Stormwater Management Report and Servicing Brief

Proposed Halo Car Wash
3535 Borrisokane Rd
Barrhaven, Ontario

Prepared for:

Halo Car Wash Inc.
18 Adelaide Street
Maxville, ON
K0C 1T0

Attention: Mr. Jordan Lupovici

LRL File No.: 210691

April 22, 2022

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1 INTRODUCTION AND SITE DESCRIPTION

LRL Associates Ltd. was retained by Halo Car Wash Inc. to complete a Stormwater Management Analysis and Servicing Brief for the construction of a car-wash development located at 3535 Borrisokane Rd, Barrhaven, Ontario. The property is legally described as Part of Lot 11, Concession 3 (Rideau Front), geographic Township of Nepean and Zoning IL – Light Industrial. The location of the proposed development can be viewed in Figure 1.

Figure 1: Aerial View of Proposed Development

The development proposes construction of a Halo Tunnel Car Wash (485 sqm). The site will be accessible from a 7.5 m wide entrance located off Flagstaff Drive. This entrance will be a shared ROW once the development to the south is to be developed. For additional details of the proposed development, refer to Site Plan C201 included in Appendix E.

This report has been prepared in consideration of the terms and conditions noted above and with the civil drawings prepared for the proposed new development. Should there be any changes in the design features, which may relate to the stormwater management and servicing considerations, LRL Associates Ltd. should be advised to review the report recommendations.

2 EXISTING SITE AND DRAINAGE DESCRIPTION

The subject site measures approximately 0.534 ha and is currently undeveloped, consisting of grassed area and treed area. Elevations of existing site range between 93.01 near the northeast corner to 92.23 at the southwest corner of the site.

Sewer and watermain locations were adopted from the current subdivision design produced by DSEL Engineering. It indicates the following infrastructures located within the adjacent right-of-way:

Flagstaff Drive

- 200 mm diameter PVC watermain stub
- 200 mm diameter PVC sanitary sewer

Borrisokane Rd

- Roadside ditches

The design intentions are to continue the water and sanitary services that were provided through this subject property and stub them past the proposed curb for future development to the south. This development will be connected to those services, and the storm outlet will be directed to the Borrisokane roadside ditch.

3 SCOPE OF WORK

As per applicable guidelines, the scope of work includes the following:

Stormwater management

- Calculate the allowable stormwater release rate.
- Calculate the anticipated post-development stormwater release rates.
- Demonstrate how the target quantity control objectives will be achieved.
- Demonstrate how the target quality control objectives will be achieved.

Water services

- Calculate the expected water supply demand at average and peak conditions.
- Calculate the required fire flow as per the Fire Underwriters Survey (FUS) method.
- Confirm the adequacy of water supply and pressure during peak flow and fire flow.
- Describe the proposed water distribution network and connection to the existing system.

Sanitary services

- Describe the existing sanitary sewers available to receive wastewater from the proposed development.
- Calculate peak flow rates from the proposed development.
- Describe the proposed sanitary sewer system.

4 REGULATORY APPROVALS

An MECP Environmental Compliance Approval (ECA) is expected to be required for installation of the proposed storm and sanitary sewers within the site. A Permit to Take Water is not anticipated to be required for pumping requirements for sewer installation. The Rideau Valley Conservation Authority (RVCA) will need to be consulted in order to obtain municipal approval for site development. No other approval requirements from other regulatory agencies are anticipated.

5 WATER SUPPLY AND FIRE PROTECTION

5.1 Existing Water Supply Services

The subject property is located to the south of a proposed 300 mm dia. watermain along Flagstaff Drive. A 200 mm dia. water service stub is available near the northeast corner of the property for service connection.

5.2 Water Supply Servicing Design

The subject property is proposed to be serviced via a 100 mm dia. water servicing to be connected to the 200 mm dia. watermain stub located within Flagstaff Drive at the northeast corner of the site. For servicing layout, refer to Site Servicing Plan C401 in Appendix E.

Table 1 summarizes the City of Ottawa Design Guidelines design parameters employed in the preparation of the water demand estimate.

Table 1: City of Ottawa Water Servicing Design Parameters

Design Parameters	Value
Average Day Demand - Commercial	28,000 L/gross ha/day
Average Day Demand - Light Industrial	35,000 L/gross ha/day
Maximum Day Demand-Commercial/Industrial	1.5 × Average Day Demand
Maximum Hour Demand-Commercial/Industrial	1.8 × Maximum Day Demand
Minimum Depth of Cover	2.4 m from top of watermain to finished grade
Desired operating pressure during Maximum Day Flow	345 kPa (50 psi) to 552 kPa (80 psi)
Minimum allowable pressure during Peak Hour Flow	275 kPa (40 psi)
Minimum allowable pressure during Fire Flow Conditions	140 kPa (20 psi)

The required water supply requirements for the proposed development is calculated by using the parameters in Table 1 are included in Appendix B. Below is the summary of anticipated water demands

- Average Day Demand = 1.29 L/s
- Maximum Day Demand = 2.29 L/s
- Peak Hour Demand = 6.72 L/s

Based on the review Hydraulic Capacity and Modelling Analysis (dated May 31, 2021) provided by DSEL, it appears that adequate pressure is available in proximity to the site to service the proposed development. Overall, the pressure scenarios at the proposed connection meet the required pressure range stated in Table 1 except for minimum hour demand (MHD) conditions when the maximum pressure reaches 93 psi (Figure E.1). The maximum pressure at the service entry is anticipated to be more than 80 psi, therefore, a pressure check at the completion of construction is required to determine if a pressure reducing valve (PRV) is required as the residual pressure is not to exceed 80 psi. Refer to Appendix B for the selected modeling analysis results.

The estimated fire flow for the proposed buildings was determined in accordance with Fire Underwriters Survey (FUS) using the formula:

$$F = 220C\sqrt{A}$$

where,

F = The required fire flow (L/min)

C = Coefficient related to the type of construction

A = The total floor area (m^2)

The estimated fire flow demand is calculated 3900 L/min, see Appendix B for calculation details. The fire hydrants in proximity to the site along Flagstaff Dr is expected to provide required fire flow for the subject site. Refer to Servicing Plan C401 for the location of available fire hydrants.

6 SANITARY SERVICE

6.1 Existing Sanitary Sewer Services

There is an existing 200 mm dia. sanitary sewer service stub extending to the property line from Flagstaff Drive at the northeast corner of the subject site.

6.2 Sanitary Sewer Servicing Design

As previously stated, the sanitary sewer will be extended along the south extent of the property and stubbed at the proposed curb. The proposed development will be serviced via 150 mm dia. sanitary sewers which will be connected to the proposed 200mm dia. sanitary sewer extending to the subject site. Refer to LRL drawing C401 for the proposed sanitary servicing layout. Table 2 summarizes the City of Ottawa Design Guidelines design parameters used in the estimation of wastewater flow.

Table 2: City of Ottawa Wastewater Design Parameters

Design Parameters	Value
Commercial Average Flow	28,000 L/gross ha/day
Average Light Industrial Flow	35,000 L/gross ha/day

Commercial Peak Factor	1.5
Industrial Peak Factor	Appendix 4-B (City Guidelines-Sewer)
Infiltration Allowance (Dry Weather)	0.05 L/s/gross ha
Infiltration Allowance (Wet Weather)	0.28 L/s/gross ha
Total Infiltration Allowance	0.33 L/s/gross ha

Based on these parameters, City of Ottawa's Appendix 4-A (Daily Sewage Flow for Various Types of Establishments), and the car wash information as per Halo Car Wash, the anticipated post-development peak design wastewater flow for the subject site is calculated 6.32 L/s. Refer to Appendix C for calculation details and the sewer design sheet.

7 STORMWATER MANAGEMENT

7.1 Existing Stormwater Infrastructure

There is an existing roadside ditch on Borrisokane Rd at the west extent of the site.

In pre-development conditions, the stormwater runoff would flow uncontrolled overland to the existing ditch. Refer to Appendix D for pre- and post-development watershed information.

7.2 Design Criteria

The stormwater management criteria for this development is based on pre-consultation meeting with the City of Ottawa officials, the City of Ottawa Sewer Design Guidelines, 2012 (City standards), as well as the Ministry of the Environment's Stormwater Management, Planning and Design Manual, 2003.

7.2.1 Water Quality

Based on site plan pre-consultation meeting note and correspondence with Rideau Valley Conservation Authority (RVCA), it was advised to achieve enhanced water quality protection (80% TSS removal) either through on-site or downstream infrastructure prior to discharging stormwater to a natural watercourse.

To address water quality objective, an Oil/Grit Separator (OGS), Stormceptor EFO4 (or approved equivalent) is proposed downstream of CBMH10 which will exceeds the required 80% TSS

removal. Refer to Appendix D for additional details on proposed OGS and servicing plan C401 (Appendix E) for the location of OGS.

7.2.2 Water Quantity

The allowable release rate for the subject site has been calculated to 5-yr pre-development level and was determined 30.95 L/s. Post-development storm events up to and including 100-yr storm will be controlled to 5-yr pre-development level. For calculations, refer to STM design calculation sheets in Appendix D.

