	STMMH07	0.90	0.083	0.07	0.07	10.00	0.20	10.20	104.19	122.14	178.56	21.64				21.64	34.22	12.85	200			1.00	1.055	12.58	36.76%
BUILDING A		STMMH07	STMMH06			0.00	0.07	10.20	0.33	10.53	103.13	120.89	176.72	21.42				21.42	43.87	17.10	250			0.50	0.866	22.45	51.18%
		STMMH06	STMMH05			0.00	0.73	12.90	0.55	13.45	91.03	106.64	155.80	183.54				183.54	392.18	35.30	675			0.20	1.062	208.63	53.20%
BUILDING A	B3	CB09	CBMH116	0.87	0.100	0.09	0.09	10.00	0.41	10.41	104.19	122.14	178.56	25.20				25.20	43.87	21.10	250			0.50	0.866	18.67	42.55%
BUILDING A	B3	CBMH116	CBMH115	0.78	0.080	0.06	0.15	10.41	0.82	11.23	102.10	119.67	174.93	42.40				42.40	133.02	40.10	450			0.20	0.810	90.61	68.12%
BUILDING A	B3	CBMH115	CBMH114	0.82	0.070	0.06	0.21	11.23	0.67	11.91	98.11	114.98	168.04	56.40				56.40	133.02	32.80	450			0.20	0.810	76.61	57.60%
BUILDING A	B3	CBMH114	CBMH113	0.85	0.060	0.05	0.26	11.91	0.55	12.45	95.10	111.43	162.83	68.16				68.16	133.02	26.50	450			0.20	0.810	64.86	48.76%
BUILDING A	B3	CB12	CBMH113	0.86	0.053	0.05	0.05	10.00	0.37	10.37	104.19	122.14	178.56	13.20				13.20	62.04	27.00	250			1.00	1.224	48.84	78.72%
BUILDING A	B3	CBM113	STMMH05	0.85	0.119	0.10	0.40	12.45	0.07	12.52	92.81	108.74	158.88	104.38				104.38	162.91	3.90	450			0.30	0.992	58.53	35.93%
		STMMH05	STMH04			0.00	1.13	13.45	0.47	13.92	88.92	104.16	152.15	279.28				279.28	367.27	22.60	750			0.10	0.805	87.99	23.96%
BUILDING C	B6	CB06	CBMH110	0.85	0.057	0.05	0.05	10.00	0.45	10.45	104.19	122.14	178.56	14.04				14.04	43.87	23.30	250			0.50	0.866	29.83	67.99%
BUILDING C	B6	CBMH110	CBMH109	0.85	0.044	0.04	0.09	10.45	0.57	11.02	101.88	119.42	174.56	24.38				24.38	59.68	27.80	300			0.35	0.818	35.30	59.15%
BUILDING C	B6	CBMH109	CBMH108	0.85	0.073	0.06	0.15	11.02	0.56	11.57	99.12	116.17	169.78	40.99				40.99	91.46	26.90	375			0.25	0.802	50.46	55.18%
BUILDING C	B6	CBMH108	STMMH04	0.85	0.095	0.08	0.23	11.57	0.26	11.83	96.55	113.15	165.35	61.73				61.73	91.46	12.30	375			0.25	0.802	29.73	32.50%
		STMMH04	STMMH 02			0.00	1.36	13.92	0.76	14.67	87.22	102.16	149.22	329.71				329.71	669.70	55.00	825			0.20	1.214	339.99	50.77%
BUILDING C	B2	BLDG C	STMMH02/ TEE	0.90	0.162	0.15	0.15	10.00	0.30	10.30	104.19	122.14	178.56	42.21				42.21	87.74	31.60	250			2.00	1.731	45.53	51.90%
BUILDING C	B5	CB04	CBMH107	0.88	0.092	0.08	0.08	10.00	0.42	10.42	104.19	122.14	178.56	23.55				23.55	62.04	31.00	250			1.00	1.224	38.49	62.03%
BUILDING C	B5	CBMH107	CBMH106	0.88	0.099	0.09	0.17	10.42	0.66	11.08	102.02	119.58	174.79	47.88				47.88	91.46	31.61	375			0.25	0.802	43.58	47.65%
BUILDING C	B5	CBMH106	CBMH105	0.88	0.080	0.07	0.24	11.08	0.69	11.77	98.82	115.81	169.26	65.80				65.80	91.46	33.14	375			0.25	0.802	25.65	28.05%
BUILDING C	B5	CBMH105	CBMH104	0.88	0.088	0.08	0.32	11.77	0.77	12.54	95.70	112.14	163.87	84.42				84.42	133.02	37.60	450			0.20	0.810	48.60	36.54%
BUILDING C	B5	CBMH103A	CBMH103 / PIPE TEE	0.88	0.116	0.10	0.10	10.00	0.51	10.51	104.19	122.14	178.56	29.57				29.57	43.87	26.70	250			0.50	0.866	14.30	32.60%
BUILDING C	B5	CBMH104	CBMH103	0.83	0.059	0.05	0.15	12.54	0.67	13.21	92.45	108.31	158.25	38.82				38.82	115.20	28.00	450			0.15	0.702	76.37	66.30%
BUILDING C	B5	CBMH103	STMMH02	0.73	0.072	0.05	0.20	13.21	0.06	13.27	89.84	105.24	153.74	50.85				50.85	200.65	3.30	525			0.20	0.898	149.79	74.66%
		STMMH02	STMMH01			0.00	1.56	14.67	0.46	15.14	84.62	99.11	144.74	367.80				367.80	844.60	35.60	900			0.20	1.286	476.80	56.45%
BUILDING B	B8	CB07	CBMH112	0.86	0.085	0.07	0.07	10.00	0.38	10.38	104.19	122.14	178.56	21.10				21.10	62.04	27.79	250			1.00	1.224	40.94	65.99%
BUILDING B	B9	CBMH112	CBMH111	0.82	0.113	0.09	0.17	10.38	0.44	10.81	102.24	119.84	175.17	47.12				47.12	71.33	25.60	300			0.50	0.978	24.22	33.95%
BUILDING B	B9	CBMH111	STMMH 03	0.82	0.095	0.08	0.24	10.81	0.29	11.11	100.08	117.29	171.44	67.77				67.77	129.34	20.00	375			0.50	1.134	61.57	47.60%
BUILDING B	B9	CB08	STMMH 03	0.82	0.085	0.07	0.07	10.00	0.18	10.18	104.19	122.14	178.56	20.27				20.27	62.04	13.30	250			1.00	1.224	41.77	67.33%
BUILDING B	B9	CB01	STMMH 03	0.82	0.080	0.07	0.07	10.00	0.27	10.27	104.19	122.14	178.56	18.95				18.95	62.04	19.50	250			1.00	1.224	43.09	69.45%
BUILDING B	B9	CB02	STMMH 03	0.82	0.101	0.08	0.08	10.00	0.20	10.20	104.19	122.14	178.56	24.09				24.09	62.04	14.68	250			1.00	1.224	37.95	61.16%

