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SITE SERVICING STUDY & STORMWATER MANAGEMENT REPORT

DYMON STORAGE
5210 INNES ROAD
OTTAWA, ONTARIO

REPORT NO. 21025

MARCH 26, 2024

CONTENTS

LIST OF APPENDICES

1.0 INTRODUCTION

This report has been prepared in support of the Site Plan Control application for the proposed 3-storey Dymon Storage building located at 5210 Innes Road in Ottawa, Ontario. The property is currently vacant. Refer to Pre-Application Consultation meeting notes in Appendix A.

This report forms part of the servicing and stormwater management design for the proposed development. Also refer to drawings C-1 to C-9 prepared by D.B. Gray Engineering Inc.

2.0 WATER SERVICING

2.1 WATER SUPPLY FOR FIREFIGHTING

The proposed building will have a sprinkler system with the fire department connection located at the SW corner of the building. The closest existing municipal fire hydrant is located in front of the subject property on the Trim Road frontage. It is 100 m unobstructed distance to the proposed fire department connection, which is more than the maximum 45 m permitted by the Ontario Building Code; therefore, a private fire hydrant is required. A private fire hydrant is proposed to be located near the SW corner of the subject property. It is 30 m unobstructed distance to the proposed fire department connection.

In accordance with City of Ottawa Technical Bulletin ISTB-2021-03, when calculating the required fire flow where pipe sizing is affected, the Fire Underwriters Survey Method is to be used. Using the Fire Underwriters Survey Method the required fire flow was calculated to be 16,000 L/min (266.7 L/s). Refer to calculations in Appendix B.

The boundary conditions in the 400 mm Trim Road municipal watermain provided by the City of Ottawa for the 266.7 L/s fire flow at the subject property indicate a hydraulic grade line (HGL) of 125.2 m. Refer to Appendix B. This HGL calculates to 357 kPa (52 psi). Since the pressure is above the Ontario Building Code's minimum required pressure of 140 kPa (20 psi), there is an adequate water supply for firefighting from the existing municipal water distribution system.

In accordance with City of Ottawa Technical Bulletin ISTB-2018-02, the aggregate flow of all contributing fire hydrants within 150 m of the building shall not be less than the required fire flow. In accordance with City of Ottawa Technical Bulletin ISTB-2018-02 Appendix I:

Class	Distance (m)	Contribution (L/min)
AA	≤ 75	5,700
	> 75 and ≤ 150	3,800

The three closest existing municipal fire hydrants are Class AA and are within 75 m of the proposed building; one is located in front of the subject property on the Trim Road frontage (mentioned above); one is located at 2035 Trim Road; and one is located at 1985 Trim Road on the Innes Road frontage. Each can contribute 5,700 L/min (95 L/s) for an aggregate flow of 17,100 L/min (285 L/s), which is greater than the required fire flow of 16,000 L/min (266.7 L/s).

2.2 DOMESTIC WATER SUPPLY

A 150 mm water service connecting to the 400 mm Trim Road municipal watermain is proposed to service the sprinkler system. The same 150 mm water service will provide an adequate domestic water supply.

In accordance with the City of Ottawa Water Design Guidelines for the consumption rate and peaking factors, the average daily demand was calculated to be 0.4 L/s, the maximum daily demand was calculated to be 0.6 L/s and the maximum hourly demand was calculated to be 1.1 L/s. Refer to calculations in Appendix B.

The boundary conditions in the 400 mm Trim Road municipal watermain provided by the City of Ottawa at the subject property indicate a minimum HGL of 125.9 m and a maximum HGL of 130.2 m. Refer to Appendix B. Based on these boundary conditions the pressure at the water meter is calculated to vary between 349 kPa (51 psi) and 391 kPa (57 psi). This is an acceptable range for the proposed development.

3.0 SANITARY SERVICING

In accordance with

i. the City of Ottawa Sewer Design Guidelines for the peaking factor, and
ii. City of Ottawa Technical Bulletin ISTB-2018-01 for the consumption rate and infiltration allowance,

the post-development sanitary flow rate was calculated to be 1.06 L/s. A 150 mm sanitary sewer service at 0.48% and 1% slopes is proposed to service the development. At the design flow rate the sanitary sewer service will only be at between 7% and 10% of its capacity. The proposed 150 mm sanitary sewer service will connect to the existing 525 mm Trim Road municipal sanitary sewer, which at 0.125% slope has a capacity of 158.31 L/s. Refer to calculations in Appendix C. The proposed development is expected to have an acceptable impact on the 525 mm Trim Road municipal sanitary sewer.

4.0 STORMWATER MANAGEMENT

4.1 PRE-DEVELOPMENT CONDITIONS

Based on the topographical plan the subject property is lower than surrounding properties with no stormwater outlet. This was discussed in July 2021 with City of Ottawa staff.

4.2 QUALITY CONTROL

It is expected that the Rideau Valley Conservation Authority will require an enhanced level of protection with 80% total suspended solids (TSS) removal. Open bottom chambers on clear stone bedding wrapped in geotextile fabric are proposed for quantity control. The clear stone bedding will serve a dual purpose also promoting infiltration for TSS removal. Runoff from Drainage Areas II and III representing 88.5% of the subject property will be conveyed to the open bottom chambers and clear stone bedding. In accordance with the Ministry of the Environment Stormwater Management Planning and Design Manual Table 3.2, it was calculated that an infiltration trench with a volume of 48.76 cu.m is required. In accordance with the Hydrogeological Investigation, an infiltration rate of 8 mm/hr was used to calculate

the draw down time. The storage volume of the clear stone bedding for the open bottom chambers was calculated to be 49.44 cu.m with a 24 hr draw down time. Refer to calculations in Appendix D.

In accordance with the Greater Cardinal Creek Subwatershed Management Plan, onsite retention of the first 5 mm of rainfall events is proposed. Similar to TSS removal above, the clear stone bedding for the open bottom chambers will serve a dual purpose providing storage of the first 5 mm of rainfall events and promoting infiltration. A 5 mm rainfall event was calculated to be 48.61 cu.m. In accordance with the Hydrogeological Investigation, an infiltration rate of 8 mm/hr was used to calculate the draw down time. The storage volume of the clear stone bedding for the open bottom chambers was calculated to be 49.44 cu.m with a 24 hr draw down time. Refer to calculations in Appendix D.

An Erosion & Sediment Control Plan has been developed to be implemented during construction. Refer to drawing C-3 and notes 4.0 to 4.10 on drawing C-4.

i. A silt fence barrier is to be installed along the perimeter of the site.
ii. Sediment capture filter sock inserts are to be installed in all existing and proposed catch-basins adjacent to and within the site.
iii. Any material deposited on the public road is to be removed.

4.3 QUANTITY CONTROL

The stormwater quantity control criterion is to control the post-development 100-year peak flow rate to the pre-development 2-year peak flow rate. In accordance with the City of Ottawa Sewer Design Guidelines, it was determined that the pre-development flat pasture, clay and silt loam conditions reflect a 5-year runoff coefficient of 0.30. In the absence of a pre-development stormwater outlet, it was mutually agreed in July 2021 with City of Ottawa staff to use a time of concentration of 10 minutes – rationale being that 10 minutes is the conservative approach that should have been taken when designing the municipal storm sewer. Using the Rational Method with a time of concentration of 10 minutes and the calculated pre-development 5-year runoff coefficient of 0.30, the maximum allowable release rate was calculated to be 83.21 L/s. The Rational and Modified Rational Methods were used to calculate the post-development flow rates and corresponding storage volumes. Refer to calculations in Appendix D.

Drainage Area I (Uncontrolled Flow Off Site to Innes Road – 115 sq.m)
The NE corner of the property will drain uncontrolled off site to Innes Road. The flow rates are calculated at a time of concentration of 10 minutes.

	100-Year Event	5-Year Event
Maximum Flow Rate	3.66 L/s	1.88 L/s

Drainage Area II (Uncontrolled Flow Off Site to Trim Road – 935 sq.m)
The west side of the property will drain uncontrolled off site to Trim Road. The flow rates are calculated at a time of concentration of 10 minutes.

	100-Year Event	5-Year Event
Maximum Flow Rate	19.05 L/s	9.47 L/s

Drainage Area III (Uncontrolled Flow Off Site to 2035 Trim Road – 450 sq.m)
The south side of the property will continue to drain uncontrolled off site to 2035 Trim Road. The flow rates are calculated at a time of concentration of 10 minutes.

	100-Year Event	5-Year Event
Maximum Flow Rate	5.58 L/s	2.61 L/s

Drainage Area IV (Roof – 5,626 sq.m)
The 12 roof drains are to be flow control type roof drains which will restrict the flow of stormwater and cause it to pond on the roof. Each roof drain is to be installed with a single-parabolic slotted weir and release 0.01242 L/s/mm (5 USgpm/in). Roof drains are to be Watts with an Accutrol Weir RD-100-A1 or approved equivalent. The opening at the top of the flow control weir is to be a minimum 50 mm in diameter. A minimum of 9 scuppers each a minimum 1,830 mm wide are to be installed 150 mm above the roof drains. Refer to architectural for exact locations and details. The roof is to be designed to carry the load of water having a 50 mm depth at the scuppers (i.e. 200 mm depth at the roof drains). Refer to structural.

	100-Year Event	5-Year Event
Maximum Release Rate	21.53 L/s	16.64 L/s
Maximum Depth at Roof Drains	144 mm	112 mm
Maximum Volume Stored	237.21 cu.m	109.49 cu.m

Drainage Area V (5,865 sq.m)
An inlet control device (ICD) located in the outlet pipe of CBMH-15 will restrict the flow of stormwater and cause it to backup into the upstream infrastructure and pond above CB-1, CB-2, CIMH-3, CIMH-4, CB-5, CICB-6, CBMH-7, CICB-8, CB-9, CB-10, CBMH-11, CB-12, CBMH-13, CBMH-14 and CBMH-15. The ICD will be a plug style with a round orifice located at the bottom of the plug manufactured by Pedro Plastics or approved equivalent sized by the manufacturer for a release rate of 54.91 L/s at 1.40 m. It was calculated that an orifice area of 17,178 sq.mm (148 mm dia) with a discharge coefficient of 0.61 will achieve the desired release rate. Since some of the restricted stormwater is proposed to be stored using underground infrastructure, an average release rate equal to 50% of the maximum release rate was used to calculate the required storage volumes. The underground infrastructure will consist of 80 – Soleno HydroStor HS31 chambers or approved equivalent surrounded by clear stone wrapped in geotextile fabric.

	100-Year Event	5-Year Event
Maximum Release Rate	54.91 L/s	43.60 L/s
Maximum Ponding Elevation	89.02 m	88.51 m
Maximum Volume Stored	310.55 cu.m	144.58 cu.m

Summary
The maximum post-development release rate during the 100-year event was calculated to be 83.21 L/s, which is equal to the maximum allowable release rate. To achieve the maximum allowable release rate, a

maximum storage volume of 547.76 cu.m is required and provided. The maximum post-development release rate during the 5-year event was calculated to be 57.56 L/s, which is 31% less than the maximum allowable release rate. The proposed development is expected to have an acceptable impact on the 1,200 mm Trim Road municipal storm sewer.