7.3 Method of Analysis

The modified Rational Method has been used to calculate the peak flow rate from the proposed site and to quantify the storage required for quantity control for the proposed development.

$$Q = 2.78CIA$$

Where,

Q = Flow (L/s)

C = Runoff Coefficient

I = Rainfall Intensity (mm/hr), determined from the City of Ottawa IDF curves

A = Area (ha)

Refer to Appendix D for runoff and storage calculations.

7.4 Proposed Stormwater Quantity Controls

The proposed stormwater management quantity control for this development will be accomplished using an Inlet Control Device (ICD) in the storm sewer. Ponding required as a result of quantity control will be accomplished through surface storage in the parking lot.

A network of storm sewers is proposed to service the site and outlet to the existing ditch along Borrisokane Rd which will eventually outlet to the existing 800mm dia. culvert crossing Borrisokane Rd. The proposed site storm sewers and stormwater management system are shown on Site Servicing Plan C401 and detailed calculations including the design sheet can be found in Appendix D.

The existing site is delineated by catchments EWS-01 which currently drains un-controlled towards the west existing ditch. Refer to Pre-development Watershed Plan C701 included in Appendix E.The site has been analyzed and post-development watersheds have been allocated. A few watersheds WS-08 and WS-09 consisting of grass area and asphalt area will flow un-controlled off the site. For additional details, refer to Post-development Watershed Plan C702 included in Appendix E.

Overland flow in Halo Car Wash area within watersheds WS-01, WS-02, WS-03, WS-04, WS-05, WS-06 & WS-07 will be captured by a several CB/CBMHs. An ICD, Hydrovex Vortex Flow Regulator 125VHV-2 or approved equivalent, is proposed at CBMH10 to restrict the collected runoff and control the release rate at 21.74 L/s. For additional details on select ICD, refer to Appendix D. Table 3 summarizes post-development drainage areas. Additional details and calculations can be found in Appendix D.

Table 3: Drainage Areas and Runoff Coefficients

Site	Watersheds	Area (ha)	Weighted Runoff Coefficient
Halo Car Wash	WS-01 (controlled)	0.064	0.41
	WS-02 (controlled)	0.056	0.85
	WS-03 (controlled)	0.096	0.68
	WS-04 (controlled)	0.056	0.90
	WS-05 (controlled)	0.115	0.90
	WS-06 (controlled)	0.032	0.68
	WS-07 (controlled)	0.046	0.46
	WS-08 (uncontrolled)	0.027	0.20
	WS-09 (uncontrolled)	0.042	0.22
	Total	**0.534**	**0.66**

Table 4 summarizes the release rates, storage volume required and available storage in the proposed site.

Table 4: Summary of Proposed Development Stormwater Release Rates

Watersheds	Area (ha)	Release Rate (L/s)		Storage Required (m^3)		Storage Provided (m^3)
		100-yr	5-yr	100-yr	5-yr	
Controlled (WS-01 to WS-07)	0.465	21.74	21.74	158.73	74.07	213.39
Uncontrolled (WS-08 to WS-09)	0.069	9.21	4.30	N/A	N/A	N/A
Total	**0.534**	**30.95**	**26.04**	**158.73**	**74.07**	**213.39**

The runoff exceeding the allowable release rate will be stored on-site via surficial ponding. For 100-yr storm event, it is calculated that a total of 158.73 m^3 of storage will be required to attenuate flows to the allowable release rate of 21.74 L/s (controlled release). The total storage provided is 213.39 m^3, thus exceeds the required storage. Refer to Appendix D for details on runoff and storage calculations. The maximum ponding elevation and depths can be found on Stormwater Management Plan C601 in Appendix E.

8 EROSION AND SEDIMENT CONTROL

During construction, erosion and sediment controls will be provided primarily via a sediment control fence to be erected along the perimeter of the site where runoff has the potential of leaving the site. Inlet sediment control devices are also to be provided in any catch basin and/or manholes in and around the site that may be impacted by the site construction. Construction and maintenance requirements for erosion and sediment controls are to comply with Ontario Provincial Standard Specification OPSS 577. Refer to Erosion and Sediment Control Plan C101 for additional details.

9 CONCLUSION

This Stormwater Management and Servicing Report for the proposed development at 3535 Borrisokane Rd presents the rationale and details for the servicing requirements for the subject property. In accordance with the report objectives, the servicing requirements for the development are summarized below.

Water Service

- The anticipated maximum hour demand of the proposed development is 6.72 L/s.
- The maximum required fire flow is 65.00 L/, calculated using the FUS method.
- The fire hydrant on Flagstaff Dr will service the proposed development.
- The proposed development will be serviced with a new 100 mm dia. watermain to be connected to the proposed 200 mm dia. watermain stub which will be connected to a watermain along Flagstaff Dr.
- Modeling results provided by DSEL show that adequate pressure is available in the proposed water distribution network to service the proposed site.

Sanitary Service

- The anticipated sanitary flow from the proposed development is 6.32 L/s.
- The proposed development will be serviced by a network of 150 mm dia. sanitary sewers which will connect to the prop SAN MH69.

Stormwater Management

- Stormwater quality control requirements of 80% TSS removal will be met via the use of an Oil/Grit Separator (Stormceptor model EFO4 or approved equivalent).
- The storm water release rates from the proposed development will meet contemplated allowable release rate of 30.95 L/s (21.74 L/s controlled and 9.21 L/s uncontrolled).
- Stormwater quantity control objectives will be met through on-site stormwater surface storage in the parking lots.

10 REPORT CONDITIONS AND LIMITATIONS

The report conclusions are applicable only to this specific project described in the preceding pages. Any changes, modifications or additions will require a subsequent review by LRL Associates Ltd. to ensure the compatibility with the recommendations contained in this document.

If you have any questions or comments, please contact the undersigned.

Prepared by:
LRL Associates Ltd.

Maxime Longtin
Civil Engineering Technologist

Mohan Basnet, P.Eng.
Civil Engineer

APPENDIX A

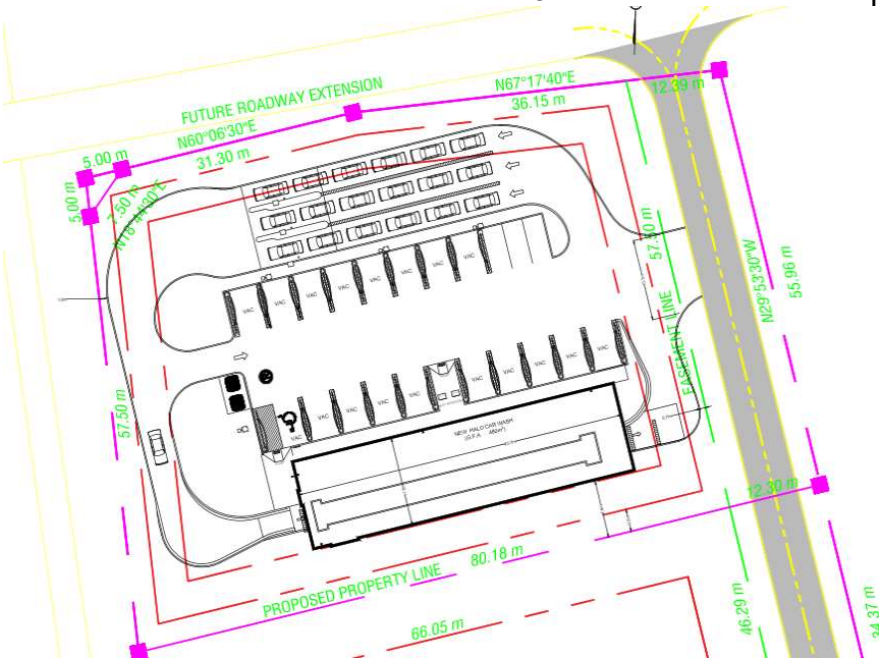
Pre-consultation / Correspondance

3555 Borrisokane Road
Meeting Summary Notes
Sept 23, 2021. Online Teams Meeting

Attendees:
- Jonah Bonn (Applicant, First Bay Properties Inc.)
- Bill Holzman (Applicant, Holzman Consultants)
- Philippe Paquette (LRL Associates)
- Peter MacEwen (MacEwen)
- Brad Moore (MacEwen)
- Greg Pedersen (Halowash)
- Jordan Lupovici (Halowash)
- Katie Morphet (File Lead, Panner, City of Ottawa)
- Jeff Shillington (Project Manager, City of Ottawa)
- Neeti Paudel (Transportation Project Manager, City of Ottawa)
- Sami Rehman (Environmental, City of Ottawa)
- Jeannette Krabicka (Parks, City of Ottawa)

Not in Attendance:
- Mark Richardson (Forestry, City of Ottawa)
- RVCA

Issue of Discussion:
- Site Plan Control for a new 1-storey 480 sq. m drive-through carwash with 3 queuing lanes for 18 cars and 21 parking spaces (18 of which are vacuum accessible).
- Development to be located on northern most 1.32 acres of total vacant property.