BUILDING B	B9	STMMH 03	STMMH 07			0.00	0.46	11.11	1.20	12.30	98.68	115.65	169.02	126.79				126.79	179.46	57.60	525			0.16	0.803	52.67	29.35%
BUILDING B	B9	STMMH 07	OBMH101			0.00	0.46	12.30	0.24	12.55	93.42	109.45	159.92	120.03				120.03	179.46	11.80	525			0.16	0.803	59.43	33.12%
BUILDING B	B9	OBMH101	STMMH 01	0.73	0.088	0.06	0.53	12.55	0.19	12.74	92.42	108.27	158.19	135.29				135.29	179.46	9.30	525			0.16	0.803	44.17	24.61%
`																											
		STMMH01	OGS			0.00	2.09	15.14	0.05	15.19	83.12	97.34	142.14	482.95				482.95	844.60	4.20	900			0.20	1.286	361.65	42.82%

Definitions:
Q = 2.78ΣA, 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: MSM

Checked: AJG

Project No.: 22-2933

No.	Revision	Date
1.	Issued for Municipal Review	2022-03-02
2	Issued for Municipal Review	2022-08-22

Date: 2022-08-22

Sheet No: 1 of 1

CBMH108 ICD Sizing

LMF90

Chart 1: LMF 14 Preset Flow Curves

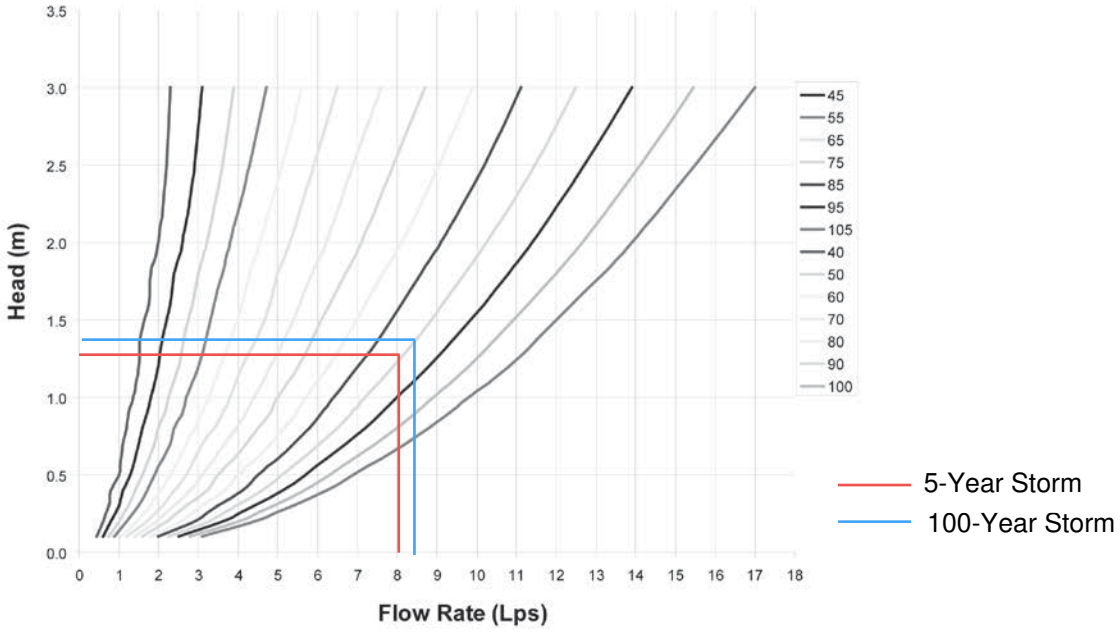
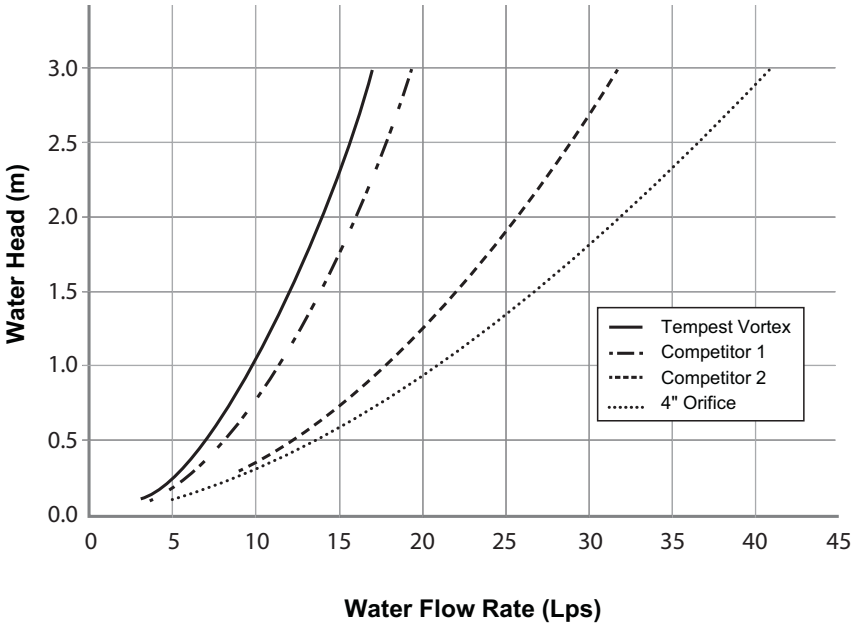


Chart 2: LMF Flow vs. ICD Alternatives



Adjustable Accutrol Weir

Tag: _____

Adjustable Flow Control for Roof Drains

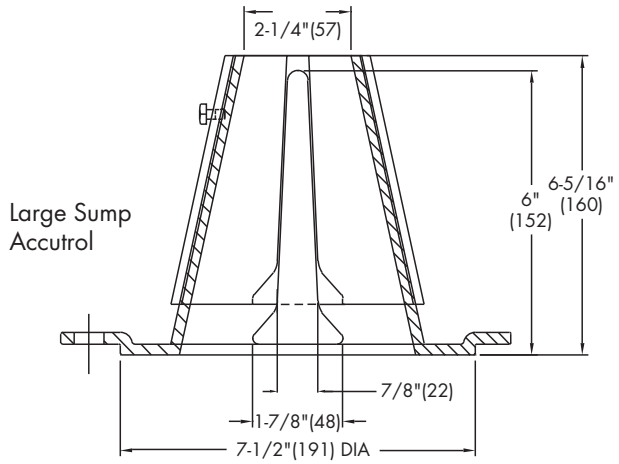
ADJUSTABLE ACCUTROL (for Large Sump Roof Drains only)

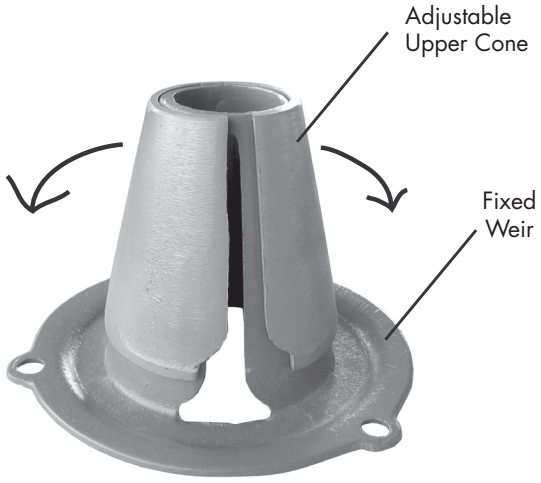
For more flexibility in controlling flow with heads deeper than 2", Watts Drainage offers the Adjustable Accutrol. The Adjustable Accutrol Weir is designed with a single parabolic opening that can be covered to restrict flow above 2" of head to less than 5 gpm per inch, up to 6" of head. To adjust the flow rate for depths over 2" of head, set the slot in the adjustable upper cone according to the flow rate required. Refer to Table 1 below.
Note: Flow rates are directly proportional to the amount of weir opening that is exposed.