	100-Year Event	5-Year Event
Maximum Allowable Release Rate	83.21 L/s	83.21 L/s
Maximum Release Rate	83.21 L/s	57.56 L/s
Maximum Volume Required	547.76 cu.m	254.07 cu.m
Maximum Volume Stored	547.76 cu.m	254.07 cu.m

4.4 STORM SERVICING

The peak restricted roof flow rate during the 2-year event was calculated to be 16.64 L/s. A 250 mm storm sewer service at 1% slope (59.47 L/s capacity) is proposed to service the roof drains. At the peak restricted 2-year flow rate the storm sewer service will only be at 28% of its capacity. Refer to calculations in Appendix D. The proposed 250 mm storm service will connect to the proposed private storm sewer system upstream of the ICD. The rainwater leaders inside the building are to be constructed to withstand the pressure from a water column the height of the rainwater leader. It is recommended pressure tests be performed on the systems in accordance with the mechanical engineer's instructions.

The peak restricted flow rate draining into the last sewer segment of the private storm sewer system during the 2-year event was calculated to be 45.93 L/s. A 375 mm storm sewer at 0.48% slope (121.47 L/s capacity) is proposed to connect to the existing 1,200 mm Trim Road municipal storm sewer, which at 0.125% slope has a capacity of 1,437 L/s. At the peak restricted 2-year flow rate the proposed 375 mm storm sewer will only be at 38% of its capacity. Refer to calculations in Appendix D.

The foundation drains will drain to a storm sump and be pumped to the storm building drain.

5.0 CONCLUSIONS

1. A private fire hydrant is required and provided.
2. There is an adequate water supply for firefighting from the existing municipal water distribution system.
3. There is an acceptable range of water pressures in the existing municipal water distribution system.
4. The post-development sanitary flow rate will be adequately handled by the proposed sanitary sewer service.
5. The proposed development is expected to have an acceptable impact on the existing municipal sanitary sewer.
6. The proposed clear stone bedding for the open bottom chambers will achieve 80% TSS removal and provide onsite retention of the first 5 mm of rainfall events.
7. An Erosion & Sediment Control Plan has been developed to be implemented during construction.

8. The maximum post-development release rate during the 100-year event will be equal to the maximum allowable release rate.
9. The proposed development is expected to have an acceptable impact on the existing municipal storm sewer.
10. The peak restricted flow rates during the 2-year event will be adequately handled by the proposed storm sewer service and private storm sewer system.
11. The rainwater leaders inside the building are to be constructed to withstand the pressure from a water column the height of the rainwater leader. It is recommended pressure tests be performed on the systems in accordance with the mechanical engineer's instructions.

Prepared by D.B. Gray Engineering Inc.

APPENDIX A

PRE-APPLICATION CONSULTATION MEETING NOTES

Pre-Application Consultation Meeting – City Comments

Property Address: 5210 and 5220 Innes Road
File Number: PC2022-0289
Description: Zoning By-law Amendment and Site Plan Control application for a 4-storey / 18m self-storage facility with retail on ground floor.
Meeting Location: Virtual – Microsoft Teams
Meeting Date: November 17, 2022

Submission Requirements

Documents required in support of this application are highlighted in the attached Study and Plan Identification List.

When checking for Application Completeness the City refers to the requirements provided in Ottawa's Guide to preparing studies and plans. Additional information is also available related to building permits, development charges, and the Accessibility Design Standards. Be aware that other fees and permits may be required, outside of the development review process. You may obtain background drawings by contacting informationcentre@ottawa.ca.

These pre-application consultation comments are valid for one year. If you submit a development application(s) after this time, you may be required to meet for another pre-consultation meeting and/or the submission requirements may change.

Application Type and Fees

The application fees (2022 rates) for the proposed applications are as follows. Application fees may vary from now to time of submission:

Application Type	**Planning / Legal Fee**	**Initial Engineering Design Review and Inspection Fee**	**Conservation Authority Fee (Initial)**	**Total** (HST may apply to part or all)
Major Zoning By-law Amendment	$22,472.80	n/a	$400.00	$22,872.80
Site Plan Control - Complex	$49,964.88	$10,000 (estimated, value of hard/soft servicing >$300,000)	$1065.00	$61,029.88

Staff Comments

Development Planning Comments – Kelly Livingstone

- Site design changes are appreciated since the previous pre-consultation meeting (PC2021-0095). I note a wider landscaping strip is provided along Innes, and a direct pedestrian connection with accessible sidewalk is also provided. There is opportunity for lots of planting and landscaping in this strip that should be taken advantage of and shown on the Landscape Plan.
- The underlying designation for the site is Corridor – Minor per the new OP.
- The site is within an area of archaeological potential. Accordingly, an Archaeological Resource Assessment is required with a complete submission.
- I agree with the suggestion to rezone to GM just as the other properties at the intersection are zoned. Rezoning will need to permit warehousing and site specific provisions for reduced parking rate in the GM zone. Providing examples in your Planning Rationale of other rezonings for Dymon facilities you have done in the City will no doubt be helpful for staff review.
- You are encouraged to consult with the local ward councillor before making an application. This development is within Ward 19, Catherine Kitts. Since it is also on the Ward 1 Boundary, Matthew Luloff should also be consulted. Both will be circulated on a future submission.
- It is anticipated that, as a result of the More Homes for Everyone Act, 2022, for applications for site plan approval and zoning by-law amendments, new processes in respect of pre-consultation will be in place as of January 1, 2023. The new processes are anticipated to require a multiple phase pre-consultation approach before an application will be deemed complete. Applicants who have not filed a complete application by the effective date may be required to undertake further pre-consultation(s) consistent with the provincial changes. The by-laws to be amended include By-law 2009-320, the Pre-Consultation By-law, By-law 2022-239, the planning fees by-law and By-law 2022-254, the Information and Materials for Planning Application By-law. The revisions are anticipated to be before Council in the period after the new Council takes office and the end of the year.
- Given the above, and Mike Schmidt's comments below: If you apply prior to the new year then we can review the files and place them on hold until the FNO is removed. If you wait until the new year then the processes in the previous point may apply and you may be required to undertake further pre-consultation and wait until the FNO is removed before formally applying.

Planning Policy Comments – Mike Schmidt

- With MMAH approval of the new OP, the policies of 5.6.2 – Future Neighbourhood Overlay apply to these lands. As outlined in 5.6.2, lands within

this overlay can only be developed (including approval of site plans or draft plan of subdivisions) once the overlay has been removed and the policies of 5.6.2 have been satisfied. This includes the requirement that all contiguous urban expansion lands must go through a secondary planning process. That being said as discussed City policy staff will be bringing a report forward in the new year to Planning Committee and Council, along with a staff initiated OPA, to outline the secondary planning process for the various urban expansion lands, as well as making some refinements to the overlay. Given the site context here (including that there are City serviced lands adjacent to the site to the south (Millennium Park) and to the east (works yards) which did not form part of the lands included to accommodate growth) staff have determined that the overlay (and associated policies) could be removed from the Dymon site. At this stage this is what staff plan to recommend in the report and staff initiated OPA. That being said this recommendation and OPA would still need to be approved by Planning Committee and Council and there is always the risk, while low, that they may not agree with the staff recommendation.

Infrastructure Approvals (Transportation), Project Manager – Josiane Gervais

- Follow Transportation Impact Assessment Guidelines:
    - A reduced-scope TIA, with a focus on the Design Review Component (note that Module 3.1 is also not required) is required.
    - Start this process asap. The application will not be deemed complete until the submission of the draft step 1-4, including the functional draft RMA package (if applicable) and/or monitoring report (if applicable).
    - Request base mapping asap if RMA is required. Contact Engineering Services (https://ottawa.ca/en/city-hall/planning-and-development/engineering-services)
- ROW protection on Innes between Tenth Line and Trim is 37.5m even, and between Trim and the East Urban Community limit is 37.5m even. Ensure this ROW is shown on the site plan.
- ROW protection on Trim between Innes and the East Urban Community- south limit is 37.5m. This ROW is already protected.
- Corner triangles as per OP Annex 1 - Road Classification and Rights-of-Way at the following locations on the final plan will be required (measure on the property line/ROW protected line; no structure above or below this triangle): Arterial Road to Arterial Road: 5 m x 5 m
- Clear throat requirements on an arterial is 15m.
- Access locations proposed are supported.
- As the proposed site is commercial and for general public use, AODA legislation applies.

    - Ensure all crosswalks located internally on the site provide a TWSI at the depressed curb, per requirements of the Integrated Accessibility Standards Regulation under the AODA.
    - Clearly define accessible parking stalls and ensure they meet AODA standards (include an access aisle next to the parking stall and a pedestrian curb ramp at the end of the access aisle, as required).
    - Please consider using the City's Accessibility Design Standards, which provide a summary of AODA requirements. https://ottawa.ca/en/city-hall/creating-equal-inclusive-and-diverse-city/accessibility-services/accessibility-design-standards-features#accessibility-design-standards
- On site plan:
    - Ensure site accesses meet the City's Private Approach Bylaw. Access off Trim currently exceeds the maximum access width of 9.0m.
    - Show all details of the roads abutting the site up to and including the opposite curb; include such items as pavement markings, accesses and/or sidewalks.
    - Turning movement diagrams required for all accesses showing the largest vehicle to access/egress the site.
    - Turning movement diagrams required for internal movements (loading areas, garbage).
    - Show all curb radii measurements; ensure that all curb radii are reduced as much as possible and fall within TAC guidelines (Figure 8.5.1).
    - Show dimensions for site elements (i.e. lane/aisle widths, access width and throat length, parking stalls, sidewalks, pedestrian pathways, etc.)
    - Sidewalk is to be continuous across access as per City Specification 7.1.
- Noise Impact Studies required for the following:
    - Stationary if there will be any exposed mechanical equipment due to the proximity to neighboring noise sensitive land uses (i.e. homes across the street).