1. **Official Plan -** designated “General Urban Area”.

   Car wash a permitted use

   Barrhaven South CDP – property identified as institutional

2. **Zoning Information**

   Zoned IL [304]

   Urban Exception 304 permits place of worship as an additional use.

   IL Zone permits Drive-Through Facility and Car wash uses

   Zoning interpretation has confirmed that Section 203 (2)(c) limits the Car wash use to 300 sq. m.

   Floodplain overlay on a portion of the site – RVCA has confirmed that this floodplain area has been removed from their mapping. It will still need to be removed from the City’s mapping.

   Within the 400 m MTO Permit Control Area

3. **Infrastructure/Servicing – Jeff Shillington**

   - Servicing for the subdivision is currently being designed by DSEL for Mattamy. To coordinate service locations please contact Jen Ailey at DSEL (email: jailey@dsel.ca, cell no. 613-222-6476)

   - The current design has not yet been approved, however a 2nd submission of the detailed design is currently under review. There were no significant concerns with any of the servicing proposed for this area.

   - The current design shows the following:
     - 300 mm dia. sanitary sewer along Flagstaff with a 200 mm service and control MH proposed just inside the property in the northeast corner.

     - 300 mm watermain along Flagstaff with a 200 mm service and valve on the property line in the northeast corner of the property.

     - No storm sewer is proposed along Flagstaff. Stormwater could be outlet into the ditch on Borrisokane Road. A C=0.80 for the 5 year event should be used for the design. As per RVCA requirements the stormwater must maintain enhanced water quality protection either through on-site or down stream infrastructure prior to outletting to the Jock River.

- A MECP ECA is likely required for the stormwater outlet to the Borrisokane ditch.

- As discussed at the meeting a shared servicing corridor along the private road would be possible to service the neighboring site to the south. A joint use maintenance agreement and MECP ECA for the shared sanitary sewer would be required.

4. Initial Planning Comments – Katie Morphet

- Please add table to submitted site plan to identify all required zone and applicable general provisions and that they are being met.

- I have been able to confirm that Section 203 (2)(c) does limit the proposed car wash use to 300 sq.m. If you wish to move forward with a footprint of this size a minor variance would need to be approved prior to the Site Plan being finalized and approved. I understand that the minor variance process is severely backed up due to covid so I would inquire with the Committee timing for the next available meeting.

- The floodplain overlay will need to be removed from the property prior to approval of a Site Plan.

  The flood plain can be dealt with multiple ways.

  1. You can undertake a site-specific ZBA;

  2. If the timing works for both the applicant and the zoning group the City can add it to the omnibus report. The next omnibus report is expected in Q1 of 2022. This means it could go forward at the end of April 2022; or

  3. It will be removed when the City undertakes flood plain mapping updates. The floodplain mapping for this area is expected to be updated by the end of the year but it is not guaranteed.

- A Survey Plan will be required to clarify property boundaries and lot ownership.

- The Site Plan design drawings and agreement and will apply to entire lot if it is yet to be severed at the time of application.

- The site is within 400m of the High 416 – MTO Permit control Area – please confirm with MTO whether you require a permit from them.

5. **Parks – Jeanette Krabicka**

   Please see the attached comments.

6. **Trees - Mark Richardson**

   1) if there are trees >10cm in diameter on site a tree removal permit will required and a TCR will need to be submitted with their application

   2) they will need to contact mark.richardson@ottawa.ca for information on the permitting and TCR process.

7. **Environment – Sami Rehman**

   The subject property is located adjacent to an Urban Natural Feature (UNF) called Cambrian Woods North and the proposal requires an Environmental Impact Statement (EIS) as outlined in OP section 3.2.3 and 4.7.8. As such, the EIS will need to address:

   - potential impacts from the development on the UNF
   - potential impacts from the development on the adjacent watercourse
   - significant habitat for threatened or endangered species
   - review and draw recommendations from the Jock River Reach 1 Subwatershed Plan
   - review and draw recommendations from the Protocol for Wildlife Protection during Construction

   Further details on the EIS requirements can be found in OP Section 4.7.8 or the EIS guidelines:
   https://documents.ottawa.ca/sites/documents/files/documents/eis_guidelines2015_en.pdf

   City staff will be looking to ensure that the proposal's design includes buffering along the adjacent watercourse.

   Staff are also recommending landscaping and design elements that will reduce energy and water consumption, as outlined in OP Section 4.9.

   Given the subject property's proximity to the UNF, the adjacent watercourse and the Jock River, staff will be anticipating using only locally appropriate native species in their landscape plan.

   I recommend contacting the Trail Road Waste Facility to identify their comments or advice for this proposed development because the subject property is within 500m of the facility.

I would also recommend consulting with the Rideau Valley Conservation Authority to determine if any permits or approvals are required under their regulations.

While not explicitly discussed in this meeting, a severance will trigger the requirement for an EIS and the advice provided above would be applicable to that EIS and severance application.

8. Conservation Authority – Eric Lalande (RVCA)

For the floodplain, mapping below shows that the floodplain does not extend onto the property. This was confirmed and updated on our end earlier this year, and mapping at the City should be updated through an omnibus zoning amendment.

As for SWM and TSS removal, you are required to maintain enhanced water quality protection either through on-site or down stream infrastructure prior to any outlet to a natural watercourse. Note that setbacks and stormwater should take into consideration the realigned channel adjacent to your site (along the easterly property boundary).

Given the use, I would also suggest you contact the City's HydroG related to any groundwater constraints given the use.

9. Transportation – Neeti Paudel

Follow Traffic Impact Assessment Guidelines

- Complete the screening form as soon as possible and submit it to the Neeti Paudel at neeti.paudel@ottawa.ca for review. Please include the **site generated trips** for the trip generation trigger. Once reviewed, and if, the triggers are met, proceed to Step 2.

- **Applicant advised that their 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). Collaboration and communication between development proponents and City staff are required at the end of every step in the TIA process**

- Request base mapping asap if RMA is required. Contact Engineering Services (https://ottawa.ca/en/city-hall/planning-and-development/engineering-services)

- Noise Impact Studies required for the following:
  - Stationary (if, within 100m of noise sensitive land use).

- Ensure clear throat length requirements as per TAC are met at the accesses.

- On site plan:
    - Show all details of the roads abutting the site up to and including the opposite curb; include such items as pavement markings, accesses and/or sidewalks.
    - Turning templates will be required for all accesses showing the largest vehicle to access the site; required for internal movements and at all access (entering and exiting and going in both directions).
    - Show all curb radii measurements; ensure that all curb radii are reduced as much as possible

- As the proposed site is for general public use, AODA legislation applies. Consider using the City's Accessibility Design Standards.

- Number of accessible parking spaces should meet the requirements from Table 3 of the City's accessible Design Standards.

- Site triangles at the following locations on the final plan will be required:
    - Local Road to Local Road: 3 metre x 3 metres
    - Local Road to Collector Road: 5 metre x 5 metres
    - Collector Road to Collector Road: 5 metre x 5 metres
    - Collector Road to Arterial Road: 5 metre x 5 metres

10. General Information

a. Ensure that all plans and studies are prepared as per City guidelines – as available online…
   https://ottawa.ca/en/city-hall/planning-and-development/information-developers/development-application-review-process/development-application-submission/guide-preparing-studies-and-plans

Mohan Basnet

From: Eric Lalande <eric.lalande@rvca.ca>
Sent: September 24, 2021 10:42 AM
To: Philippe Paquette; Jamie Batchelor
Cc: katie.morphet@ottawa.ca; Brad Moore; Jordan Lupovici; Jonah Bonn
Subject: RE: Future Halo carwash Borrisokane Rd. Barrhaven ON. (LRL#210691)

Hi Philippe,

As for the floodplain, mapping below shows that the floodplain does not extend onto the property. This was confirmed and updated on our end earlier this year, and mapping at the City should be updated through an omnibus zoning amendment.
As for SWM and TSS removal, you are required to maintain enhanced water quality protection either through on-site or down stream infrastructure prior to any outlet to a natural watercourse. Note that setbacks and stormwater should take into consideration the realigned channel adjacent to your site (along the easterly property boundary).

Given the use, I would also suggest you contact the City's HydroG related to any groundwater constraints given the use.

Cheers,

Eric Lalande, MCIP, RPP
Planner, RVCA
613-692-3571 x1137

From: Philippe Paquette <ppaquette@lrl.ca>
Sent: Thursday, September 23, 2021 4:25 PM

To: Jamie Batchelor <jamie.batchelor@rvca.ca>; Eric Lalande <eric.lalande@rvca.ca>
Cc: katie.morphet@ottawa.ca; Brad Moore <b.moore@macewen.ca>; Jordan Lupovici <jlupovici@halowash.com>; Jonah Bonn <jbonn@firstbay.ca>
Subject: Future Halo carwash Borrisokane Rd. Barrhaven ON. (LRL#210691)

Hi Jamie and Eric,
After pre-consulting with the City of Ottawa this morning regrading the above mentioned project, the City of Ottawa planner assigned to the file (Katie Morphet) gave me your contacts in order to discuss about the flood plain crossing this property, SWM and TSS removal criterion. To put you in context, our client wishes to purchase a piece of land located at the north end of the employment block of the Mattamy Homes Half Moon bay West Subdivision. Refer to the attached document for more info. Also attached is a preliminary plan of what they want to develop.
Let us know of your availability so we can book a meeting very soon.
Thanks for your time.