EXAMPLE:

For example, if the adjustable upper cone is set to cover 1/2 of the weir opening, flow rates above 2"of head will be restricted to 2-1/2 gpm per inch of head.

Therefore, at 3"of head, the flow rate through the Accutrol Weir that has 1/2 the slot exposed will be:
[5 gpm (per inch of head) x 2 inches of head] + 2-1/2 gpm (for the third inch of head) = 12-1/2 gpm.





1/2 Weir Opening Exposed Shown Above

TABLE 1. Adjustable Accutrol Flow Rate Settings

Weir Opening Exposed	1"	2"	3"	4"	5"	6"
	Flow Rate (gallons per minute)					
Fully Exposed	5	10	15	20	25	30
3/4	5	10	13.75	17.5	21.25	25
1/2	5	10	12.5	15	17.5	20
1/4	5	10	11.25	12.5	13.75	15
Closed	5	5	5	5	5	5

Job Name _____ Contractor _____

Job Location _____ Contractor's P.O. No. _____

Engineer _____ Representative _____

USA: Tel: (800) 338-2581 • Fax: (828) 248-3929 • Watts.com
Canada: Tel: (905) 332-4090 • Fax: (905) 332-7068 • Watts.ca
Latin America: Tel: (52) 81-1001-8600 • Fax: (52) 81-8000-7091 • Watts.com

A Watts Water Technologies Company

Site Area	33779.3	m2
10 mm storm	337.79	m3

Existing Storage Unit - CBMH113	72	m3	**Per Previously Approved Design*
Existing Storage Unit - CBMH119	67	m3	**Per Previously Approved Design*
Existing Roof Storage	18.4	m3	**5 Yr Required Storage Utilized*

Remaining (Below Grade) Storage Required	**180.39**	**m3**

Proposed Building B Roof Storage	17.74	m3	**5 Yr Required Storage Utilized*
Proposed Building C Roof Storage	43.06	m3	**5 Yr Required Storage Utilized*
Proposed Storage Unit - CBMH103	160	m3	
Proposed Storage Unit - CBMH101	163	m3	

Total Storage Provided to Collect the First 10 mm **541.20 m3**

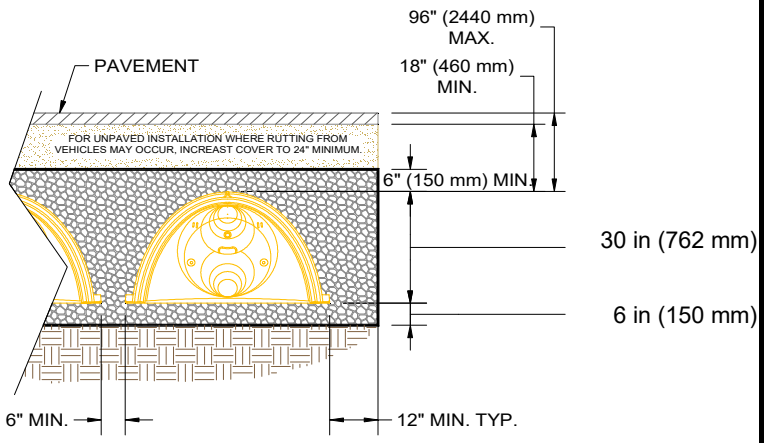
StormTech
Detention • Retention • Recharge
Subsurface Stormwater Management℠

Units: **Metric**

Project: 4149 Strandherd Drive (117148) - ST-CBMH113
By: Conrad Stang
Point of Contact
Date: 22-Oct-20

System Requirements

Required Storage Volume	**72**	cubic meters
Select Stormtech Chamber System	SC-740	
Stone Porosity (Industry Standard = 40%)	**40%**	
Stone Foundation Depth	150	mm
Storage Volume Per Chamber	2.12	cubic meters
Avg Cover over Chambers (460mm min. & 2440mm max.)	700	mm



Number of Chambers Required - 34

Approximate Bed Size Required	127	square meters
Tons of Stone Required	151	Tonnes
Volume of Excavation	205	cubic meters
Area of Filter Fabric	393	square meters
# of End Caps Required	**4**	Each
Length of ISOLATOR ROW	**36.89**	m
ISOLATOR FABRIC	**55**	square meters

Is the limiting dimension for the bed the width or length? **width**

Controlled by Width (Rows)

Width	**4**	m
# of Chambers Long	17	EA
# of Rows	2	EA
Actual Length	37.99	m
Actual Width	3.35	m

Controlled by Length

Length	**50**	m
# of Chambers long	-	EA
# of Rows	-	EA
Actual Length	-	m
Actual Width	-	m

Material Estimate

To use this sheet: Please enter data into the blue and green cells. If switching between Imperial and Metric units please check the correct units and data is input in the green cells.

Please call StormTech @ 888-892-2694 for conceptual cost estimates.

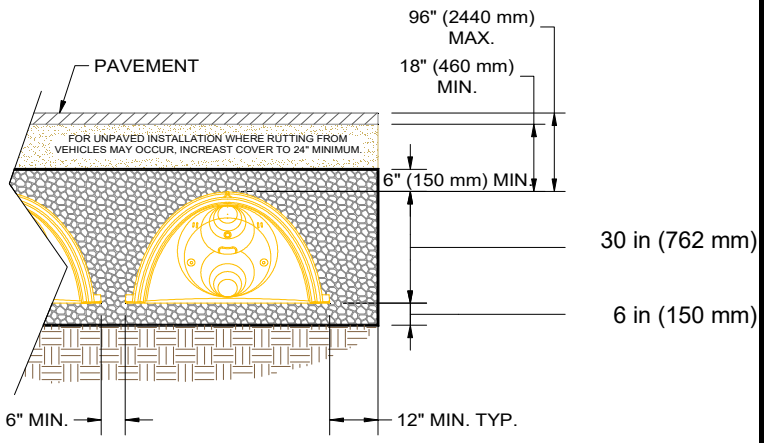
StormTech
Detention • Retention • Recharge
Subsurface Stormwater Management℠

Units: **Metric**

Project: 4149 Strandherd Drive (117148) - ST-CBMH119
By: Conrad Stang
Point of Contact
Date: 22-Oct-20

System Requirements

Required Storage Volume	**67**	cubic meters
Select Stormtech Chamber System	SC-740	
Stone Porosity (Industry Standard = 40%)	**40%**	
Stone Foundation Depth	150	mm
Storage Volume Per Chamber	2.12	cubic meters
Avg Cover over Chambers (460mm min. & 2440mm max.)	700	mm



Number of Chambers Required - 32

Approximate Bed Size Required	120	square meters
Tons of Stone Required	142	Tonnes
Volume of Excavation	193	cubic meters
Area of Filter Fabric	371	square meters
# of End Caps Required	**4**	Each
Length of ISOLATOR ROW	**34.72**	m
ISOLATOR FABRIC	**52**	square meters

Is the limiting dimension for the bed the width or length? **width**

Controlled by Width (Rows)

Width	**4**	m
# of Chambers Long	16	EA
# of Rows	2	EA
Actual Length	35.82	m
Actual Width	3.35	m

Controlled by Length

Length	**50**	m
# of Chambers long	-	EA
# of Rows	-	EA
Actual Length	-	m
Actual Width	-	m

Material Estimate

To use this sheet: Please enter data into the blue and green cells. If switching between Imperial and Metric units please check the correct units and data is input in the green cells.