Infrastructure Approvals (Engineering), Project Manager – Alex Polyak

Note the following Development charges which are applicable to the site:

- Outer Greenbelt development charge

Please note the following information regarding the engineering design submissions for the above noted site:

1. The Servicing Study Guidelines for Development Applications are available at the following address: https://ottawa.ca/en/city-hall/planning-and-development/how-

develop-property/development-application-review-process-2/guide-preparing-studies-and-plans

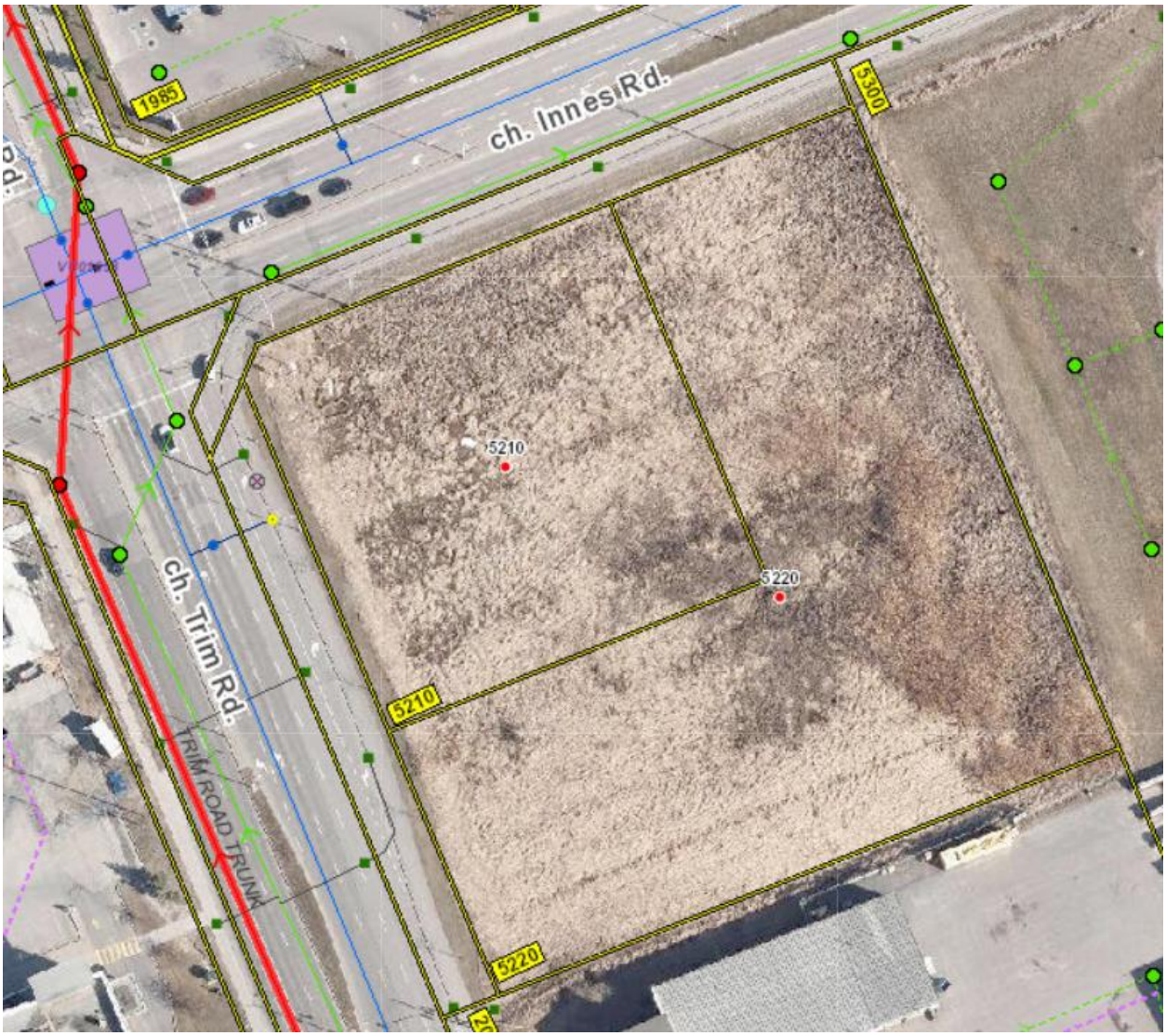
2. Servicing and site works shall be in accordance with the following documents:
   - Ottawa Sewer Design Guidelines, Second Edition, (October 2012), including Technical Bulletins, ISDTB-2014-01, PIEDTB-2016-01, ISTB 2018-01, ISTB-2018-04, and ISTB-2019-02
   - Ottawa Design Guidelines – Water Distribution, First Edition, (July 2010), including Technical Bulletins ISD-2010-2, ISDTB-2014-02, ISTB-2018-02, and ISTB-2021-03
   - Geotechnical Investigation and Reporting Guidelines for Development Applications in the City of Ottawa (Revised 2008)
   - City of Ottawa Slope Stability Guidelines for Development Applications (Revised 2012)
   - City of Ottawa Environmental Noise Control Guidelines (January, 2016)
   - City of Ottawa Hydrogeological and Terrain Analysis Guidelines (March 2021)
   - City of Ottawa Park and Pathway Development Manual (2012)
   - City of Ottawa Accessibility Design Standards (2012)
   - Ottawa Standard Tender Documents (latest version)
   - Ontario Provincial Standards for Roads & Public Works (2013)

3. Record drawings and utility plans are also available for purchase from the City (Contact the City's Information Centre by email at InformationCentre@ottawa.ca or by phone at (613) 580-2424 x 44455

4. The Stormwater Management Criteria for the subject site has previously been discussed with the City's Rural team through a Pre-Consultation meeting held in March 2021 and subsequent email conversations with the engineering consultant, the highlights of which are:
   - Flow to the minor storm sewer system is restricted to the runoff from a storm event with a 2-year return period. Stormwater runoff in excess of the 2-year storm , up to and including the 100-year storm event +20% stress test, must be detained on site.
   - The Greater Cardinal Creek Subwatershed Management Plan (SMP) is applicable to the site, which includes the retention of the first 5mm of rainfall events, including the roof of the proposed building, as outlined in Table 4.1 of the SMP.
   - Ensure no overland flow for all storms up to and including the 100-year event. Provide adequate emergency overflow conveyance off-site
   - Soils mapping shows sensitive marine clays in this area. It is anticipated that the groundwater level is high in this area.

- The following reports which were previously shared with your consultant should be referenced in the site plan design and identified in the body of the SWM and/or servicing report where applicable.
    i. R-2881 Innes Road Widening – Tenth Line Road to Frank Kenny Road Storm Sewer Design Report, April 2004
    ii. R-1447.A Update to Master Drainage Plan – City of Cumberland East Urban Community Expansion Area, Aug 2000
    iii. R-1447.B Update to Master Drainage Plan – City of Cumberland East Urban Community Expansion Area – Computer Outputs, Aug 2000
    iv. R-1447.C Update to Master Drainage Plan – East Urban Community Expansion Area, Aug 2000
    v. R-1497 Gloucester and Cumberland East Urban Community Expansion Area and Bilberry Creek Industrial Park Master Servicing Update, Updated July 2006
- Given the challenges faced in Greenfields developments with low grades and lack of conveyance of the major system, a time of concentration of 10 minutes may be used on this site provided that there is rationale to support it's use.

5. Deep Services:



i. A plan view of the approximate services may be seen above. Services should ideally be grouped in a common trench to minimize the number of road cuts. The sizing of available services is:

   a) Connections (Trim):
      i. 406 mm dia. water service
      ii. 525 mm dia. trunk sanitary sewer
      iii. 1200 mm dia. storm sewer
   b) Please note, there may be additional approvals required before a sanitary connection to the trunk sewer is accepted.

ii. Provide existing servicing information and the recommended location for the proposed connections. Services should ideally be grouped in a common trench to minimize the number of road cuts.

iii. Provide information on the monitoring manhole requirements – should be located in an accessible location on private property near the property line (ie. Not in a parking area).

iv. Provide information on the type of connection permitted

Sewer connections to be made above the springline of the sewermain as per:

a) Std Dwg S11.1 for flexible main sewers – connections made using approved tee or wye fittings.
b) Std Dwg S11 (For rigid main sewers) – lateral must be less that 50% the diameter of the sewermain,
c) Std Dwg S11.2 (for rigid main sewers using bell end insert method) – for larger diameter laterals where manufactured inserts are not available; lateral must be less that 50% the diameter of the sewermain,
d) Connections to manholes permitted when the connection is to rigid main sewers where the lateral exceeds 50% the diameter of the sewermain. – Connect obvert to obvert with the outlet pipe unless pipes are a similar size.
e) No submerged outlet connections.

v. The capacity of the existing system should be evaluated when estimating the peak sanitary flow rates.

6. Civil consultant must request boundary conditions from the City's assigned Project Manager prior to first submission. Water Boundary condition requests must include the location of the service and the expected loads required by the proposed development. Please provide the following information:
   i. Location of service(s)
   ii. Type of development and the amount of fire flow required (as per FUS, 2020).
   iii. Average daily demand: ___ l/s.
   iv. Maximum daily demand: ___l/s.
   v. Maximum hourly daily demand: ___ l/s.
   vi. Hydrant location and spacing to meet City's Water Design guidelines.
   vii. Water supply redundancy will be required for more than 50 m3/day water demand.

Please note that a boundary condition request should be made to the City as early as possible, in order to identify any water supply constraints (if any exist). Please also provide the estimated sanitary flows with the design, so the City can confirm that there aren't any capacity constraints downstream.

7. Phase 1 ESAs and Phase 2 ESAs must conform to clause 4.8.4 of the Official Plan that requires that development applications conform to Ontario Regulation 153/04.

8. All development applications should be considered for an Environmental Compliance Approval (ECA) by the Ministry of the Environment, Conservation, and Parks (MECP);
   a) The consultants determine if an approval for sewage works under Section 53 of OWRA is required and determines what type of application. The City's project manager may help confirm and coordinate with the MECP as required.
   b) The project will be either transfer of review (standard), transfer of review (additional), direct submission, or exempt as per O. Reg. 525/98.
   c) Pre-consultation is not required if applying for standard or additional works (Schedule A of the Agreement) under Transfer Review.
   d) Pre-consultation with local District office of MECP is recommended for direct submission.
   e) Consultant completes an MECP request form for a pre-consultation. Send request to moeccottawasewage@ontario.ca
   f) ECA applications are required to be submitted online through the MECP portal. A business account required to submit ECA application. For more information visit https://www.ontario.ca/page/environmental-compliance-approval

   NOTE: Site Plan Approval, or Draft Approval, is required before an application is sent to the MECP.

9. General Engineering Submission requirements:
   a) As per section 53 of the Professional Engineers Act, O. Reg 941/40, R.S.O. 1990, all documents prepared by engineers must be signed and dated on the seal.
   b) All required plans are to be submitted on standard A1 size sheets (594mm x 841mm) sheets, utilizing a reasonable and appropriate metric scale as per City of Ottawa Servicing and Grading Plan Requirements: title blocks are to be placed on the right of the sheets and not along the bottom. Engineering plans may be combined, but the Site Plans must be provided separately. Plans shall include the survey monument used to confirm datum. Information shall be provided to enable a non-surveyor to locate the survey monument presented by the consultant.
   c) All required plans & reports are to be provided in *.pdf format (at application submission and for any, and all, re-submissions)

Minimum Drawing and File Requirements- All Plans

Plans are to be submitted on standard A1 size (594mm x 841mm) sheets, utilizing an appropriate Metric scale (1:200, 1:250, 1:300, 1:400, or 1:500).

With all submitted hard copies provide individual PDF of the DWGs and for reports please provide one PDF file of the reports. All PDF documents are to be unlocked and flattened.

Should you have any questions or require additional information, please contact me directly at alex.polyak@ottawa.ca

Parks Planning – Phil Castro

The Owner shall pay cash-in-lieu of parkland in accordance with the Parkland Dedication By-law of the City of Ottawa, as well as the fee for appraisal services. The monies are to be paid at the time of execution of the Site Plan Agreement.

Please note that Parks and Facilities Planning has recently undertaken a legislated replacement of the Parkland Dedication By-law, with the new by-law approved by City Council on August 31, 2022. To ensure you are aware of parkland dedication requirements for your proposed development, we encourage you to familiarize yourself with the staff report and By-Law that were approved by Council on August 31, 2022.