Philippe Paquette, C.E.T.
Certified Engineering Technologist

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Given the current COVID-19 situation, please be aware that LRL has implemented alternative working conditions for our team. Many of us have now transitioned to working from home; however, communication and workability remains one of our top priorities.
We will continue to be reachable by cell phone or by calling LRL at 613-842-3434 which will prompt you to enter the extension of the person you are trying to reach.
In addition, we will continue to have access to all e-mail correspondence and do our best to return all inquiries in a timely manner.

APPENDIX B

Water Supply Calculations

Water Service Calculations

LRL File No. : 210691
Project : Proposed Development - Halo Car Wash
Location : 3555 Borrisokane Rd
Date : April 13, 2022
Designed by : M. Basnet

Water Demand

Site area = 0.534 ha

Average day demand =	*35000*	*L / ha·day*	(based on City of Ottawa guidelines)
=	18690	L / day	
=	**0.22**	**L / s**	
Maximum daily peak factor =	1.5		
Maximum daily demand =	**0.32**	**L / s**	
Maximum hour peak factor =	1.8		
Maximum hour demand =	**0.58**	**L / s**	

Adjustment - Car Wash (as per Halo Car Wash Inc.)

Estimated vol. of water/car wash = 170 L

Average day demand =	93151	L / day	(assuming 200000 car wash/year)
	1.08	**L / s**	
Maximum daily demand =	**1.97**	**L / s**	(assuming 1000 car wash/day)
Maximum hour demand =	**6.14**	**L / s**	(assuming 130 car wash/hour)

Total Anticipated Water Demand

Average day demand =	**1.29**	**L / s**
Maximum daily demand =	**2.29**	**L / s**
Maximum hour demand =	**6.72**	**L / s**

Water Service Pipe Sizing

$Q = VA$

Where: V = velocity
A = area of watermain pipe
Q = water supply flow rate

By deriving the above formula with V=1.5 m/s

Minimum pipe diameter:

$d = (4Q/\pi V)^{1/2}$

$d =$ 0.076 m

$d =$ 76 mm (minimum required size)

Proposed pipe diameter: **100** mm

Fire Flow Calculations

LRL File No. 210691
Project: Proposed Development-Halo Car Wash
Location: 3535 Borrisokane Rd, Barrhaven, ON
Date: April 14, 2022
Method: Fire Underwriters Survey (FUS)
Prepared by: M. Basnet

Step	Task	Term	Options	Multiplier	Choose:	Value	Unit	Fire Flow
Structural Framing Material								
1	Choose frame used for building	Coefficient C related to the type of construction	Wood Frame	1.5	Non-combustible Construction	**0.8**		
			Ordinary Construction	1.0				
			Non-combustible construction	0.8				
			Fire resistive construction <2 hrs	0.7				
			Fire resistive construction >2 hrs	0.6				
Floor Space Area (A)								
2	Total area					**485**	m^2	
3	Obtain fire flow before reductions	Required fire flow	Fire Flow = 220 x C x $A^{0.5}$				L/min	**3,876**
Reductions or surcharge due to factors affecting burning								
4	Choose combustibility of contents	Occupancy hazard reduction or surcharge	Non-combustible	-25%	Combustible	**0%**	L/min	**3,876**
			Limited combustible	-15%				
			Combustible	0%				
			Free burning	15%				
			Rapid burning	25%				
5	Choose reduction for sprinklers	Sprinkler reduction	Full automatic sprinklers	-30%	False	**0%**	L/min	**3,876**
			Water supply is standard for both the system and fire department hose lines	-10%	False	**0%**		
			Fully supervised system	-10%	False	**0%**		
6	Choose separation	Exposure distance between units	North side	>45m	0%		L/min	**3,876**
			East side	>45m	0%			
			South side	>45m	0%			
			West side	>45m	0%	**0%**		
Net required fire flow								
7	Obtain fire flow, duration, and volume				Minimum required fire flow rate (rounded to nearest 100)		L/min	**3,900**
					Minimum required fire flow rate		L/s	**65.0**
					Required duration of fire flow		hr	**1.5**

Hydraulic Capacity and Modeling Analysis Mattamy Half Moon Bay West Phase 3

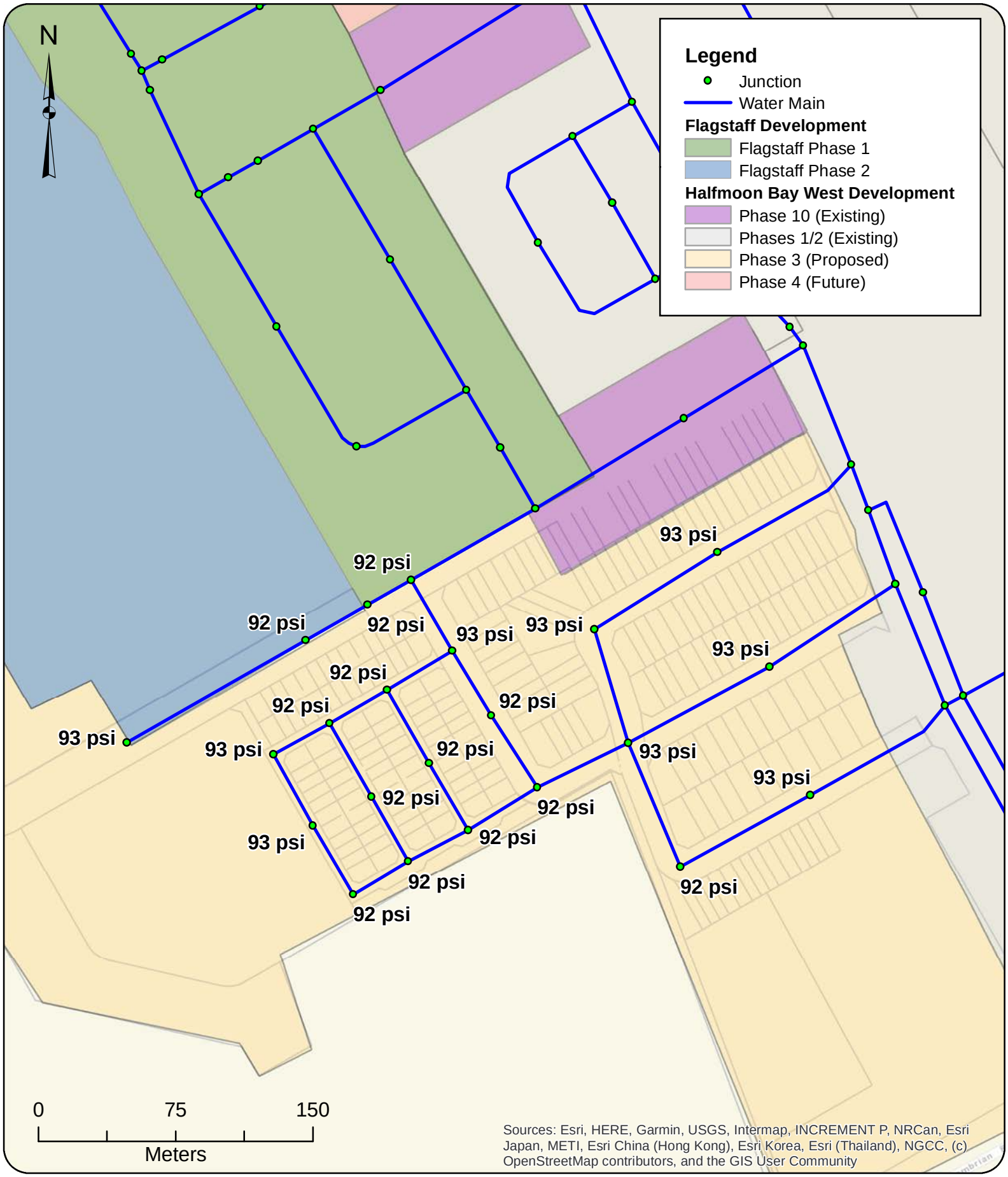
Final Report

Prepared for:
David Schaeffer Engineering Ltd.
120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

Prepared by:
GeoAdvice Engineering Inc.
Unit 203, 2502 St. John's Street
Port Moody, BC V3H 2B4