Please call StormTech @ 888-892-2694 for conceptual cost estimates.

Area B5

Parameters

Units: Metric

Storage Volume: 160 Cu m

Chamber Selection: S-29

Header Row Position: Left

Fill Over Embedment Stone: 300 mm

Controlled By: width 11 m

Embedment Stone mm:

Over: 150 Under: 150 Porosity: 0.4

Min 150mm over and under

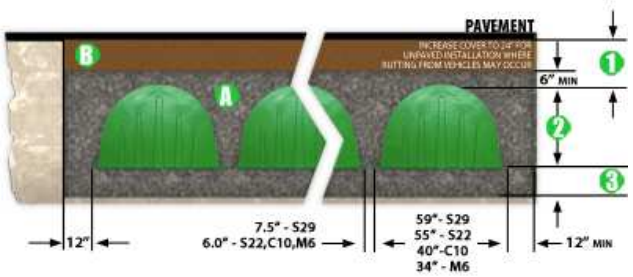
Double Stacked

Double Stacked?: No

Stone Between:

Note: After making an input change you must hit calculate to update the Field Diagram and Project Results.
* The image generation will not save if using MicroSoft Edge

Project Results



1	Total Cover Over Chambers: 301 mm
2	Height Of Chamber: 915 mm
3	Embedment Stone Under Chambers: 151 mm
A	Volume of Embedment Stone Required: 150 Cu. m
B	Volume of Fill Material Required: 63 Cu. m
	Total Storage Provided: 162 Cu. m
	Type Of Chambers: S-29
	# Of Chambers Required: 131
	# Of End Caps Required: 14
	Required Bed Size: 208 Sq. m
	Volume of Excavation: 252 Cu. m
	* Area of Filter Fabric: 281 Sq. m
	# of Chambers Long: 20
	# of rows: 6
	Actual Trench Length: 19.64 m
	Actual Trench Width: 10.55 m

* Filter Fabric quantity for Fabric on Top and Sides of System Only, does not include overlap

Area B8

Parameters

Units: Metric

Storage Volume: 163 Cu m

Chamber Selection: S-29

Header Row Position: Left

Fill Over Embedment Stone: 300 mm

Controlled By: width 10 m

Embedment Stone mm:

Over: 150 Under: 150 Porosity: 0.4

Min 150mm over and under

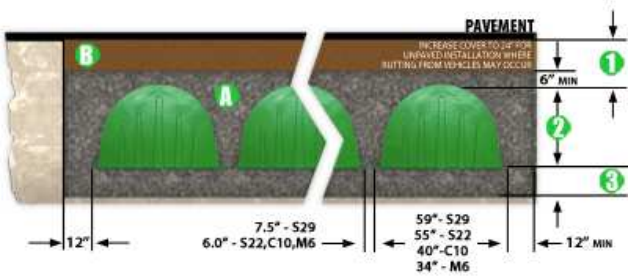
Double Stacked

Double Stacked?: No

Stone Between:

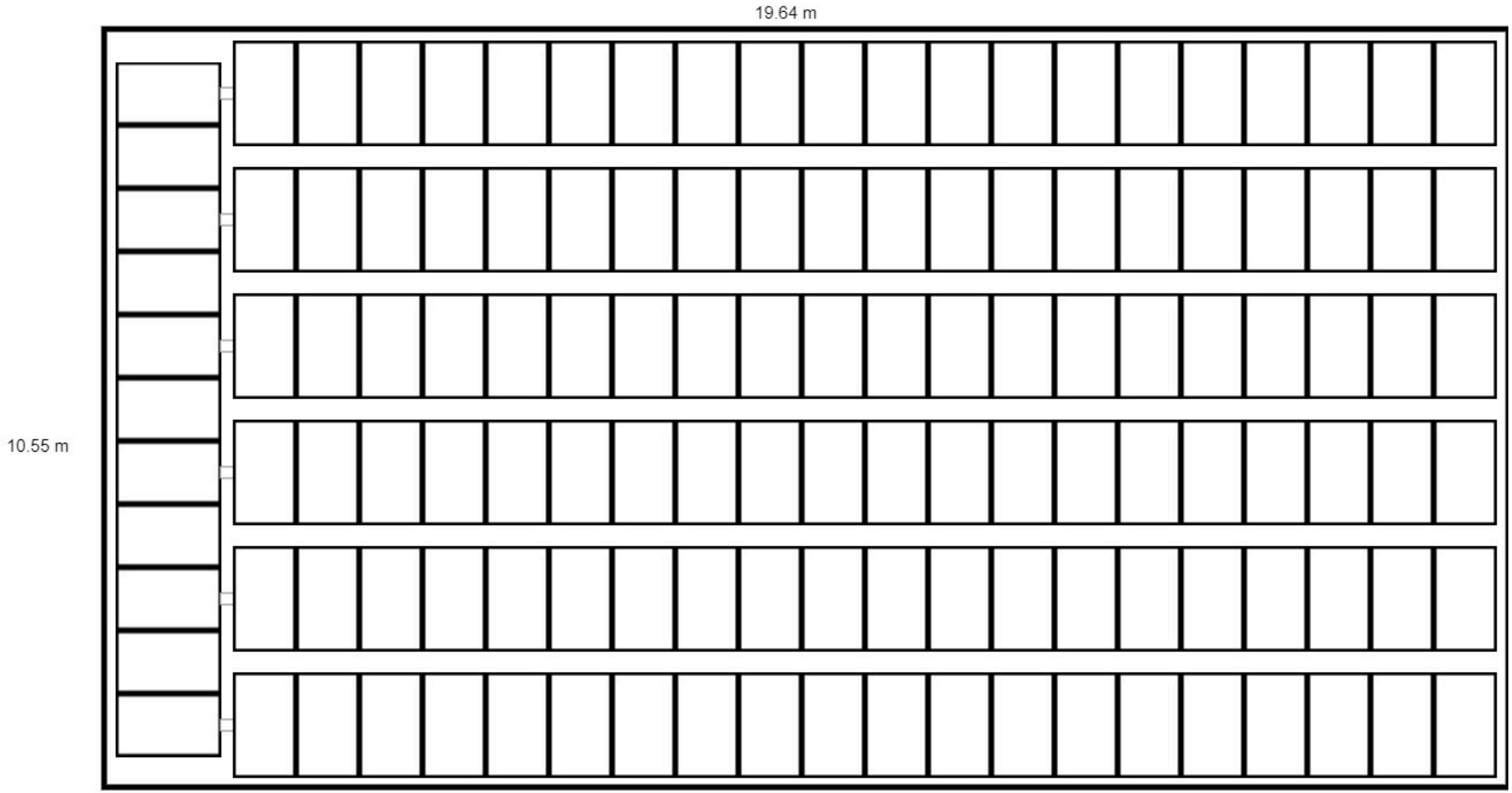
Note: After making an input change you must hit calculate to update the Field Diagram and Project Results.
* The image generation will not save if using MicroSoft Edge