Urban Design – Christopher Moise

- This proposal does not run along or does not meet the threshold in one of the City's Design Priority Areas and need not attend the City's UDRP. Staff will be responsible for evaluating the proposal and providing design direction;
- We appreciate the scale and general approach to this proposal and have the following comments related to the design:
    - **Built form supporting the street**: The inclusion of this site as urban lands suggests it would benefit from supporting the intersection in a similar way as found on the west sides of the intersection (both corners have buildings built to the sidewalk without parking or drive aisles between building and street). We note that the applicant provided illustrations of two similar Dymon projects in Ottawa that accomplish this quite successfully and we recommend the applicant match those, at least on the Innes Road frontage.
    - **Landscape**: We recommend a landscape plan be developed to show the quality of spaces indicated adjacent and contributing to the public realm and streetscape;
    - **Pedestrian connection**: We recommend the building provide clear and safe connection to all surrounding sidewalks.
- 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.

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

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

Forestry – Mark Richardson

Tree Conservation Report (TCR) is not required

Environmental Planning – Sami Rehman

I don't have any major environmental concerns, subject to the following:

- Review and incorporate design elements from the Bird Safe Design Guidelines into the design at Site Plan Control.
- Plant as many locally appropriate native trees as possible on the site. Show these on the landscape plan at Site Plan Control.

APPENDIX B

WATER SERVICING

D.B. Gray Engineering Inc.

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

700 Long Point Circle
Ottawa, Ontario K1T 4E9

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

June 30, 2023

5210 Innes Road

3-Storey Dymon Storage Building

Ottawa, Ontario

FIRE FLOW CALCULATIONS

FUS Method

RFF = Required Fire Flow in litres per minute
= $220CA^{0.5}$

C = Construction Coefficient related to the type of construction of the building
= 0.8 Type II Noncombustible Construction

A = Total Effectice Floor Area in square meters of the building

3rd Floor:	5,566.51	sq.m
2nd Floor:	5,585.69	sq.m
1st Floor:	5,626.07	sq.m
	16,778.27	sq.m

RFF = 22,797 L/min
= 23,000 L/min (rounded to nearest 1,000 L/min)

Occupancy and Contents Adjustment Factor
15% Free Burning Contents
= 3,450 L/min Occupancy and Contents Adjustment Factor

RFF = 26,450 L/min

Automatic Sprinkler Protection Credit

30%	Sprinkler system designed, installed and maintained in accordance with NFPA standards
10%	Standard water supply for both the sprinkler system and fire department hose lines

= 10,580 L/min Automatic Sprinkler Protection Credit

Exposure Adjustment Charge

Side	Charge	Distance	Construction	Length	Storeys	Factor
North	0%	over 30 m				
East	0%	over 30 m				
South	1%	20.1 m to 30 m	Type I-II	44	1	44
West	0%	over 30 m				

1% Exposure Adjustment Charge

= 265 L/min Exposure Adjustment Charge

RFF = 16,135 L/min

= 16,000 L/min (rounded to nearest 1,000 L/min)

= 266.7 L/s

266.7 L/s Fire Flow HGL: 125.2 m

Elevation at Fire Hydrant: 88.8 m

Static Pressure at Fire Hydrant: 36.4 m 357 kPa 52 psi

D.B. Gray Engineering Inc.

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

700 Long Point Circle
Ottawa, Ontario K1T 4E9

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

December 21, 2022

5210 Innes Road

3-Storey Dymon Storage Building

Ottawa, Ontario

WATER DEMAND CALCULATIONS

Average Daily Demand:	1.3	ha				
	28,000	L/ha/day				
	36,400	L/day				
	24	hour day				
	25.3	L/min	0.4	L/s	6.7	USgpm
Maximum Daily Demand:	1.5	(Peaking factor as per City of Ottawa Water Design Guidelines)				
	37.9	L/min	0.6	L/s	10.0	USgpm
Maximum Hourly Demand:	1.8	(Peaking factor as per City of Ottawa Water Design Guidelines)				
	68.3	L/min	1.1	L/s	18.0	USgpm

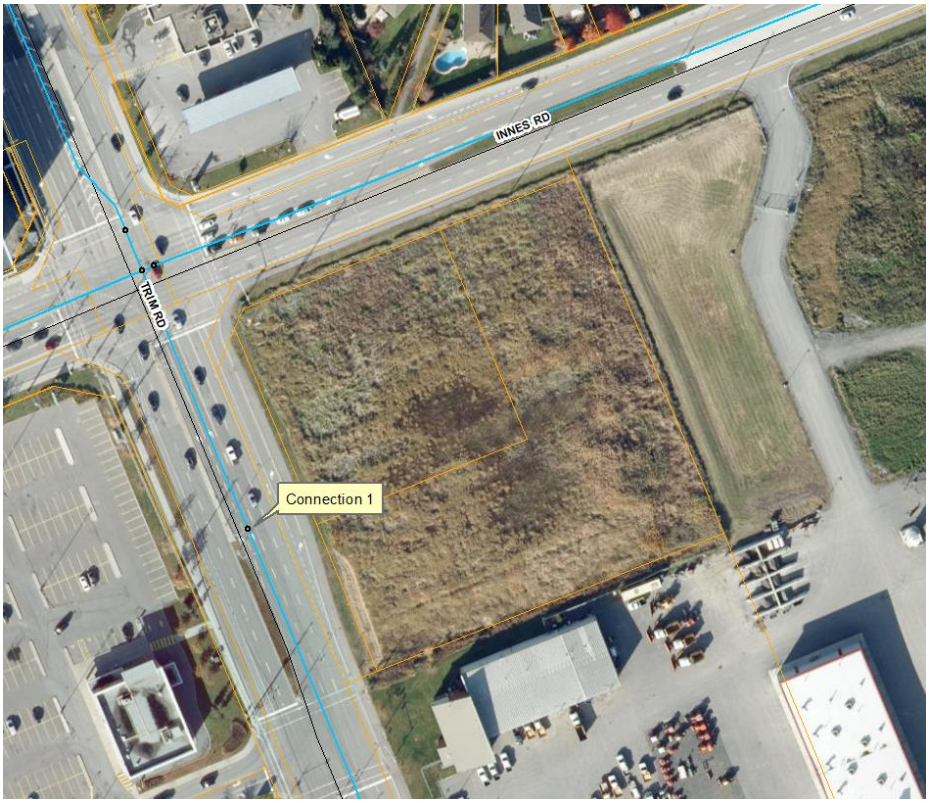
Elevation of Water Meter:	90.28	m				
Finished Floor Elevation:	89.38	m				
Minimum HGL:	125.9	m				
Static Pressure at Water Meter:	35.6	m	349	kPa	51	psi
Maximum HGL:	130.2	m				
Static Pressure at Water Meter:	39.9	m	391	kPa	57	psi

Boundary Conditions
5210 & 5220 Innes Road

Provided Information

Scenario	Demand	
	L/min	L/s
Average Daily Demand	24	0.4
Maximum Daily Demand	36	0.6
Peak Hour	66	1.1
Fire Flow Demand # 1	16000	266.7

Location



Results

Connection 1 – Trim Rd.

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	130.2	58.8
Peak Hour	125.9	52.6
Max Day plus Fire #1	125.2	51.6

[1] Ground Elevation = 88.86 m

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.

June 30, 2023

5210 Innes Road

Ottawa, Ontario

EPANET RESULTS

Node ID	Demand (L/s)	HGL (m)	Elevation (m)	Pressure (m)	Pressure (kPa)	Pressure (psi)
1 - Reservoir	-133.6	125.2	88.8	36.4	357	52
2 - Fire Hydrant	95.0	108.75	88.8	20.0	196	28
3 - Sprinkler & Domestic Demands	38.6	107.14	89.4	17.7	174	25

Link ID	Length (m)	Diameter (mm)	Roughness Coefficient	Minor Loss Coefficient	Flow (L/s)	Velocity (m/s)
1 - Reservoir to Fire Hydrant	19.5	150	100	2.15	133.6	7.56
2 - Fire Hydrant to Building	27.8	150	100	0.60	38.6	2.18

APPENDIX C

SANITARY SERVICING

SANITARY SEWER CALCULATIONS

D.B. Gray Engineering Inc.

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

700 Long Point Circle
Ottawa, Ontario K1T 4E9

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

Project: 5210 Innes Road
3-Storey Dymon Storage Building
Ottawa, Ontario

Date: June 30, 2023

Location		Commercial				Infiltration	Q	Sewer Data						
		Individual	Cumulative			Cumulative	Total		Nominal	Actual			Q_{Full}	
From	To	Area (ha)	Area (ha)	Peaking Factor	Flow Rate (L/s)	Flow Rate (L/s)	Flow Rate (L/s)	Length (m)	Diameter (mm)	Diameter (mm)	Slope (%)	Velocity (m/s)	Capacity (L/s)	Q / Q_{Full}
Proposed Building	MH-SA.1	1.3	1.3	1.5	0.63	0.43	1.06	22.6	150	150	1	0.86	15.23	7%
MH-SA.1	525 SAN		1.3	1.5	0.63	0.43	1.06	41.4	150	150	0.48	0.60	10.55	10%
							Existing 525 mm Trim Road Municipal Sanitary Sewer:		525	533	0.125	0.71	158.31	

Commercial Average Daily Flow:	28,000	L/ha/day
Commercial Peaking Factor:	1.5	
Institutional Average Daily Flow:	28,000	L/ha/day
Institutional Peaking Factor:	1.5	
Light Industrial Average Daily Flow:	35,000	L/ha/day
Heavy Industrial Average Daily Flow:	55,000	L/ha/day
Industrial Peaking Factor:	Ministry of the Environment	
Infiltration Allowance:	0.33	L/s/ha
Manning's Roughness Coefficient:	0.013	

APPENDIX D

STORMWATER MANAGEMENT

November 15, 2023

5210 Innes Road

Ottawa, Ontario

INFILTRATION CALCULATIONS
(80% TSS Removal)

DRAINAGE AREAS IV & V

			C
Roof Area:	5,671	sq.m	0.90
Hard Area:	4,935	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Soft Area:	885	sq.m	0.20
Total Catchment Area:	11,491	sq.m	0.85
Impervious Level:	92	%	
Volume Required:	42.43	cu.m/ha (interpolated from MOE Stormwater Management Planning and Design Manual Table 3.2)	
	48.76	cu.m	

Clear Stone Bedding Storage

Clear Stone Length	Clear Stone Width	Clear Stone Storage Depth	Clear Stone Volume	40% Voids
176.262	1.461	0.48	123.61	49.44

Volume Stored:	49.44	cu.m
Infiltration Rate:	8	mm/hr
Draw Down Time:	24	hr

November 15, 2023

5210 Innes Road

Ottawa, Ontario

INFILTRATION CALCULATIONS

(5 mm Retention)

DRAINAGE AREAS IV & V

			C
Roof Area:	5,671	sq.m	0.90
Hard Area:	4,935	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Soft Area:	885	sq.m	0.20
Total Catchment Area:	11,491	sq.m	0.85
Rainfall:	5	mm	
Volume Required:	48.61	cu.m	

Clear Stone Bedding Storage

Clear Stone Length	Clear Stone Width	Clear Stone Storage Depth	Clear Stone Volume	40% Voids
176.262	1.461	0.48	123.61	49.44