Submission Date: May 31, 2021

Contact: Mr. Werner de Schaetzen, Ph.D., P.Eng.
Project: 2021-033-DSE

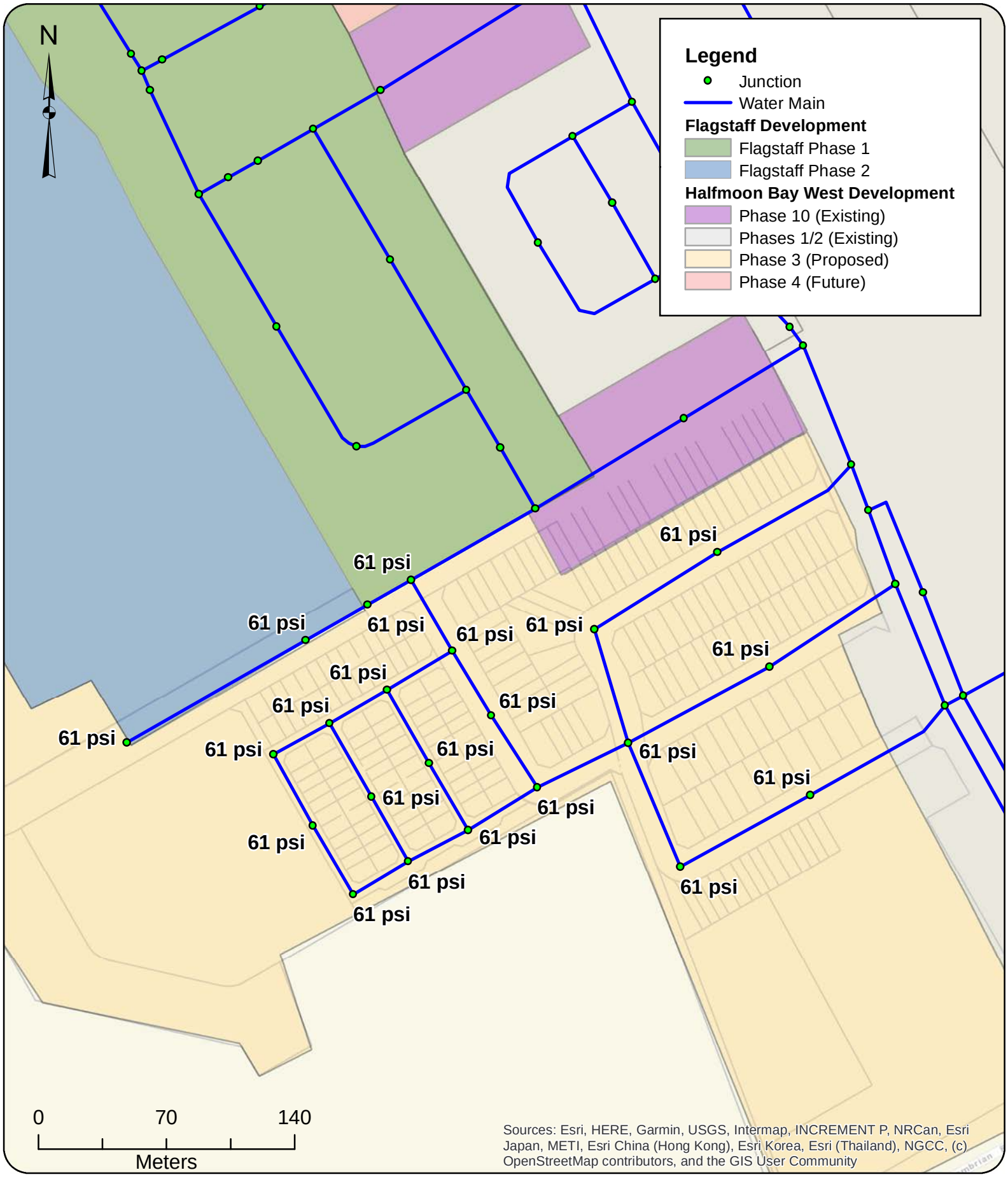


GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis Mattamy Half Moon Bay West Phase 3 2021-033-DSE**
Client: **David Schaeffer Engineering Ltd.**
Date: **May 2021**
Created by: **BL**
Reviewed by: **WdS**

MHD Pressure Results HMBW Phase 3

Figure E.1



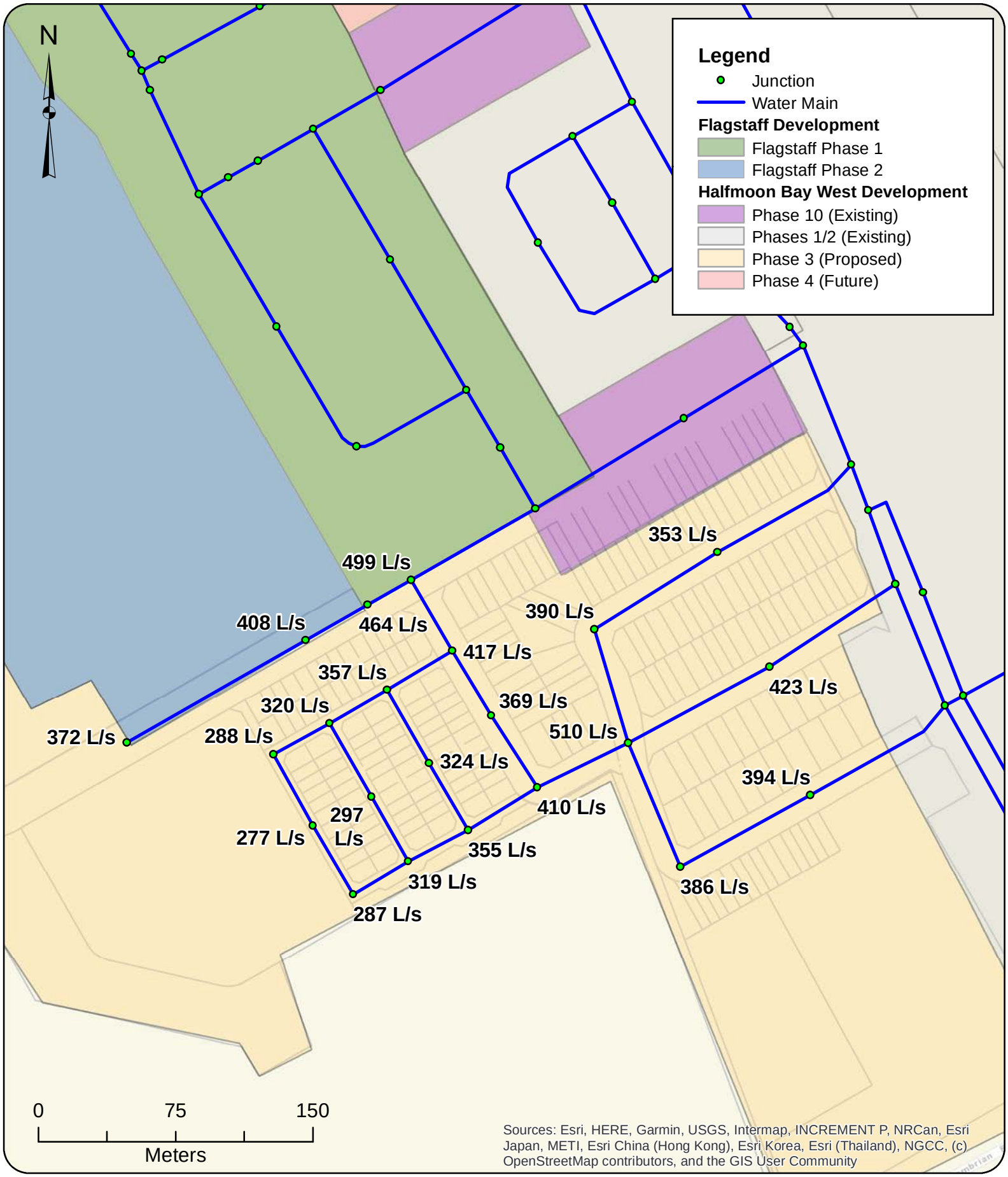
GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis Mattamy Half Moon Bay West Phase 3 2021-033-DSE**
Client: **David Schaeffer Engineering Ltd.**
Date: **May 2021**
Created by: **BL**
Reviewed by: **WdS**

DISCLAIMER: GeoAdvice does not warrant in any way the accuracy and completeness of the information shown on this map. Field verification of the accuracy and completeness of the information shown on this map is the sole responsibility of the user.