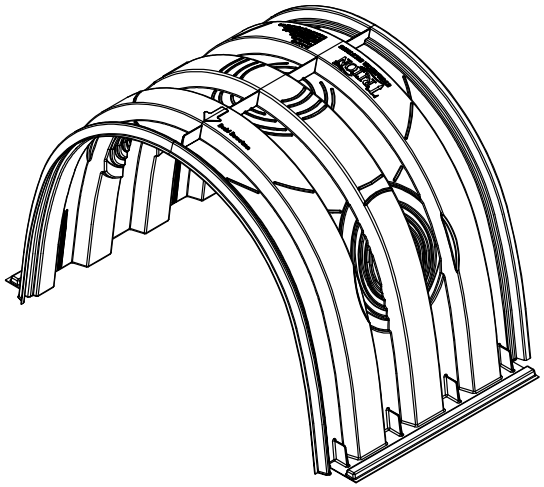
Project Results



1	Total Cover Over Chambers: 301 mm
2	Height Of Chamber: 915 mm
3	Embedment Stone Under Chambers: 151 mm
A	Volume of Embedment Stone Required: 153 Cu. m
B	Volume of Fill Material Required: 64 Cu. m
	Total Storage Provided: 166 Cu. m
	Type Of Chambers: S-29
	# Of Chambers Required: 134
	# Of End Caps Required: 12
	Required Bed Size: 212 Sq. m
	Volume of Excavation: 258 Cu. m
	* Area of Filter Fabric: 292 Sq. m
	# of Chambers Long: 25
	# of rows: 5
	Actual Trench Length: 23.87 m
	Actual Trench Width: 8.86 m

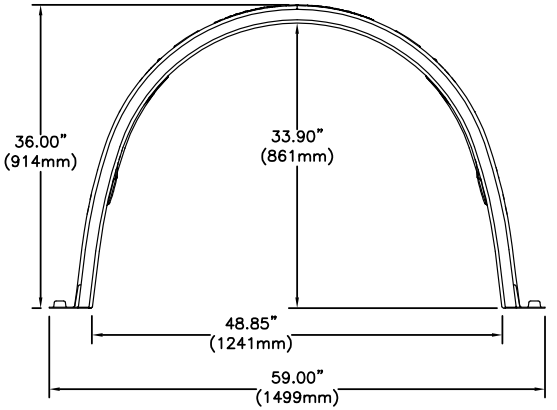
* Filter Fabric quantity for Fabric on Top and Sides of System Only, does not include overlap

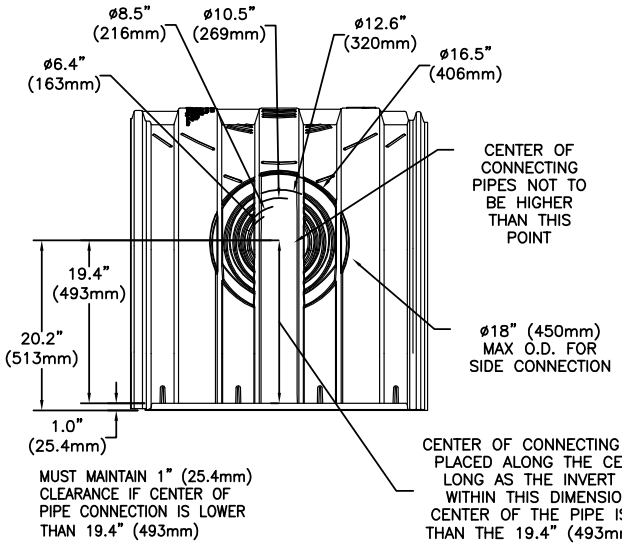

19.64 m
10.55 m

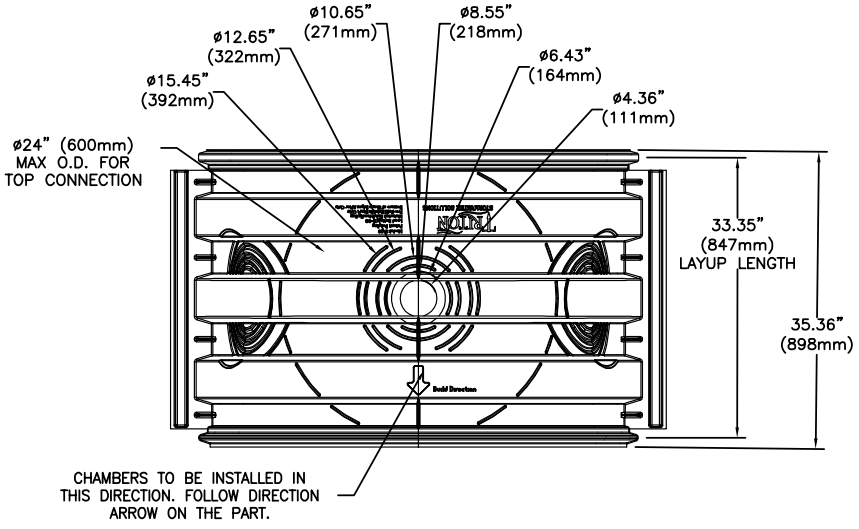


S-29 CHAMBER SPECS	
NOMINAL DIMENSIONS (LAYUP LENGTH X WIDTH X HEIGHT)	33.35" X 59.00" X 36.00" (847mm X 1499mm X 914mm)
BARE CHAMBER STORAGE	27.35 CUBIC FEET (0.774 CUBIC METERS)
*MIN INSTALLED STORAGE	41.05 CUBIC FEET (1.162 CUBIC METERS)
CHAMBER WEIGHT	32 lbs (14.515 kg)
STORAGE PER LINEAR FOOT WITHOUT STONE	9.84 CUBIC FEET (0.279 CUBIC METERS)
STORAGE PER LINEAR FOOT WITH STONE	14.77 CUBIC FEET (0.418 CUBIC METERS)
*ASSUMING A MIN OF 6" (152mm) STONE ABOVE AND BELOW AND 7.5" (191mm) BETWEEN ROWS WITH 40% STONE POROSITY (DOES NOT INCLUDE 12" (305mm) PERIMETER STONE VOLUME)	

NOTE: S-29 CHAMBER DETAILS TESTED AND RATED FOR H-30 LOAD CONDITIONS WITH 18" (457mm) OF COVER AND NO PAVEMENT.