Volume Stored:	49.44	cu.m
Infiltration Rate:	8	mm/hr
Draw Down Time:	24	hr

SUMMARY TABLES

100-YEAR EVENT

Drainage Area	Pre-Development Flow Rate (L/s)	Maximum Allowable Release Rate (L/s)	Maximum Release Rate (L/s)	Maximum Volume Required (cu.m)	Maximum Volume Stored (cu.m)
AREA I (Uncontrolled Flow Off Site to Innes Road)	-	-	3.66	-	-
AREA II (Uncontrolled Flow Off Site to Trim Road)	-	-	19.05	-	-
AREA III (Uncontrolled Flow Off Site to 2035 Trim Road)	241.82	-	5.58	-	-
AREA IV (Roof)	-	-	21.53	237.21	237.21
AREA V	-	-	54.91	310.55	310.55
TOTAL (AREA I + AREA II + AREA III + AREA V)	-	83.21	83.21	547.76	547.76

5-YEAR EVENT

Drainage Area	Pre-Development Flow Rate (L/s)	Maximum Allowable Release Rate (L/s)	Maximum Release Rate (L/s)	Maximum Volume Required (cu.m)	Maximum Volume Stored (cu.m)
AREA I (Uncontrolled Flow Off Site to Innes Road)	-	-	1.88	-	-
AREA II (Uncontrolled Flow Off Site to Trim Road)	-	-	9.47	-	-
AREA III (Uncontrolled Flow Off Site to 2035 Trim Road)	112.89	-	2.61	-	-
AREA IV (Roof)	-	-	16.64	109.49	109.49
AREA V	-	-	43.60	144.58	144.58
TOTAL (AREA I + AREA II + AREA III + AREA V)	-	83.21	57.56	254.07	254.07

November 15, 2023

5210 Innes Road

Ottawa, Ontario

STORMWATER MANAGEMENT CALCULATIONS

Modified Rational Method

PRE-DEVELOPMENT CONDITIONS

100-YEAR EVENT

Flat Pasture, Clay and Silt Loam Area (A):	12,991	sq.m
Time of Concentration:	10	min
Rainfall Intensity (i):	179	mm/hr
Runoff Coeficient (C):	0.375	
100-Year Pre-Development Flow Rate (2.78AiC):	241.82	L/s

5-YEAR EVENT

Flat Pasture, Clay and Silt Loam Area (A):	12,991	sq.m
Time of Concentration:	10	min
Rainfall Intensity (i):	104	mm/hr
Runoff Coeficient (C):	0.30	
5-Year Pre-Development Flow Rate (2.78AiC):	112.89	L/s

MAXIMUM ALLOWABLE RELEASE RATE

Flat Pasture, Clay and Silt Loam Area (A):	12,991	sq.m
Time of Concentration:	10	min
Rainfall Intensity (i):	77	mm/hr (2-Year Event)
Runoff Coeficient (C):	0.30	
Maximum Allowable Release Rate (2.78AiC):	83.21	L/s

100-YEAR EVENT

DRAINAGE AREA I (Uncontrolled Flow Off Site to Innes Road)

(100-YEAR EVENT)

			C
Roof Area:	0	sq.m	1.00
Hard Area:	60	sq.m	1.00
Gravel Area:	0	sq.m	0.875
Soft Area:	55	sq.m	0.25
Total Catchment Area:	115	sq.m	0.64
Area (A):	115	sq.m	
Time of Concentration:	10	min	
Rainfall Intensity (i):	179	mm/hr	
Runoff Coeficient (C):	0.64		
Flow Rate (2.78AiC):	3.66	L/s	

DRAINAGE AREA II (Uncontrolled Flow Off Site to Trim Road)

(100-YEAR EVENT)

			C
Roof Area:	0	sq.m	1.00
Hard Area:	200	sq.m	1.00
Gravel Area:	0	sq.m	0.875
Soft Area:	735	sq.m	0.25
Total Catchment Area:	935	sq.m	0.41
Area (A):	935	sq.m	
Time of Concentration:	10	min	
Rainfall Intensity (i):	179	mm/hr	
Runoff Coeficient (C):	0.41		
Flow Rate (2.78AiC):	19.05	L/s	

DRAINAGE AREA III (Uncontrolled Flow Off Site to 2035 Trim Road)

(100-YEAR EVENT)

			C
Roof Area:	0	sq.m	1.00
Hard Area:	0	sq.m	1.00
Gravel Area:	0	sq.m	0.875
Soft Area:	450	sq.m	0.25
Total Catchment Area:	450	sq.m	0.25
Area (A):	450	sq.m	
Time of Concentration:	10	min	
Rainfall Intensity (i):	179	mm/hr	
Runoff Coeficient (C):	0.25		
Flow Rate (2.78AiC):	5.58	L/s	

DRAINAGE AREA IV (Roof)

(100-YEAR EVENT)

			C
Total Catchment Area:	5,626	sq.m	1.00

No. of Roof Drains: 12

Slots per Wier: 1 0.01242 L/s/mm/slot (5 USgpm/in/slot)

Depth at Roof Drains: 144 mm

Maximum Release Rate: 21.53 L/s

Pond Area: 4,926 sq.m

Maximum Volume Stored: 237.21 cu.m

Maximum Volume Required: 237.21 cu.m

Time (min)	i (mm/hr)	2.78AiC (L/s)	Release Rate (L/s)	Stored Rate (L/s)	Required Storage Volume (cu.m)
10	179	279.27	21.53	257.74	154.65
15	143	223.49	21.53	201.96	181.77
20	120	187.61	21.53	166.08	199.29
25	104	162.42	21.53	140.89	211.34
30	92	143.68	21.53	122.16	219.88
35	83	129.16	21.53	107.63	226.01
40	75	117.53	21.53	96.00	230.40
45	69	108.00	21.53	86.47	233.46
50	64	100.03	21.53	78.50	235.49
55	60	93.25	21.53	71.72	236.69
60	56	87.42	21.53	65.89	237.21
65	53	82.34	21.53	60.81	237.16
70	50	77.87	21.53	56.34	236.64
75	47	73.91	21.53	52.38	235.71
80	45	70.37	21.53	48.84	234.42
85	43	67.18	21.53	45.65	232.82
90	41	64.30	21.53	42.77	230.95
95	39	61.68	21.53	40.15	228.84
100	38	59.28	21.53	37.75	226.51
105	36	57.08	21.53	35.55	223.99
110	35	55.06	21.53	33.53	221.29
115	34	53.19	21.53	31.66	218.43
120	33	51.45	21.53	29.92	215.42
125	32	49.83	21.53	28.30	212.28
130	31	48.33	21.53	26.80	209.01
135	30	46.92	21.53	25.39	205.63
140	29	45.59	21.53	24.07	202.15
145	28	44.35	21.53	22.82	198.57
150	28	43.18	21.53	21.65	194.89
180	24	37.38	21.53	15.86	171.23
210	21	33.07	21.53	11.54	145.42
240	19	29.73	21.53	8.20	118.03
270	17	27.05	21.53	5.52	89.42
300	16	24.85	21.53	3.33	59.86
330	15	23.02	21.53	1.49	29.51
360	14	21.46	21.46	0.00	0.00
390	13	20.12	20.12	0.00	0.00
420	12	18.95	18.95	0.00	0.00
450	11	17.92	17.92	0.00	0.00
480	11	17.01	17.01	0.00	0.00

DRAINAGE AREA V

(100-YEAR EVENT)

			C
Roof Area:	45	sq.m	1.00
Hard Area:	4,935	sq.m	1.00
Gravel Area:	0	sq.m	0.875
Soft Area:	885	sq.m	0.25
Total Catchment Area:	5,865	sq.m	0.89

Water Elevation:	89.02	m
Head:	1.40	m
Centroid of ICD Orifice:	87.62	m
Invert of Outlet Pipe of CBMH-15:	87.55	m
Orifice Diameter:	148	mm
Orifice Area:	17,178	sq.mm
Discharge Coefficient:	0.61	
Maximum Release Rate:	54.91	L/s

Surface Storage

CB/MH	Top Area	Depth	Volume	
CB-1	79	0.10	2.73	cu.m
CB-2	104	0.10	3.59	cu.m
CIMH-3	53	0.14	2.55	cu.m
CIMH-4	67	0.14	3.21	cu.m
CB-5	497	0.22	37.09	cu.m
CICB-6	117	0.14	5.62	cu.m
CBMH-7	92	0.09	2.88	cu.m
CICB-8	199	0.19	12.83	cu.m
CB-9	354	0.19	22.85	cu.m
CB-10	29	0.06	0.61	cu.m
CB-12	232	0.18	14.19	cu.m
CBMH-13	586	0.22	43.72	cu.m
CBMH-14	93	0.14	4.44	cu.m
CBMH-15	94	0.12	3.88	cu.m

DRAINAGE AREA V (Continued)

(100-YEAR EVENT)

Chamber Storage

No. of Chambers	Volume Per Chamber	No. of End Caps	Volume Per End Cap	No. of Rows	Length	Volume	
80	0.42	6	0.01	3	174.462	33.66	cu.m

Clear Stone Storage

Length	Width	Depth	Volume	40% Voids	
176.262	1.461	1.040	234.160	93.66	cu.m

CB/MH Storage

CB/MH	Invert	Size	Volume	
CB-1	87.93	0.61	0.41	cu.m
CB-2	87.86	0.61	0.43	cu.m
CIMH-3	87.96	1.219	1.24	cu.m
CIMH-4	87.75	1.219	1.49	cu.m
CB-5	87.71	0.61	0.49	cu.m
CICB-6	87.72	0.61	0.49	cu.m
CBMH-7	87.70	1.219	1.54	cu.m
CICB-8	87.72	0.61	0.49	cu.m
CB-9	87.72	0.61	0.49	cu.m
CB-10	87.71	0.61	0.49	cu.m
CBMH-11	87.70	1.219	1.54	cu.m
CB-12	87.77	0.61	0.47	cu.m
CBMH-13	87.93	1.219	1.28	cu.m
CBMH-14	87.70	1.219	1.54	cu.m
CBMH-15	87.55	1.219	1.72	cu.m

Pipe Storage

From	Invert	To	Invert	Length	Dia.	Volume	
CIMH-3	87.96	CIMH-4	87.75	62.2	0.30	4.40	cu.m
CIMH-4	87.75	CBMH-7	87.70	13.7	0.30	0.97	cu.m
CBMH-13	87.93	CBMH-14	87.70	52.2	0.25	2.56	cu.m
CBMH-14	87.70	CBMH-15	87.61	20.4	0.25	1.00	cu.m

Maximum Volume Stored: 310.55 cu.m

Maximum Volume Required: 310.55 cu.m

DRAINAGE AREA V (Continued)

(100-YEAR EVENT)