PHD Pressure Results HMBW Phase 3

Figure E.2

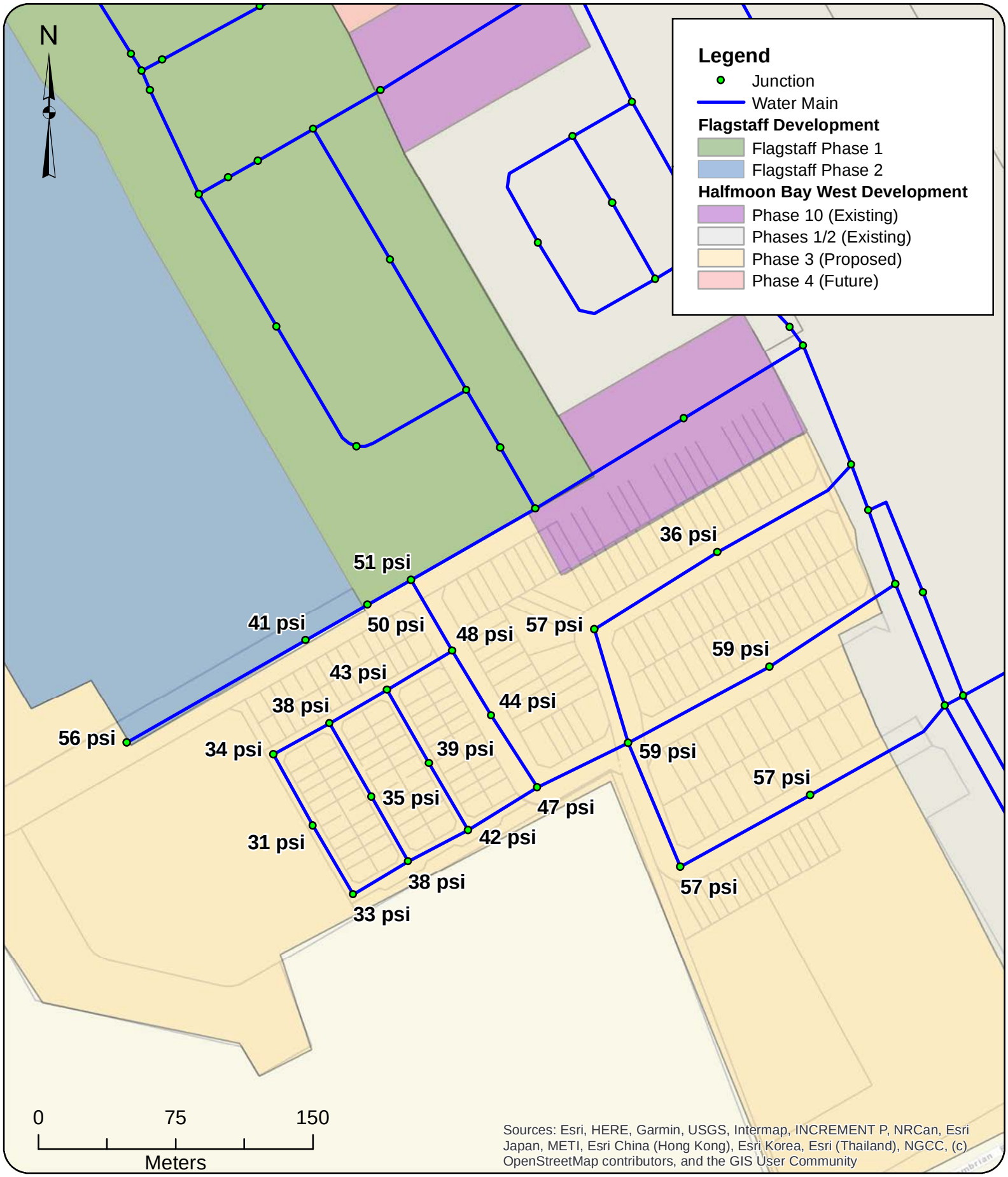


GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis Mattamy Half Moon Bay West Phase 3 2021-033-DSE**
Client: **David Schaeffer Engineering Ltd.**
Date: **May 2021**
Created by: **BL**
Reviewed by: **WdS**

Available Fire Flow @ 20 psi HMBW Phase 3

Figure F.1



GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis Mattamy Half Moon Bay West Phase 2 2021-033-DSE**
Client: **David Schaeffer Engineering Ltd.**
Date: **May 2021**
Created by: **BL**
Reviewed by: **WdS**

Residual Pressure @ Required Fire Flow HMBW Phase 3

Figure F.2

APPENDIX C

Wastewater Calculations

LRL File No. 210691
Project: Proposed Development-Halo Car Wash
Location: 3535 Borrisokane Rd, Barrhaven, ON
Date: April 22, 2022

Sanitary Design Parameters

Average Daily Flow = 280 L/p/day
Commercial & Institutional Flow = 28000 L/ha/day
Light Industrial Flow = 35000 L/ha/day
Heavy Industrial Flow = 55000 L/ha/day
Maximum Residential Peak Factor = 4.0
Commercial & Institutional Peak Factor = 1.5
Industrial Peak Factor = as per Appendix 4-B
Extraneous Flow = 0.33 L/s/gross ha
(as Per Tech Bulleting ISTB-2018-01)

Pipe Design Parameters

Minimum Velocity = 0.60 m/s
Manning's n = 0.013

LOCATION			RESIDENTIAL AREA AND POPULATION						COMMERCIAL		INDUSTRIAL			INSTITUTIONAL		C+I+I	INFILTRATION			*TOTAL	PIPE					
STREET/ SITE	FROM MH	TO MH	AREA (Ha)	POP.	CUMMULATIVE AREA (Ha)	CUMMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (Ha)	ACCU. AREA (Ha)	AREA (Ha)	ACCU. AREA (Ha)	PEAK FACT.	AREA (Ha)	ACCU. AREA (Ha)	*PEAK FLOW (l/s)	TOTAL AREA (Ha)	ACCU. AREA (Ha)	INFILT. FLOW (l/s)	*TOTAL FLOW (l/s)	LENGTH (m)	DIA. (mm)	SLOPE (%)	MATERIAL	CAP. (FULL) (l/s)	VEL. (FULL) (m/s)
	SAN MH01 (on-site)	SAN MH02									0.534					6.141	0.534	0.53	0.18	6.32	36.8	150	1.57%	PVC	19.08	1.08

Designed: M. B./M.L.	PROJECT: Proposed Halo Car Wash		
Checked: M.B.	LOCATION: 3535 Borrisokane Rd, Barrhaven, ON		
Dwg. Reference: C401	File Ref.: 210691	Date: 2022-04-22	Sheet No. 1 of 1

Note:
*Peak flow including anticipated waste water from Halo Car Wash (6.141 L/s), see below

Site Description	Qty	L/Qty	Total L/day	Total L/s
Halo Car Wash				
Anticipated Employees	2	75	150	0.002
Total x Peak Factor (1.5)				**0.003**
Estimated Car Wash/Hour (based on info by Halo Car Wash)	130	170		**6.139**
Total Anticipated Peak Design Flow (dry weather flow)				**6.141**

APPENDIX D

Stormwater Management Calculations

LRL Associates Ltd.

Storm Watershed Summary

LRL File No. 210691
Project: Proposed Development-Halo Car Wash
Location: 3555 Borrisokane Rd (Barrhaven, ON)
Date: April 6, 2022
Designed: M. Longtin
Checked: M. Basnet
Dwg Reference: C701, C702

Pre-Development Catchments

Watershed	C = 0.20	C = 0.80	C = 0.90	Total Area (ha)	Combined C
EWS-01 (uncontrolled)	0.534	0.000	0.000	0.534	0.20
Total	**0.534**	**0.000**	**0.000**	**0.534**	**0.20**

Post-Development Catchments

Watershed	C = 0.20	C = 0.8	C = 0.90	Total Area (ha)	Combined C
WS-01 (controlled)	0.045	0.000	0.019	0.064	0.41
WS-02 (controlled)	0.004	0.000	0.052	0.056	0.85
WS-03 (controlled)	0.030	0.000	0.066	0.096	0.68
WS-04 (controlled)	0.000	0.000	0.056	0.056	0.90
WS-05 (controlled)	0.000	0.000	0.115	0.115	0.90
WS-06 (controlled)	0.010	0.000	0.022	0.032	0.68
WS-07 (controlled)	0.029	0.000	0.017	0.046	0.46
WS-08 (uncontrolled)	0.027	0.000	0.000	0.027	0.20
WS-09 (uncontrolled)	0.041	0.000	0.001	0.042	0.22
Total	**0.186**	**0.000**	**0.348**	**0.534**	**0.66**

LRL File No. 210691
Project: Proposed Development-Halo Car Wash
Location: 3555 Borrisokane Rd (Barrhaven, ON)
Date: April 12, 2022
Designed: M. Longtin
Checked: M. Basnet
Drawing Ref.: C701, C702

Stormwater Management Design Sheet

STORM - 100 YEAR

Runoff Equation

Q = 2.78CIA (L/s)
C = Runoff coefficient
I = Rainfall intensity (mm/hr) = $A / (Td + C)^B$
A = Area (ha)
T_c = Time of concentration (min)

Pre-Devlopment Catchments within Development Area

	Total Area =	**0.534**	ha	**∑R=**	**0.20**
Un-Controlled	EWS-01	0.534	ha	R=	0.20
	Total Uncontrolled =	**0.534**	**ha**	**∑R=**	**0.20**

Pre-development Stormwater Management (5-Yr)

I_5 = 998.071 / (Td + 6.053)$^{0.814}$ **A =** 998.071 **B =** 0.814 **C =** 6.053

C = 0.20 max of 0.5 as per City of Ottawa
I = 104.2 mm/hr
Tc = 10 min
Total Area = 0.534 ha

Pre-development Stormwater Management (100-Yr)