CONCEPTUAL PLAN DISCLAIMER

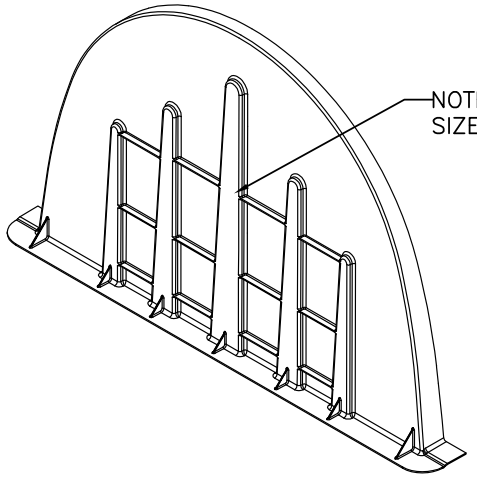
THIS GENERIC DETAIL DOES NOT ENCOMPASS THE SIZING, FIT, AND APPLICABILITY OF THE TRITON CHAMBER SYSTEM FOR THIS SPECIFIC PROJECT. IT IS THE ULTIMATE RESPONSIBILITY OF THE DESIGN ENGINEER TO ASSURE THAT THE STORMWATER SYSTEM DESIGN IS IN FULL COMPLIANCE WITH ALL APPLICABLE LAWS AND REGUALTIONS. TRITON PRODUCTS MUST BE DESIGNED AND INSTALLED IN ACCORDANCE WITH TRITON'S MINIMUM REQUIREMENTS. TRITON STORMWATER SOLUTIONS DOES NOT APPROVE PLANS, SIZING, OR SYSTEM DESIGNS. THE DESIGN ENGINEER IS RESPONSIBLE FOR ALL DESIGN DECISIONS.

TRITON STORMWATER SOLUTIONS
7600 EAST GRAND RIVER, STE.195
BRIGHTON, MI 48114
PHONE: (810) 222-7652 ● FAX: (810) 222-1769
WWW.TRITONSWS.COM

S-29 CHAMBER DETAIL

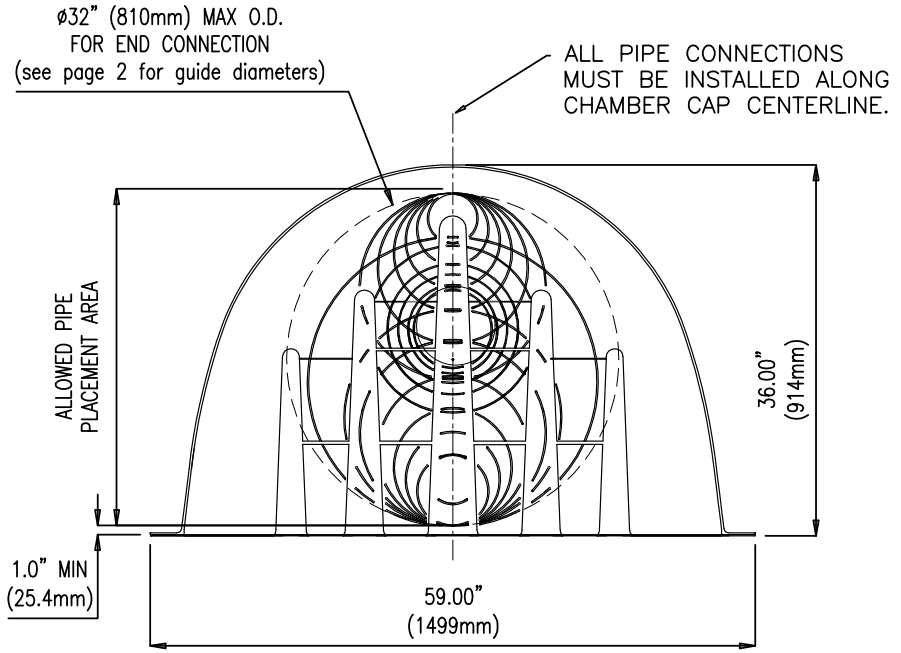
TRITON - STANDARD DETAILS

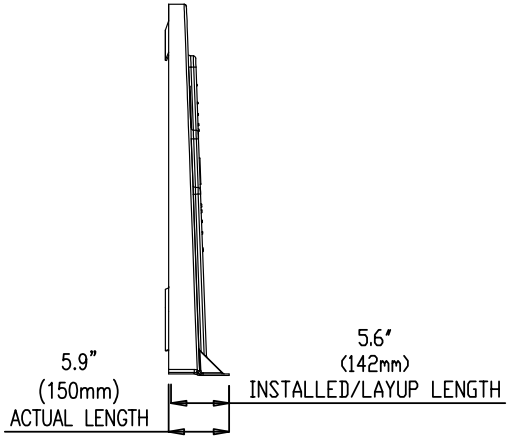
REVISED:
02-26-16 JWM



NOTE: REFER TO PAGE 2 FOR SIZES OF DIAMETER CUT GUIDES.

S-29 END CAP SPECS	
NOMINAL DIMENSIONS (LAYUP LENGTH X WIDTH X HEIGHT)	5.90" X 59.00" X 36.00" (150mm X 1499mm X 914mm)
BARE END CAP STORAGE	1.031 CUBIC FEET (0.029 CUBIC METERS)
*MIN INSTALLED STORAGE	4.98 CUBIC FEET (0.141 CUBIC METERS)
*ASSUMING A MIN OF 6" (152mm) STONE ABOVE AND BELOW AND 7.5" (191mm) BETWEEN ROWS WITH 40% STONE POROSITY (DOES NOT INCLUDE 12" (305mm) PERIMETER STONE VOLUME)	





THE END CAP FITS UP ON THE OUTSIDE OF THE S-29 CHAMBER. REFER TO INSTALLATION MANUAL FOR FURTHER DETAIL.