Time (min)	i (mm/hr)	2.78AiC (L/s)	Roof Inflow (L/s)	Total Inflow (L/s)	50% Release Rate (L/s)	Stored Rate (L/s)	Required Storage Volume (cu.m)
10	179	258.19	21.53	279.72	27.46	252.26	151.36
15	143	206.62	21.53	228.15	27.46	200.69	180.62
20	120	173.44	21.53	194.97	27.46	167.52	201.02
25	104	150.16	21.53	171.69	27.46	144.23	216.35
30	92	132.84	21.53	154.37	27.46	126.91	228.44
35	83	119.40	21.53	140.93	27.46	113.48	238.30
40	75	108.66	21.53	130.19	27.46	102.73	246.55
45	69	99.84	21.53	121.37	27.46	93.92	253.57
50	64	92.47	21.53	114.00	27.46	86.55	259.64
55	60	86.21	21.53	107.74	27.46	80.29	264.94
60	56	80.82	21.53	102.35	27.46	74.89	269.62
65	53	76.12	21.53	97.65	27.46	70.20	273.77
70	50	71.99	21.53	93.52	27.46	66.07	277.48
75	47	68.33	21.53	89.86	27.46	62.40	280.81
80	45	65.05	21.53	86.58	27.46	59.13	283.81
85	43	62.11	21.53	83.64	27.46	56.18	286.53
90	41	59.44	21.53	80.97	27.46	53.52	288.99
95	39	57.02	21.53	78.55	27.46	51.09	291.23
100	38	54.81	21.53	76.34	27.46	48.88	293.27
105	36	52.77	21.53	74.30	27.46	46.85	295.13
110	35	50.90	21.53	72.43	27.46	44.97	296.83
115	34	49.17	21.53	70.70	27.46	43.24	298.38
120	33	47.56	21.53	69.09	27.46	41.64	299.79
125	32	46.07	21.53	67.60	27.46	40.14	301.08
130	31	44.68	21.53	66.21	27.46	38.75	302.25
135	30	43.37	21.53	64.90	27.46	37.45	303.32
140	29	42.15	21.53	63.68	27.46	36.23	304.29
145	28	41.00	21.53	62.53	27.46	35.08	305.17
150	28	39.92	21.53	61.45	27.46	34.00	305.97
180	24	34.56	21.53	56.09	27.46	28.63	309.26
210	21	30.57	21.53	52.10	27.46	24.65	310.55
240	19	27.48	21.53	49.01	27.46	21.55	310.38
270	17	25.01	21.53	46.54	27.46	19.08	309.10
300	16	22.98	21.53	44.51	27.46	17.05	306.92
330	15	21.28	21.53	42.81	27.46	15.36	304.03
360	14	19.84	21.46	41.30	27.46	13.85	299.06
390	13	18.60	20.12	38.72	27.46	11.26	263.53
420	12	17.52	18.95	36.47	27.46	9.01	227.09
450	11	16.57	17.92	34.49	27.46	7.03	189.87
480	11	15.72	17.01	32.73	27.46	5.28	151.97

STRESS TEST EVENT

DRAINAGE AREA I (Uncontrolled Flow Off Site to Innes Road)

(STRESS TEST EVENT)

			C
Roof Area:	0	sq.m	1.00
Hard Area:	60	sq.m	1.00
Gravel Area:	0	sq.m	0.875
Soft Area:	55	sq.m	0.25
Total Catchment Area:	115	sq.m	0.64
Area (A):	115	sq.m	
Time of Concentration:	10	min	
Rainfall Intensity (i):	214	mm/hr	
Runoff Coeficient (C):	0.64		
Flow Rate (2.78AiC):	4.39	L/s	

DRAINAGE AREA II (Uncontrolled Flow Off Site to Trim Road)

(STRESS TEST EVENT)

			C
Roof Area:	0	sq.m	1.00
Hard Area:	200	sq.m	1.00
Gravel Area:	0	sq.m	0.875
Soft Area:	735	sq.m	0.25
Total Catchment Area:	935	sq.m	0.41
Area (A):	935	sq.m	
Time of Concentration:	10	min	
Rainfall Intensity (i):	214	mm/hr	
Runoff Coeficient (C):	0.41		
Flow Rate (2.78AiC):	22.86	L/s	

DRAINAGE AREA III (Uncontrolled Flow Off Site to 2035 Trim Road)

(STRESS TEST EVENT)

			C
Roof Area:	0	sq.m	1.00
Hard Area:	0	sq.m	1.00
Gravel Area:	0	sq.m	0.875
Soft Area:	450	sq.m	0.25
Total Catchment Area:	450	sq.m	0.25
Area (A):	450	sq.m	
Time of Concentration:	10	min	
Rainfall Intensity (i):	214	mm/hr	
Runoff Coeficient (C):	0.25		
Flow Rate (2.78AiC):	6.70	L/s	

DRAINAGE AREA IV (Roof)

(STRESS TEST EVENT)

			C
Total Catchment Area:	5,626	sq.m	1.00

No. of Roof Drains:	12	
Slots per Wier:	1	0.01242 L/s/mm/slot (5 USgpm/in/slot)
Depth at Roof Drains:	150	mm
Maximum Roof Drains Release Rate:	22.36	L/s
Maximum Overflow Release Rate:	9.14	L/s
Total Maximum Release Rate:	31.50	L/s

Pond Area:	5,312	sq.m
Maximum Volume Stored:	265.60	cu.m
Maximum Volume Required:	265.60	cu.m

Time (min)	i (mm/hr)	2.78AiC (L/s)	Roof Drains Release Rate (L/s)	Overflow Release Rate (L/s)	Total Release Rate (L/s)	Stored Rate (L/s)	Required Storage Volume (cu.m)
10	214	335.13	22.36	0.00	22.36	312.77	187.66
15	171	268.19	22.36	0.00	22.36	245.83	221.25
20	144	225.13	22.36	0.00	22.36	202.77	243.33
25	125	194.90	22.36	0.00	22.36	172.55	258.82
30	110	172.42	22.36	2.51	24.87	147.56	265.60
35	99	154.99	22.36	6.15	28.51	126.48	265.60
40	90	141.04	22.36	8.01	30.37	110.67	265.60
45	83	129.60	22.36	8.87	31.23	98.37	265.60
50	77	120.03	22.36	9.14	31.50	88.53	265.60
55	72	111.90	22.36	9.06	31.42	80.48	265.60
60	67	104.90	22.36	8.77	31.13	73.78	265.60
65	63	98.81	22.36	8.35	30.71	68.10	265.60
70	60	93.45	22.36	7.85	30.21	63.24	265.60
75	57	88.69	22.36	7.31	29.67	59.02	265.60
80	54	84.44	22.36	6.75	29.11	55.33	265.60
85	52	80.62	22.36	6.18	28.54	52.08	265.60
90	49	77.16	22.36	5.62	27.97	49.19	265.60
95	47	74.01	22.36	5.06	27.42	46.60	265.60
100	45	71.14	22.36	4.52	26.87	44.27	265.60
105	44	68.50	22.36	3.98	26.34	42.16	265.60
110	42	66.07	22.36	3.47	25.83	40.24	265.60
115	41	63.82	22.36	2.97	25.33	38.49	265.60
120	39	61.74	22.36	2.49	24.85	36.89	265.60
125	38	59.80	22.36	2.03	24.39	35.41	265.60
130	37	57.99	22.36	1.58	23.94	34.05	265.60
135	36	56.30	22.36	1.15	23.51	32.79	265.60
140	35	54.71	22.36	0.74	23.09	31.62	265.60
145	34	53.22	22.36	0.34	22.69	30.53	265.60
150	33	51.82	22.36	0.00	22.36	29.46	265.18
180	29	44.86	22.36	0.00	22.36	22.51	243.06
210	25	39.68	22.36	0.00	22.36	17.33	218.34
240	23	35.67	22.36	0.00	22.36	13.31	191.73
270	21	32.46	22.36	0.00	22.36	10.10	163.67
300	19	29.83	22.36	0.00	22.36	7.47	134.45
330	18	27.62	22.36	0.00	22.36	5.27	104.30
360	16	25.75	22.36	0.00	22.36	3.40	73.38
390	15	24.14	22.36	0.00	22.36	1.79	41.79
420	15	22.74	22.36	0.00	22.36	0.38	9.65
450	14	21.50	21.50	0.00	21.50	0.00	0.00
480	13	20.41	20.41	0.00	20.41	0.00	0.00
510	12	19.43	19.43	0.00	19.43	0.00	0.00
540	12	18.55	18.55	0.00	18.55	0.00	0.00
570	11	17.76	17.76	0.00	17.76	0.00	0.00
600	11	17.03	17.03	0.00	17.03	0.00	0.00

DRAINAGE AREA V

(STRESS TEST EVENT)

			C
Roof Area:	45	sq.m	1.00
Hard Area:	4,935	sq.m	1.00
Gravel Area:	0	sq.m	0.875
Soft Area:	885	sq.m	0.25
Total Catchment Area:	5,865	sq.m	0.89

Water Elevation:	89.03	m
Head:	1.41	m
Centroid of ICD Orifice:	87.62	m
Invert of Outlet Pipe of CBMH-15:	87.55	m
Orifice Diameter:	148	mm
Orifice Area:	17,178	sq.mm
Discharge Coefficient:	0.61	
Maximum ICD Release Rate:	55.04	L/s
Maximum Overflow Release Rate:	11.39	L/s
Total Maximum Release Rate:	66.43	L/s

Surface Storage

CB/MH	Top Area	Depth	Volume	
CB-1	89	0.11	3.26	cu.m
CB-2	117	0.11	4.29	cu.m
CIMH-3	58	0.15	2.90	cu.m
CIMH-4	73	0.15	3.65	cu.m
CB-5	526	0.23	40.33	cu.m
CICB-6	128	0.15	6.40	cu.m
CBMH-7	105	0.10	3.50	cu.m
CICB-8	212	0.20	14.13	cu.m
CB-9	377.5	0.20	25.17	cu.m
CB-10	35	0.07	0.82	cu.m
CB-12	248	0.19	15.71	cu.m
CBMH-13	620	0.23	47.53	cu.m
CBMH-14	101	0.15	5.05	cu.m
CBMH-15	104	0.13	4.51	cu.m

DRAINAGE AREA V (Continued)

(STRESS TEST EVENT)

Chamber Storage

No. of Chambers	Volume Per Chamber	No. of End Caps	Volume Per End Cap	No. of Rows	Length	Volume	
80	0.42	6	0.01	3	174.462	33.66	cu.m

Clear Stone Storage

Length	Width	Depth	Volume	40% Voids	
176.262	1.461	1.040	234.160	93.66	cu.m

CB/MH Storage

CB/MH	Invert	Size	Volume	
CB-1	87.93	0.61	0.41	cu.m
CB-2	87.86	0.61	0.44	cu.m
CIMH-3	87.96	1.219	1.25	cu.m
CIMH-4	87.75	1.219	1.49	cu.m
CB-5	87.71	0.61	0.49	cu.m
CICB-6	87.72	0.61	0.49	cu.m
CBMH-7	87.70	1.219	1.55	cu.m
CICB-8	87.72	0.61	0.49	cu.m
CB-9	87.72	0.61	0.49	cu.m
CB-10	87.71	0.61	0.49	cu.m
CBMH-11	87.70	1.219	1.55	cu.m
CB-12	87.77	0.61	0.47	cu.m
CBMH-13	87.93	1.219	1.28	cu.m
CBMH-14	87.70	1.219	1.55	cu.m
CBMH-15	87.55	1.219	1.73	cu.m

Pipe Storage

From	Invert	To	Invert	Length	Dia.	Volume	
CIMH-3	87.96	CIMH-4	87.75	62.2	0.30	4.40	cu.m
CIMH-4	87.75	CBMH-7	87.70	13.7	0.30	0.97	cu.m
CBMH-13	87.93	CBMH-14	87.70	52.2	0.25	2.56	cu.m
CBMH-14	87.70	CBMH-15	87.61	20.4	0.25	1.00	cu.m

Maximum Volume Stored: 327.66 cu.m

Maximum Volume Required: 327.66 cu.m

DRAINAGE AREA V (Continued)