I_{100} = 1735.688 / (Td + 6.014)$^{0.820}$ **A =** 1735.688 **B =** 0.820 **C =** 6.014

C = 0.66
I = 178.6 mm/hr
Tc = 10 min
Total Area = 0.534 ha

Allowable Release Rate = 30.95 L/s

(5-yr pre-development level corresponding to EWS-01, see drawing C701)

Post-development Stormwater Management

					$∑R_5$	**$∑R_{100}$**
	Total Site Area =	**0.534**	ha	**∑R=**	**0.66**	**0.82**
Controlled	WS-01	0.064	ha	R=	0.41	0.51
	WS-02	0.056	ha	R=	0.85	1.00
	WS-03	0.096	ha	R=	0.68	0.85
	WS-04	0.056	ha	R=	0.90	1.00
	WS-05	0.115	ha	R=	0.90	1.00
	WS-06	0.032	ha	R=	0.68	0.85
	WS-07	0.046	ha	R=	0.46	0.57
	Total Contolled =	**0.465**	**ha**	**∑R=**	**0.72**	**0.90**
Uncontrolled	WS-08	0.027	ha	R=	0.20	0.25
	WS-09	0.042	ha	R=	0.22	0.28
	Total Uncontolled =	**0.069**	**ha**	**∑R=**	**0.21**	**0.27**

Post-development Stormwater Management (100-Yr)

Time (min)	Intensity (mm/hr)	Controlled Runoff (L/s)	Storage Volume (m^3)	Controlled Release Rate (L/s)	Uncontrolled Runoff (L/s)	Total Release Rate (L/s)
10	178.56	208.26	111.91	21.74	9.21	30.95
15	142.89	166.66	130.42	21.74	7.37	29.11
20	119.95	139.90	141.79	21.74	6.19	27.93
25	103.85	121.12	149.06	21.74	5.36	27.10
30	91.87	107.15	153.72	21.74	4.74	26.48
35	82.58	96.31	156.59	21.74	4.26	26.00
40	75.15	87.64	158.16	21.74	3.88	25.62
45	69.05	80.53	158.73	21.74	3.56	25.31
50	63.95	74.59	158.54	21.74	3.30	25.04
55	59.62	69.54	157.73	21.74	3.07	24.82
60	55.89	65.19	156.41	21.74	2.88	24.63
65	52.65	61.40	154.67	21.74	2.71	24.46
70	49.79	58.07	152.57	21.74	2.57	24.31
75	47.26	55.11	150.17	21.74	2.44	24.18
80	44.99	52.47	147.50	21.74	2.32	24.06
85	42.95	50.10	144.60	21.74	2.22	23.96
90	41.11	47.95	141.50	21.74	2.12	23.86
95	39.43	45.99	138.22	21.74	2.03	23.78
100	37.90	44.21	134.77	21.74	1.95	23.70
105	36.50	42.57	131.18	21.74	1.88	23.63
110	35.20	41.06	127.46	21.74	1.82	23.56
115	34.01	39.66	123.62	21.74	1.75	23.50
120	32.89	38.37	119.67	21.74	1.70	23.44

On-site stormwater detention

Storage required = 158.73 m^3
Storage provided = 213.39 m^3 (See Dwg C601)

LRL File No. 210691
Project: Proposed Development-Halo Car Wash
Location: 3555 Borrisokane Rd (Barrhaven, ON)
Date: April 12, 2022
Designed: M. Longtin
Checked: M. Basnet
Drawing Ref.: C701, C702

Stormwater Management Design Sheet

STORM - 100 YEAR + Stress Test

Runoff Equation

Q = 2.78CIA (L/s)
C = Runoff coefficient
I = Rainfall intensity (mm/hr) = A / (Td + C)^B
A = Area (ha)
T_c = Time of concentration (min)

Pre-Devlopment Catchments within Development Area

	Total Area =	**0.534**	ha	**∑R=**	**0.20**
Un-Controlled	EWS-01	0.534	ha	R=	0.20
	Total Uncontrolled =	**0.534**	**ha**	**∑R=**	**0.20**

Pre-development Stormwater Management (5-Yr)

I_5 = **998.071 / (Td + 6.053)$^{0.814}$** **A = 998.071** **B = 0.814** **C = 6.053**

C =	0.20	max of 0.5 as per City of Ottawa
I =	104.2	mm/hr
Tc =	10	min
Total Area =	0.534	ha

Pre-development Stormwater Management (100-Yr)

I_{100} = **1735.688 / (Td + 6.014)$^{0.820}$** **A = 1735.688** **B = 0.820** **C = 6.014**

C =	0.66	
I =	178.6	mm/hr
Tc =	10	min
Total Area =	0.534	ha

Allowable Release Rate = 30.95 L/s

(5-yr pre-development level corresponding to EWS-01, see drawing C701)

Post-development Stormwater Management

					$\sum R_5$	$\sum R_{100}$
	Total Site Area =	**0.534**	ha	**∑R=**	**0.66**	**0.82**
Controlled	WS-01	0.064	ha	R=	0.41	0.51
	WS-02	0.056	ha	R=	0.85	1.00
	WS-03	0.096	ha	R=	0.68	0.85
	WS-04	0.056	ha	R=	0.90	1.00
	WS-05	0.115	ha	R=	0.90	1.00
	WS-06	0.032	ha	R=	0.68	0.85
	WS-07	0.046	ha	R=	0.46	0.57
	Total Contolled =	**0.465**	**ha**	**∑R=**	**0.72**	**0.90**
Uncontrolled	WS-08	0.027	ha	R=	0.20	0.25
	WS-09	0.042	ha	R=	0.22	0.28
	Total Uncontolled =	**0.069**	**ha**	**∑R=**	**0.21**	**0.27**

Post-development Stormwater Management (100-Yr + Stress Test)

Time (min)	*Intensity (mm/hr)	Controlled Runoff (L/s)	Storage Volume (m^3)	Controlled Release Rate (L/s)	Uncontrolled Runoff (L/s)	Total Release Rate (L/s)
10	214.27	249.91	136.90	21.74	11.05	32.79
15	171.47	199.99	160.42	21.74	8.84	30.59
20	143.94	167.88	175.36	21.74	7.42	29.17
25	124.62	145.34	185.40	21.74	6.43	28.17
30	110.24	128.58	192.30	21.74	5.69	27.43
35	99.09	115.58	197.04	21.74	5.11	26.85
40	90.17	105.17	200.22	21.74	4.65	26.39
45	82.86	96.64	202.22	21.74	4.27	26.02
50	76.74	89.51	203.29	21.74	3.96	25.70
55	71.55	83.45	203.62	21.74	3.69	25.43
60	67.07	78.23	203.34	21.74	3.46	25.20
65	63.18	73.68	202.56	21.74	3.26	25.00
70	59.75	69.68	201.35	21.74	3.08	24.83
75	56.71	66.14	199.77	21.74	2.92	24.67
80	53.99	62.97	197.87	21.74	2.78	24.53
85	51.54	60.12	195.70	21.74	2.66	24.40
90	49.33	57.54	193.28	21.74	2.54	24.29
95	47.32	55.19	190.65	21.74	2.44	24.18
100	45.48	53.05	187.82	21.74	2.35	24.09
105	43.80	51.08	184.82	21.74	2.26	24.00
110	42.24	49.27	181.66	21.74	2.18	23.92
115	40.81	47.59	178.35	21.74	2.10	23.85
120	39.47	46.04	174.92	21.74	2.04	23.78

*20% increase in intensity for stress test

On-site stormwater detention

Storage required = 203.62 m^3
Storage provided = 213.39 m^3 (See Dwg C601)

LRL File No.	210691
Project:	Proposed Development-Halo Car Wash
Location:	3555 Borrisokane Rd (Barrhaven, ON)
Date:	April 12, 2022
Designed:	M. Longtin
Checked:	M. Basnet
Drawing Ref.:	C701, C702

Stormwater Management Design Sheet

STORM - 5 YEAR

Runoff Equation

Q = 2.78CIA (L/s)
C = Runoff coefficient
I = Rainfall intensity (mm/hr) $= A / (Td + C)^B$
A = Area (ha)
T_c = Time of concentration (min)

Pre-Devlopment Catchments within Development Area

	Total Area =	**0.534**	ha	**∑R=**	**0.20**	
Un-Controlled	EWS-01	0.534	ha	R=	0.20	
	Total Uncontrolled =	**0.534**	**ha**	**∑R=**	**0.20**	

Pre-development Stormwater Management (5-Yr)

$I_5 = 998.071 / (Td + 6.053)^{0.814}$ **A = 998.071** **B = 0.814** **C = 6.053**

C = 0.20 max of 0.5 as per City of Ottawa
I = 104.2 mm/hr
Tc = 10 min
Total Area = 0.534 ha

Pre-development Stormwater Management (100-Yr)

$I_{100} = 1735.688 / (Td + 6.014)^{0.820}$ **A = 1735.688** **B = 0.820** **C = 6.014**

C = 0.66
I = 178.6 mm/hr
Tc = 10 min
Total Area = 0.534 ha

Allowable Release Rate = 30.95 L/s

(5-yr pre-development level corresponding to EWS-01, see drawing C701)