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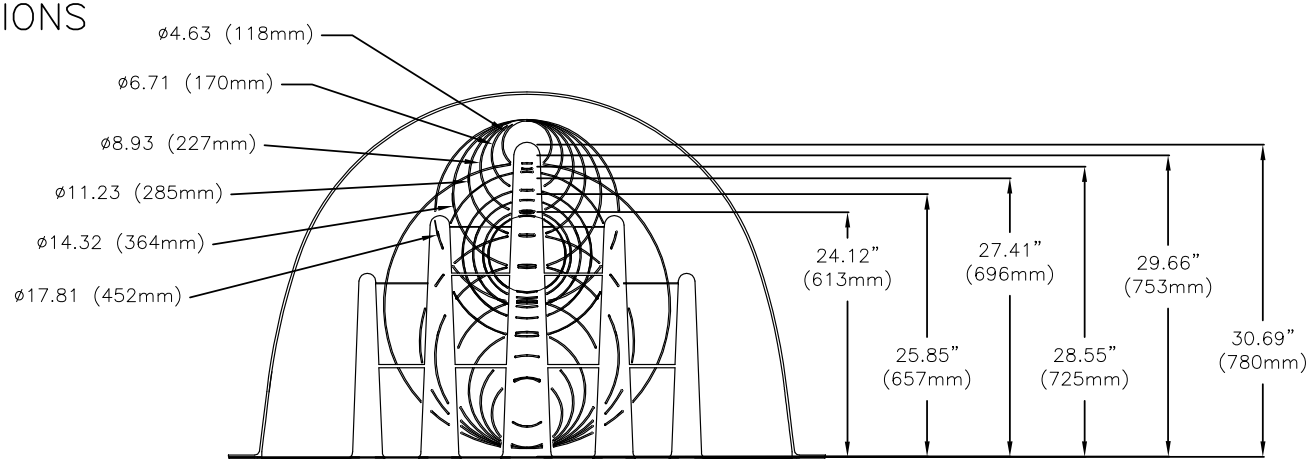
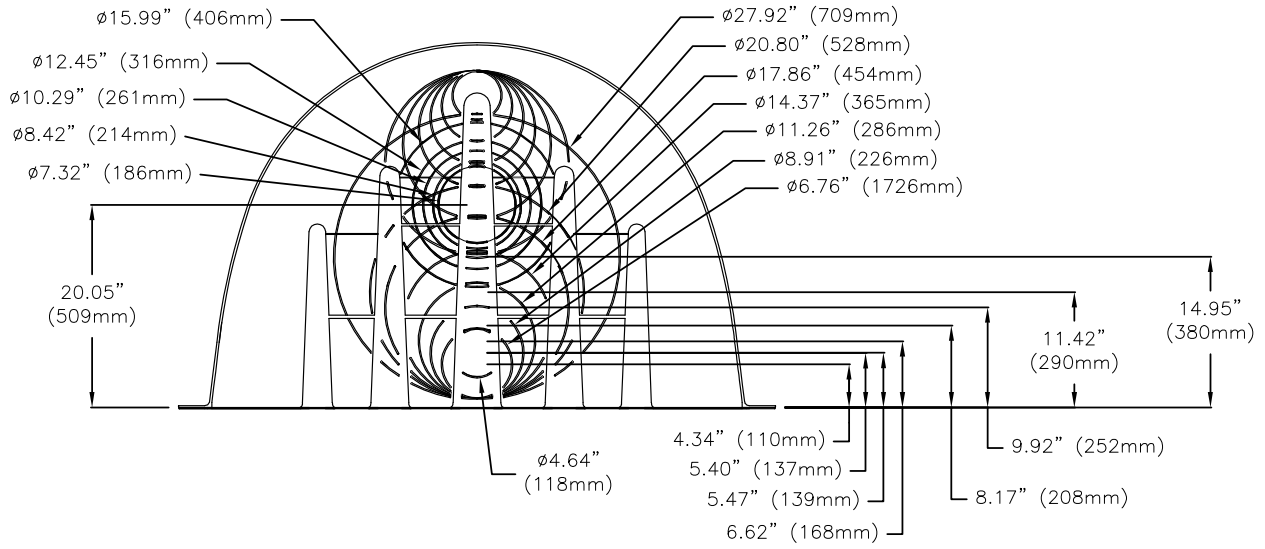
S-29 CHAMBER END CAP DETAIL

S-29 END CAP:
TOP HOLE DIMENSIONS



S-29 END CAP:
CENTER AND BOTTOM HOLE DIMENSIONS



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S-29 CHAMBER END CAP DETAIL

TRITON S-29 PRODUCT SPECIFICATIONS

1.0 General

1.1 Triton chambers are designed to control stormwater runoff. As a subsurface retention or detention system, Triton chambers retain and allow effective infiltration of water into the soil. As a subsurface detention system, Triton chambers detain and allow for the metered flow of water to an outfall.

2.0 Chamber Parameters

2.1 The chamber shall be injection compression molded of a structural grade 1010 green soy resin composite to be inherently resistant to environmental stress cracking (ESCR), creep, and to maintain proper stiffness through temperature ranges of -40 degrees F to 180 degrees F.

2.2 The material property for the chamber and end cap must meet or exceed the following:
Tensile Strength- Ultimate: 21,755 PSI
Tensile Strength-Yield: 17,404 PSI
Tensile Modulus: 1,750-2,240 PSI
Flex Modulus: 1,600 KSI
Flex Yield Strength: 33,100 PSI
Compressive Strength: 30,457,000 PSI
Shear Strength: 11,500 PSI

2.3 The nominal chamber dimensions of the Triton S-29 shall be 36.0 inches tall, 59.0 inches wide and 35.0 inches long. Lay-up length is 33.35”

2.4 The chamber shall have an elliptical curved section profile.

2.5 The chamber shall be open-bottomed.

2.6 The chamber shall incorporate an overlapping corrugation joint system to allow chamber rows to be constructed.

2.7 The nominal storage volume of a Triton S-29 chamber shall be 41.06 cubic feet per chamber when installed per Triton’s typical details. This equates to 2.67 cubic feet of storage/square foot of bed. This does not include perimeter stone.

2.8 The chamber shall have both of its ends open to allow for unimpeded hydraulic flows and visual inspections down a row’s entire length.

2.9 The chamber shall have five corrugations to achieve strengths defined above.

2.10 The chamber shall have five circular and elliptical, indented and raised, surfaces on the top to the chamber for a maximum of 33 inch diameter optional top feed inlets, inspection ports and or clean-out access ports.

2.11 The chamber shall have 5 elliptical, indented, surfaces on either side of the chamber for optional feed inlets, outlets. Capable of accepting pipe O.D. up to 18 inches.

2.12 The chamber shall be analyzed, designed and field tested using AASHTO LRFD bridge design specifications 1. Design live load shall meet or exceed the AASHTO HS30 or a rear axle load of 48,000 pounds. Design shall consider earth and live loads without pavement as appropriate for the minimum of 18” of total cover to a maximum total cover of 50’.

2.13 The chamber shall be manufactured in an ISO 9001:2008 certified facility

2.14 The service life of the product is over 60 years under a constant sustained load of 10,000 PSI which is equal to the H-20 loading condition. Under typical loading conditions the Chamber and End Cap has a useful lifespan of 120 years from date of when manufactured.

2.15 Designed to exceed ASTM F2418, F2787, F2922 standard and AASHTO LRFD Bridge specifications. Validated through independent third party performance testing.

3.0 End Cap Parameters

3.1 The end cap shall be Injection Compression molded of 1010 green soy resin to be inherently resistant to environmental stress cracking (ESCR), creep and to maintain proper stiffness through temperature ranges of -40 degrees F to 180 degrees F.

3.2 The end cap shall be designed to fit over the last corrugation of a chamber, which allows: the capping of each end of the chamber row.

3.3 The end cap shall have six upper saw guides capable of accepting pipe O.D. up to 18.2” Six middle saw guides and eight lower saw guides capable of accepting pipe O.D. up to 28.2” to allow easy cutting for various diameters of pipe that may be used to inlet or outlet the system.

3.4 The end cap shall have excess structural adequacies to allow cutting an orifice of any size at any invert elevation.

3.5 The primary face of an end cap shall have 5 corrugations and be angled outward to resist horizontal loads generated near the edges of beds.

3.6 The end cap shall be manufactured in an ISO 9001:2008 certified facility.

3.7 The service life of the product to be over 60 years under a sustained load of 10,000 PSI which is equal to the H-20 loading condition.

4.0 Installation

4.1 Installation shall be in accordance with the latest Triton Installation manual that can be downloaded from the Triton website:
www.tritonsws.com/support/downloads

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S-29 PRODUCT SPECIFICATIONS

TRITON - STANDARD DETAILS

REVISED:
05-25-17 JWM

APPENDIX H
CITY OF OTTAWA DESIGN CHECKLIST

McINTOSH PERRY

City of Ottawa

4. Development Servicing Study Checklist

The following section describes the checklist of the required content of servicing studies. It is expected that the proponent will address each one of the following items for the study to be deemed complete and ready for review by City of Ottawa Infrastructure Approvals staff.