(STRESS TEST EVENT)

Time (min)	i (mm/hr)	2.78AiC (L/s)	Roof Inflow (L/s)	Total Inflow (L/s)	50% Release Rate (L/s)	Overflow Release Rate (L/s)	Total Release Rate (L/s)	Stored Rate (L/s)	Required Storage Volume (cu.m)
10	214	309.82	22.36	332.18	27.52	0.00	27.52	304.66	182.80
15	171	247.94	22.36	270.30	27.52	0.00	27.52	242.78	218.50
20	144	208.13	22.36	230.49	27.52	0.00	27.52	202.97	243.56
25	125	180.19	22.36	202.54	27.52	0.00	27.52	175.03	262.54
30	110	159.40	24.87	184.27	27.52	0.00	27.52	156.75	282.15
35	99	143.29	28.51	171.80	27.52	0.00	27.52	144.28	302.98
40	90	130.39	30.37	160.76	27.52	0.00	27.52	133.24	319.77
45	83	119.81	31.23	151.04	27.52	2.16	29.68	121.36	327.66
50	77	110.97	31.50	142.47	27.52	5.73	33.25	109.22	327.66
55	72	103.46	31.42	134.87	27.52	8.06	35.58	99.29	327.66
60	67	96.98	31.13	128.11	27.52	9.58	37.09	91.02	327.66
65	63	91.35	30.71	122.06	27.52	10.52	38.04	84.02	327.66
70	60	86.39	30.21	116.60	27.52	11.07	38.59	78.02	327.66
75	57	81.99	29.67	111.66	27.52	11.33	38.85	72.81	327.66
80	54	78.07	29.11	107.17	27.52	11.39	38.91	68.26	327.66
85	52	74.53	28.54	103.07	27.52	11.30	38.82	64.25	327.66
90	49	71.33	27.97	99.31	27.52	11.11	38.63	60.68	327.66
95	47	68.42	27.42	95.84	27.52	10.84	38.36	57.48	327.66
100	45	65.77	26.87	92.64	27.52	10.51	38.03	54.61	327.66
105	44	63.33	26.34	89.67	27.52	10.14	37.66	52.01	327.66
110	42	61.08	25.83	86.91	27.52	9.74	37.26	49.65	327.66
115	41	59.00	25.33	84.33	27.52	9.33	36.85	47.49	327.66
120	39	57.08	24.85	81.93	27.52	8.90	36.42	45.51	327.66
125	38	55.28	24.39	79.67	27.52	8.46	35.98	43.69	327.66
130	37	53.61	23.94	77.55	27.52	8.03	35.54	42.01	327.66
135	36	52.05	23.51	75.56	27.52	7.59	35.11	40.45	327.66
140	35	50.58	23.09	73.68	27.52	7.15	34.67	39.01	327.66
145	34	49.21	22.69	71.90	27.52	6.72	34.24	37.66	327.66
150	33	47.91	22.36	70.26	27.52	6.34	33.86	36.41	327.66
180	29	41.47	22.36	63.83	27.52	5.97	33.49	30.34	327.66
210	25	36.69	22.36	59.04	27.52	5.52	33.04	26.01	327.66
240	23	32.98	22.36	55.33	27.52	5.06	32.58	22.75	327.66
270	21	30.01	22.36	52.36	27.52	4.62	32.14	20.23	327.66
300	19	27.57	22.36	49.93	27.52	4.21	31.73	18.20	327.66
330	18	25.54	22.36	47.89	27.52	3.83	31.35	16.55	327.66
360	16	23.81	22.36	46.16	27.52	3.48	31.00	15.17	327.66
390	15	22.32	22.36	44.68	27.52	3.15	30.67	14.00	327.66
420	15	21.02	22.36	43.38	27.52	2.86	30.38	13.00	327.66
450	14	19.88	21.50	41.39	27.52	1.73	29.25	12.14	327.66
480	13	18.87	20.41	39.28	27.52	0.38	27.90	11.38	327.66
510	12	17.96	19.43	37.40	27.52	0.00	27.52	9.88	302.29
540	12	17.15	18.55	35.70	27.52	0.00	27.52	8.19	265.20
570	11	16.42	17.76	34.17	27.52	0.00	27.52	6.65	227.54
600	11	15.75	17.03	32.78	27.52	0.00	27.52	5.26	189.35

5-YEAR EVENT

DRAINAGE AREA I (Uncontrolled Flow Off Site to Innes Road)

(5-YEAR EVENT)

			C
Roof Area:	0	sq.m	0.90
Hard Area:	60	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Soft Area:	55	sq.m	0.20
Total Catchment Area:	115	sq.m	0.57
Area (A):	115	sq.m	
Time of Concentration:	10	min	
Rainfall Intensity (i):	104	mm/hr	
Runoff Coeficient (C):	0.57		
Flow Rate (2.78AiC):	1.88	L/s	

DRAINAGE AREA II (Uncontrolled Flow Off Site to Trim Road)

(5-YEAR EVENT)

			C
Roof Area:	0	sq.m	0.90
Hard Area:	200	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Soft Area:	735	sq.m	0.20
Total Catchment Area:	935	sq.m	0.35
Area (A):	935	sq.m	
Time of Concentration:	10	min	
Rainfall Intensity (i):	104	mm/hr	
Runoff Coeficient (C):	0.35		
Flow Rate (2.78AiC):	9.47	L/s	

DRAINAGE AREA III (Uncontrolled Flow Off Site to 2035 Trim Road)

(5-YEAR EVENT)

			C
Roof Area:	0	sq.m	0.90
Hard Area:	0	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Soft Area:	450	sq.m	0.20
Total Catchment Area:	450	sq.m	0.20
Area (A):	450	sq.m	
Time of Concentration:	10	min	
Rainfall Intensity (i):	104	mm/hr	
Runoff Coeficient (C):	0.20		
Flow Rate (2.78AiC):	2.61	L/s	

DRAINAGE AREA IV (Roof)

(5-YEAR EVENT)

			C
Total Catchment Area:	5,626	sq.m	0.90

No. of Roof Drains:	12	
Slots per Wier:	1	0.01242 L/s/mm/slot (5 USgpm/in/slot)
Depth at Roof Drains:	112	mm
Maximum Release Rate:	16.64	L/s

Pond Area:	2,942	sq.m
Maximum Volume Stored:	109.49	cu.m
Maximum Volume Required:	109.49	cu.m

Time (min)	i (mm/hr)	2.78AiC (L/s)	Release Rate (L/s)	Stored Rate (L/s)	Required Storage Volume (cu.m)
10	104	146.66	16.64	130.03	78.02
15	84	117.62	16.64	100.98	90.88
20	70	98.89	16.64	82.25	98.70
25	61	85.72	16.64	69.08	103.62
30	54	75.91	16.64	59.27	106.69
35	49	68.29	16.64	51.66	108.48
40	44	62.20	16.64	45.56	109.34
45	41	57.19	16.64	40.55	109.49
50	38	53.00	16.64	36.36	109.09
55	35	49.44	16.64	32.80	108.25
60	33	46.37	16.64	29.73	107.04
65	31	43.70	16.64	27.06	105.53
70	29	41.34	16.64	24.71	103.77
75	28	39.26	16.64	22.62	101.78
80	27	37.39	16.64	20.75	99.61
85	25	35.71	16.64	19.07	97.26
90	24	34.19	16.64	17.55	94.77
95	23	32.81	16.64	16.17	92.15
100	22	31.54	16.64	14.90	89.42
105	22	30.38	16.64	13.74	86.57
110	21	29.31	16.64	12.67	83.63
115	20	28.32	16.64	11.68	80.61
120	19	27.40	16.64	10.76	77.51
125	19	26.55	16.64	9.91	74.33
130	18	25.75	16.64	9.11	71.09
135	18	25.01	16.64	8.37	67.78
140	17	24.31	16.64	7.67	64.42
145	17	23.65	16.64	7.01	61.00
150	16	23.03	16.64	6.39	57.54
180	14	19.96	16.64	3.32	35.88
210	13	17.67	16.64	1.03	13.04
240	11	15.90	15.90	0.00	0.00
270	10	14.48	14.48	0.00	0.00
300	9	13.31	13.31	0.00	0.00

DRAINAGE AREA V

(5-YEAR EVENT)

			C
Roof Area:	45	sq.m	0.90
Hard Area:	4,935	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Soft Area:	885	sq.m	0.20
Total Catchment Area:	5,865	sq.m	0.79

Water Elevation:	88.51	m
Head:	0.88	m
Centroid of ICD Orifice:	87.62	m
Invert of Outlet Pipe of CBMH-15:	87.55	m
Orifice Diameter:	148	mm
Orifice Area:	17,178	sq.mm
Discharge Coefficient:	0.61	
Maximum Release Rate:	43.60	L/s

Surface Storage

CB/MH	Top Area	Depth	Volume	
CB-1	0	-0.41	0.00	cu.m
CB-2	0	-0.41	0.00	cu.m
CIMH-3	0	-0.37	0.00	cu.m
CIMH-4	0	-0.37	0.00	cu.m
CB-5	0	-0.29	0.00	cu.m
CICB-6	0	-0.37	0.00	cu.m
CBMH-7	0	-0.42	0.00	cu.m
CICB-8	0	-0.32	0.00	cu.m
CB-9	0	-0.32	0.00	cu.m
CB-10	0	-0.45	0.00	cu.m
CB-12	0	-0.33	0.00	cu.m
CBMH-13	0	-0.29	0.00	cu.m
CBMH-14	0	-0.37	0.00	cu.m
CBMH-15	0	-0.39	0.00	cu.m

DRAINAGE AREA V (Continued)

(5-YEAR EVENT)

Chamber Storage

No. of Chambers	Volume Per Chamber	No. of End Caps	Volume Per End Cap	No. of Rows	Length	Volume	
80	0.42	6	0.01	3	174.462	33.66	cu.m

Clear Stone Storage

Length	Width	Depth	Volume	40% Voids	
176.262	1.461	1.040	234.160	93.66	cu.m

CB/MH Storage

CB/MH	Invert	Size	Volume	
CB-1	87.93	0.61	0.21	cu.m
CB-2	87.86	0.61	0.24	cu.m
CIMH-3	87.96	1.219	0.64	cu.m
CIMH-4	87.75	1.219	0.88	cu.m
CB-5	87.71	0.61	0.30	cu.m
CICB-6	87.72	0.61	0.29	cu.m
CBMH-7	87.70	1.219	0.94	cu.m
CICB-8	87.72	0.61	0.29	cu.m
CB-9	87.72	0.61	0.29	cu.m
CB-10	87.71	0.61	0.30	cu.m
CBMH-11	87.70	1.219	0.94	cu.m
CB-12	87.77	0.61	0.27	cu.m
CBMH-13	87.93	1.219	0.67	cu.m
CBMH-14	87.70	1.219	0.94	cu.m
CBMH-15	87.55	1.219	1.12	cu.m

Pipe Storage

From	Invert	To	Invert	Length	Dia.	Volume	
CIMH-3	87.96	CIMH-4	87.75	62.2	0.30	4.40	cu.m
CIMH-4	87.75	CBMH-7	87.70	13.7	0.30	0.97	cu.m
CBMH-13	87.93	CBMH-14	87.70	52.2	0.25	2.56	cu.m
CBMH-14	87.70	CBMH-15	87.61	20.4	0.25	1.00	cu.m