The level of required detail in the Servicing Study will increase depending on the type of application. For example, for Official Plan amendments and re-zoning applications, the main issues will be to determine the capacity requirements for the proposed change in land use and confirm this against the existing capacity constraint, and to define the solutions, phasing of works and the financing of works to address the capacity constraint. For subdivisions and site plans, the above will be required with additional detailed information supporting the servicing within the development boundary.

4.1 General Content

Criteria	Location (if applicable)
☐ Executive Summary (for larger reports only).	N/A
☐ Date and revision number of the report.	On Cover
☐ Location map and plan showing municipal address, boundary, and layout of proposed development.	Appendix A
☐ Plan showing the site and location of all existing services.	Site Servicing Plan (C102)
☐ Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to which individual developments must adhere.	1.1 Purpose 1.2 Site Description 6.0 Stormwater Management
☐ Summary of pre-consultation meetings with City and other approval agencies.	Appendix B
☐ Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defendable design criteria.	1.1 Purpose 1.2 Site Description 6.0 Stormwater Management
☐ Statement of objectives and servicing criteria.	3.0 Pre-Consultation Summary

☐ Identification of existing and proposed infrastructure available in the immediate area.	N/A
☐ Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available).	Site Grading Plan (C101)
☐ Concept level master grading plan to confirm existing and proposed grades in the development. This is required to confirm the feasibility of proposed stormwater management and drainage, soil removal and fill constraints, and potential impacts to neighbouring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths.	Site Grading Plan (C101)
☐ Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts.	N/A
☐ Proposed phasing of the development, if applicable.	N/A
☐ Reference to geotechnical studies and recommendations concerning servicing.	Section 2.0 Background Studies, Standards and References
☐ All preliminary and formal site plan submissions should have the following information: ○ Metric scale ○ North arrow (including construction North) ○ Key plan ○ Name and contact information of applicant and property owner ○ Property limits including bearings and dimensions ○ Existing and proposed structures and parking areas ○ Easements, road widening and rights-of-way ○ Adjacent street names	Site Grading Plan (C101)

4.2 Development Servicing Report: Water

Criteria	Location (if applicable)
☐ Confirm consistency with Master Servicing Study, if available	N/A
☐ Availability of public infrastructure to service proposed development	N/A
☐ Identification of system constraints	N/A
☐ Identify boundary conditions	Appendix C
☐ Confirmation of adequate domestic supply and pressure	N/A
☐ Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow at locations throughout the development.	Appendix C
☐ Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves.	N/A
☐ Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design	N/A
☐ Address reliability requirements such as appropriate location of shut-off valves	N/A
☐ Check on the necessity of a pressure zone boundary modification.	N/A
☐ Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range	Appendix C, Section 4.2

☐ Description of the proposed water distribution network, including locations of proposed connections to the existing system, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions.	Site Servicing Plan (C101)
☐ Description of off-site required feedermains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation.	N/A
☐ Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.	Appendix C
☐ Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.	N/A

4.3 Development Servicing Report: Wastewater

Criteria	Location (if applicable)
☐ Summary of proposed design criteria (Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitored flow data from relatively new infrastructure cannot be used to justify capacity requirements for proposed infrastructure).	N/A
☐ Confirm consistency with Master Servicing Study and/or justifications for deviations.	N/A
☐ Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the guidelines. This includes groundwater and soil conditions, and age and condition of sewers.	N/A
☐ Description of existing sanitary sewer available for discharge of wastewater from proposed development.	Section 5.2 Proposed Sanitary Sewer

☐ Verify available capacity in downstream sanitary sewer and/or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable)	Section 5.3 Proposed Sanitary Design
☐ Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix 'C') format.	N/A
☐ Description of proposed sewer network including sewers, pumping stations, and forcemains.	Section 5.2 Proposed Sanitary Sewer
☐ Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality).	N/A
☐ Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.	N/A
☐ Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.	N/A
☐ Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.	N/A
☐ Special considerations such as contamination, corrosive environment etc.	N/A

4.4 Development Servicing Report: Stormwater Checklist

Criteria	Location (if applicable)
☐ Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property)	Section 6.0 Stormwater Sewer Design & Section 7.0 Proposed Stormwater Management
☐ Analysis of available capacity in existing public infrastructure.	N/A
☐ A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.	Pre & Post-Development Plans
☐ Water quantity control objective (e.g. controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5-year event (dependent on the receiving sewer design) to 100-year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking into account long-term cumulative effects.	Section 6.0 Stormwater Sewer Design & Section 7.0 Proposed Stormwater Management
☐ Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.	Section 6.0 Stormwater Sewer Design & Section 7.0 Proposed Stormwater Management
☐ Description of the stormwater management concept with facility locations and descriptions with references and supporting information.	Section 6.0 Stormwater Sewer Design & Section 7.0 Proposed Stormwater Management
☐ Set-back from private sewage disposal systems.	N/A
☐ Watercourse and hazard lands setbacks.	N/A
☐ Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.	N/A
☐ Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.	N/A
☐ Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5-year return period) and major events (1:100-year return period).	Appendix G

☐ Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.	Site Grading Plan
☐ Calculate pre-and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions.	Section 7.0 Proposed Stormwater Management Appendix G
☐ Any proposed diversion of drainage catchment areas from one outlet to another.	Section 6.0 Stormwater Sewer Design & Section 7.0 Proposed Stormwater Management
☐ Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.	Section 6.0 Stormwater Sewer Design & Section 7.0 Proposed Stormwater Management
☐ If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100-year return period storm event.	N/A
☐ Identification of potential impacts to receiving watercourses	N/A
☐ Identification of municipal drains and related approval requirements.	N/A
☐ Descriptions of how the conveyance and storage capacity will be achieved for the development.	Section 6.0 Stormwater Sewer Design & Section 7.0 Proposed Stormwater Management
☐ 100-year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.	Site Grading Plan (C101)
☐ Inclusion of hydraulic analysis including hydraulic grade line elevations.	N/A

☐ Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.	Section 8.0 Sediment & Erosion Control
☐ Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplain elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current conditions.	N/A
☐ Identification of fill constraints related to floodplain and geotechnical investigation.	N/A

4.5 Approval and Permit Requirements: Checklist

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

Criteria	Location (if applicable)
☐ Conservation Authority as the designated approval agency for modification of floodplain, potential impact on fish habitat, proposed works in or adjacent to a watercourse, cut/fill permits and Approval under Lakes and Rivers Improvement Act. The Conservation Authority is not the approval authority for the Lakes and Rivers Improvement Act. Where there are Conservation Authority regulations in place, approval under the Lakes and Rivers Improvement Act is not required, except in cases of dams as defined in the Act.	N/A
☐ Application for Certificate of Approval (CofA) under the Ontario Water Resources Act.	N/A
☐ Changes to Municipal Drains.	N/A
☐ Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)	N/A

4.6 Conclusion Checklist

Criteria	Location (if applicable)
☐ Clearly stated conclusions and recommendations	Section 9.0 Summary Section 10.0 Recommendations
☐ Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency.	All are stamped
☐ All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario	All are stamped