Maximum Volume Stored: 144.58 cu.m

Maximum Volume Required: 144.58 cu.m

DRAINAGE AREA V (Continued)

(5-YEAR EVENT)

Time (min)	i (mm/hr)	2.78AiC (L/s)	Roof Inflow (L/s)	Total Inflow (L/s)	50% Release Rate (L/s)	Stored Rate (L/s)	Required Storage Volume (cu.m)
10	104	134.95	16.64	151.59	21.80	129.79	77.87
15	84	108.22	16.64	124.86	21.80	103.06	92.76
20	70	90.99	16.64	107.63	21.80	85.83	103.00
25	61	78.87	16.64	95.51	21.80	73.71	110.57
30	54	69.85	16.64	86.49	21.80	64.69	116.44
35	49	62.84	16.64	79.48	21.80	57.68	121.13
40	44	57.23	16.64	73.87	21.80	52.07	124.96
45	41	52.62	16.64	69.26	21.80	47.46	128.15
50	38	48.77	16.64	65.41	21.80	43.61	130.83
55	35	45.49	16.64	62.13	21.80	40.33	133.10
60	33	42.67	16.64	59.31	21.80	37.51	135.03
65	31	40.21	16.64	56.85	21.80	35.05	136.69
70	29	38.04	16.64	54.68	21.80	32.88	138.11
75	28	36.12	16.64	52.76	21.80	30.96	139.33
80	27	34.40	16.64	51.04	21.80	29.24	140.37
85	25	32.86	16.64	49.50	21.80	27.70	141.26
90	24	31.46	16.64	48.10	21.80	26.30	142.01
95	23	30.19	16.64	46.82	21.80	25.03	142.65
100	22	29.02	16.64	45.66	21.80	23.86	143.17
105	22	27.95	16.64	44.59	21.80	22.79	143.60
110	21	26.97	16.64	43.61	21.80	21.81	143.94
115	20	26.06	16.64	42.70	21.80	20.90	144.21
120	19	25.21	16.64	41.85	21.80	20.05	144.40
125	19	24.43	16.64	41.07	21.80	19.27	144.52
130	18	23.70	16.64	40.33	21.80	18.54	144.58
135	18	23.01	16.64	39.65	21.80	17.85	144.58
140	17	22.37	16.64	39.00	21.80	17.21	144.53
145	17	21.76	16.64	38.40	21.80	16.60	144.44
150	16	21.19	16.64	37.83	21.80	16.03	144.29
180	14	18.37	16.64	35.00	21.80	13.21	142.63
210	13	16.26	16.64	32.90	21.80	11.10	139.89
240	11	14.63	15.90	30.53	21.80	8.73	125.70
270	10	13.32	14.48	27.80	21.80	6.00	97.20
300	9	12.25	13.31	25.56	21.80	3.76	67.70

D.B. Gray Engineering Inc.

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

700 Long Point Circle
Ottawa, Ontario K1T 4E9

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STORM SEWER CALCULATIONS

Rational Method

2-YEAR EVENT

Project: 5210 Innes Road
3-Storey Dymon Storage Building
Ottawa, Ontario

Date: June 30, 2023

Manning's Roughness Coefficient: 0.013

Location		Individual					Cumulative				Sewer Data							
		Roof C = 0.90	Hard C = 0.90	Gravel C = 0.70	Soft C = 0.20				Rainfall	Q		Nominal	Actual			Q_{Full}		
From	To	(ha)	(ha)	(ha)	(ha)	2.78AC	2.78AC	Time (min)	Intensity (mm/hr)	Flow Rate (L/s)	Length (m)	Diameter (mm)	Diameter (mm)	Slope (%)	Velocity (m/s)	Capacity (L/s)	Time (min)	Q / Q_{Full}
CB-1	CIMH-3		0.0215			0.0538	0.0538	10.00	77	4.13	3.4	250	250	0.432	0.80	39.09	0.07	11%
CB-2	CIMH-3		0.0175			0.0438	0.0438	10.00	77	3.36	3.9	250	250	0.432	0.80	39.09	0.08	9%
Roof Drains	CIMH-3	0.5626				1.4076	1.4076	10.00	77	108.11	8.8	250	250	1	1.21	59.47	0.12	182%
							Flow through flow control roof drains:			16.64	8.8	250	250	1	1.21	59.47	0.12	28%
CIMH-3	CIMH-4		0.0230			0.0575	1.5627	10.00	77	120.03	62.2	300	300	0.34	0.80	56.39	1.30	213%
								Restricted upstream flow:		28.55	62.2	300	300	0.34	0.80	56.39	1.30	51%
CIMH-4	CBMH-7		0.0115			0.0288	1.5915	10.00	77	122.24	13.7	300	300	0.34	0.80	56.39	0.29	217%
								Restricted upstream flow:		30.76	13.7	300	300	0.34	0.80	56.39	0.29	55%
CB-5	CBMH-7		0.0680		0.0360	0.1902	0.1902	10.00	77	14.60	2.2	250	250	0.432	0.80	39.09	0.05	37%
CICB-6	CBMH-7		0.0355		0.0195	0.0997	0.0997	10.00	77	7.65	3.3	250	250	0.432	0.80	39.09	0.07	20%
CBMH-7	CBMH-11		0.0130		0.0070	0.0364	1.9178	10.00	77	147.29	39 - Soleno HydroStor HS31 Chambers							
CICB-8	CBMH-11		0.0285		0.0260	0.0858	0.0858	10.00	77	6.59	3.8	250	250	0.432	0.80	39.09	0.08	17%
CB-9	CBMH-11		0.0705			0.1764	0.1764	10.00	77	13.55	2.9	250	250	0.432	0.80	39.09	0.06	35%
CB-10	CBMH-11		0.0185			0.0463	0.0463	10.00	77	3.56	1.4	250	250	0.432	0.80	39.09	0.03	9%
CBMH-11	CBMH-15						2.2262	10.00	77	170.98	33 - Soleno HydroStor HS31 Chambers							
CB-12	CBMH-13		0.0445			0.1113	0.1113	10.00	77	8.55	4.2	250	250	0.432	0.80	39.09	0.09	22%
CBMH-13	CBMH-14	0.0045	0.0735			0.1952	0.3065	10.00	77	23.54	52.2	250	250	0.432	0.80	39.09	1.09	60%
CBMH-14	CBMH-15		0.0270			0.0676	0.3740	10.00	77	28.73	20.4	250	250	0.432	0.80	39.09	0.43	74%
CBMH-15	MH-19		0.0410			0.1026	2.7028	10.00	77	207.59	6.7	375	375	0.39	0.99	109.49	0.11	190%
							Flow through inlet control device:			43.82	6.7	375	375	0.39	0.99	109.49	0.11	40%
CB-16	MH-17		0.0110			0.0275	0.0275	10.00	77	2.11	5.3	250	250	0.432	0.80	39.09	0.11	5%
MH-17	MH-18						0.0275	10.00	77	2.11	27.6	250	250	0.432	0.80	39.09	0.58	5%
MH-18	MH-19						0.0275	10.00	77	2.11	23.5	250	250	0.432	0.80	39.09	0.49	5%
MH-19	1200 ST						2.7303	10.00	77	209.70	33.5	375	375	0.48	1.10	121.47	0.51	173%
								Restricted upstream flow:		45.93	33.5	375	375	0.48	1.10	121.47	0.51	38%
											Existing 1,200 mm Trim Road Municipal Storm Sewer:	1,200	1,219	0.125	1.23	1,437		

SPECIFICATIONS

HYDROSTOR™

SCOPE
This specification applies to all HydroStor™ chambers supplied by Soleno. These chambers can be used to recharge the water table or to temporarily retain water and return it to the storm sewer when the rain event is over.

CHAMBER REQUIREMENTS
HydroStor™ chambers form a continuous arch with an open bottom, which helps maximize water infiltration. Each chamber shall feature four lifting handles, making it easy to move and install.

- Each HS31 chamber shall have 14 exterior corrugations
- Each HS75 chamber shall have 14 exterior corrugations
- Each HS180 chamber shall have 8 exterior corrugations
- Each HS290 chamber shall have 4 exterior corrugations

End caps shall be curved and have adequate structural capacity to allow traffic overload under CL-625; as defined by CAN/CSA-S6 standard and H-25 or HS-25, as defined by AASHTO standard and may be cut at any invert elevation to receive a pipe at any elevation.

Chambers and end caps shall comply ASTM F2418 and F2787 standards and certified to CSA B184.0 and B184.2.

RAW MATERIALS
Chambers shall be injection molded and constructed of polypropylene resin resistant to environmental stress cracking (ESCR) and with ability to maintain adequate stiffness through the construction and service life of the chamber. The chamber material shall meet or exceed the requirements of designation PP0330B99945 as defined in ASTM D4101.

The end caps shall be made of a polypropylene or polyethylene resin and molded by thermoforming or by injection

JOINT PERFORMANCE
- Joining of chambers shall be accomplished by overlapping the corrugations of longitudinally adjacent chambers as per the indications on it.
- End caps are designed to fit over top of a corrugation on either end of the chamber.

CHAMBER STORAGE CAPACITY
Excluding the amount of water contained in the void of the clear stone, each chamber:
- HS31 shall contain a minimum of 0,19 m^3 of water per linear meter (2,1 ft^3 per linear foot).
- HS75 shall contain a minimum of 0,61 m^3 of water per linear meter (6,6 ft^3 per linear foot).
- HS180 shall contain a minimum of 1,48 m^3 of water per linear meter (16,0 ft^3 per linear foot).
- HS290 shall contain a minimum of 2,53 m^3 of water per linear meter (27,2 ft^3 per linear foot).

CHAMBER STRUCTURAL CAPACITY
The backfill (measured from the top of the chamber to the final elevation) shall have:
- For the HS31, HS75 and HS180 chambers, a minimum height of 457 mm (18,0 in) and a maximum height of 2.44 m (8 ft).
- For the HS290 chamber, a minimum height of 610 mm (24,0 in) and a maximum height of 2.44 m (8 ft).

PRETREATMENT UNIT
A pretreatment unit shall be provided to remove sediments, oils and floating debris upstream from the chamber system inlet. It shall include an elbow at each outlet and two smooth outer wall access risers 750 mm (30 in) in diameter. Maintenance of the system will not require any work in confined spaces. Each access shaft will be provided with a lid and adjustable cast iron frame. If required, a diffuser shall be installed at the end of the pretreatment system to reach the additional rows of chambers. The system will be sized according to the expected inflow.

SEPARATION GEOTEXTILE (NONWOVEN)
A Soleno TX-90 BNQ G.C.T.T.G. 3001 geotextile shall be installed on the excavation bottom and walls, and the top of the system, to insulate the clear crushed stone from the existing soil and/or road/parking lot foundation.

SCOUR PROTECTION GEOTEXTILE (WOVEN)
A Soleno scour protection woven geotextile 2006W shall be installed under all the chambers with an external water uptake, over a length of 4.57 m (15 ft), to prevent any rock movement.

INSTALLATION
Installation shall be carried out in compliance with manufacturer recommendations. Contact your local Soleno representative or visit our website at soleno.com for installation recommendations.