Post-development Stormwater Management

					$\sum R_5$	**$\sum R_{100}$**
	Total Site Area =	**0.534**	ha	**∑R=**	**0.66**	**0.82**
Controlled	WS-01	0.064	ha	R=	0.41	0.51
	WS-02	0.056	ha	R=	0.85	1.00
	WS-03	0.096	ha	R=	0.68	0.85
	WS-04	0.056	ha	R=	0.90	1.00
	WS-05	0.115	ha	R=	0.90	1.00
	WS-06	0.032	ha	R=	0.68	0.85
	WS-07	0.046	ha	R=	0.46	0.57
	Total Contolled =	**0.465**	**ha**	**∑R=**	**0.72**	**0.90**
Uncontrolled	WS-08	0.027	ha	R=	0.20	0.25
	WS-09	0.042	ha	R=	0.22	0.28
	Total Uncontolled =	**0.069**	**ha**	**∑R=**	**0.21**	**0.27**

Post-development Stormwater Management (5-Yr)

Time (min)	Intensity (mm/hr)	Controlled Runoff (L/s)	Storage Volume (m^3)	Controlled Release Rate (L/s)	Uncontrolled Runoff (L/s)	Total Release Rate (L/s)
10	104.19	121.52	59.87	21.74	4.30	26.04
15	83.56	97.45	68.14	21.74	3.45	25.19
20	70.25	81.93	72.23	21.74	2.90	24.64
25	60.90	71.02	73.92	21.74	2.51	24.26
30	53.93	62.90	74.07	21.74	2.22	23.97
35	48.52	56.59	73.17	21.74	2.00	23.75
40	44.18	51.53	71.49	21.74	1.82	23.57
45	40.63	47.39	69.23	21.74	1.68	23.42
50	37.65	43.92	66.51	21.74	1.55	23.30
55	35.12	40.96	63.43	21.74	1.45	23.19
60	32.94	38.42	60.04	21.74	1.36	23.10
65	31.04	36.21	56.40	21.74	1.28	23.03
70	29.37	34.26	52.55	21.74	1.21	22.96
75	27.89	32.53	48.52	21.74	1.15	22.90
80	26.56	30.98	44.33	21.74	1.10	22.84
85	25.37	29.59	40.00	21.74	1.05	22.79
90	24.29	28.33	35.55	21.74	1.00	22.75
95	23.31	27.18	30.99	21.74	0.96	22.71
100	22.41	26.13	26.33	21.74	0.92	22.67
105	21.58	25.17	21.59	21.74	0.89	22.63
110	20.82	24.29	16.77	21.74	0.86	22.60
115	20.12	23.47	11.88	21.74	0.83	22.57
120	19.47	22.71	6.92	21.74	0.80	22.55

On-site stormwater detention

Storage required = 74.07 m^3
Storage provided = 213.39 m^3 (See Dwg C601)

Cut/Fill Report

Generated: 2022-02-10 13:15:01

By user: mlongtin

Drawing: W:\FILES 2021\210691\06 CivilDesign\02 Drawings\07 FinalProductionDrawings\W:\FILES 2021\210691\06 CivilDesign\02 Drawings\07 FinalProductionDrawings\210691-01.dwg

Volume Summary

Name	Type	Cut Factor	Fill Factor	2d Area (hectares)	Cut (Cu. M.)	Fill (Cu. M.)	Net (Cu. M.)
CBMH02 PONDING	full	1.00	1.00	0.00	0.01	1.38	1.36<Fill>
CBMH03 PONDING	full	1.00	1.00	0.02	0.00	14.09	14.09<Fill>
CB04 PONDING	full	1.00	1.00	0.03	63.58	33.26	30.32<Cut>
CBMH05 PONDING	full	1.00	1.00	0.03	0.04	26.87	26.83<Fill>
CBMH06 PONDING	full	1.00	1.00	0.03	0.00	22.88	22.88<Fill>
CB07 PONDING	full	1.00	1.00	0.01	0.05	10.95	10.90<Fill>
CBMH10 PONDING	full	1.00	1.00	0.01	0.03	3.94	3.91<Fill>

Totals

	2d Area (hectares)	Cut (Cu. M.)	Fill (Cu. M.)	Net (Cu. M.)
Total	0.13	63.72	113.36	49.64<Fill>

* Value adjusted by cut or fill factor other than 1.0

LRL Associates Ltd.
Storm Design Sheet

LRL File No.	210691
Project:	Proposed Development-Halo Car Wash
Location:	3555 Borrisokane Rd (Barrhaven, ON)
Date:	April 12, 2022
Designed:	M. Longtin
Checked:	M. Basnet
Drawing Reference:	C702, C401

Storm Design Parameters

Rational Method	Runoff Coefficient (C)		City of Ottawa IDF curve equation
Q = 2.78CIA	Grass	0.20	(5 year event, intensity in mm/hr)
Q = Peak flow (L/s)	Gravel	0.80	$I_5 = 998.071 / (Td + 6.053)^{0.814}$
A = Drainage area (ha)	Asphalt / rooftop	0.90	Min. velocity = 0.80 m/s
C = Runoff coefficient			Manning's "n" = 0.013
I = Rainfall intensity (mm/hr)			

LOCATION			AREA (ha)			FLOW						STORM SEWER							
WATERSHED / STREET	From MH	To MH	C = 0.20	C = 0.80	C = 0.90	Indiv. 2.78AC	Accum. 2.78AC	Time of Conc. (min.)	Rainfall Intensity (mm/hr)	Peak Flow Q (L/s)	Controlled Flow Q (L/s)	Pipe Diameter (mm)	Type	Slope (%)	Length (m)	Capacity Full (L/s)	Velocity Full (m/s)	Time of Flow (min.)	Ratio (Q/Q_{FULL})
WS-01	CBMH02	CBMH03	0.045	0.000	0.019	0.07	0.07	10.00	104.19	7.54		250	PVC	0.45%	22.9	39.9	0.81	0.47	0.19
WS-02	CBMH03	CBMH05	0.004	0.000	0.052	0.13	0.20	10.47	101.78	20.78		250	PVC	0.45%	16.7	39.9	0.81	0.34	0.52
WS-03	CB04	CBMH05	0.030	0.000	0.066	0.18	0.18	10.00	104.19	18.92		250	PVC	0.45%	14.9	39.9	0.81	0.31	0.47
WS-04	CBMH05	CBMH06	0.000	0.000	0.056	0.14	0.53	10.65	100.89	53.12		300	PVC	0.35%	21.7	57.2	0.81	0.45	0.93
WS-05	CBMH06	CBMH08	0.000	0.000	0.115	0.29	0.81	11.09	98.74	80.33		375	PVC	0.30%	23.2	96.0	0.87	0.44	0.84
WS-06	CB07	CBMH08	0.010	0.000	0.022	0.06	0.06	10.00	104.19	6.33		250	PVC	0.45%	10.1	39.9	0.81	0.21	0.16
	CBMH08	CBMH10					0.87	11.30	97.78	85.50		375	PVC	0.30%	17.2	96.0	0.87	0.33	0.89
	CB09	CBMH10	0.029	0.000	0.017	0.06	0.06	10.00	104.19	6.12		250	PVC	0.50%	15.7	42.0	0.86	0.31	0.15
WS-07	CBMH10	OGS					0.93	11.63	96.30	89.85	21.74	250	PVC	0.50%	3.3	42.0	0.86	0.06	0.52
	OGS	Ex. STM					0.93	11.70	96.01	89.59	21.74	250	PVC	0.50%	8.4	42.0	0.86	0.16	0.52

Note

The Peak flow will be controlled by an ICD at the outlet of STM CBMH10

Stormceptor®

FORTERRA

Stormceptor® EF Sizing Report

STORMCEPTOR®
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

04/12/2022

Province:	Ontario
City:	Barrhaven
Nearest Rainfall Station:	OTTAWA CDA RCS
Climate Station Id:	6105978
Years of Rainfall Data:	20

Site Name:	3555 Borrisokane Rd.

Drainage Area (ha):	0.465
Runoff Coefficient 'c':	0.72

Particle Size Distribution:	Fine
Target TSS Removal (%):	80.0
Required Water Quality Runoff Volume Capture (%):	90.0

Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	

Project Name:	3555 Borrisokane Rd.
Project Number:	210691
Designer Name:	Brandon O'Leary
Designer Company:	Forterra
Designer Email:	brandon.oleary@forterrabp.com
Designer Phone:	905-630-0359
EOR Name:	Mohan Basnet
EOR Company:	LRL Associates Ltd.
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	88
EFO6	95
EFO8	98
EFO10	99
EFO12	100

Recommended Stormceptor EFO Model: **EFO4**

Estimated Net Annual Sediment (TSS) Load Reduction (%): **88**

Water Quality Runoff Volume Capture (%): **> 90**

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THIRD-PARTY TESTING AND VERIFICATION

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

PERFORMANCE

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

PARTICLE SIZE DISTRIBUTION (PSD)

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

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

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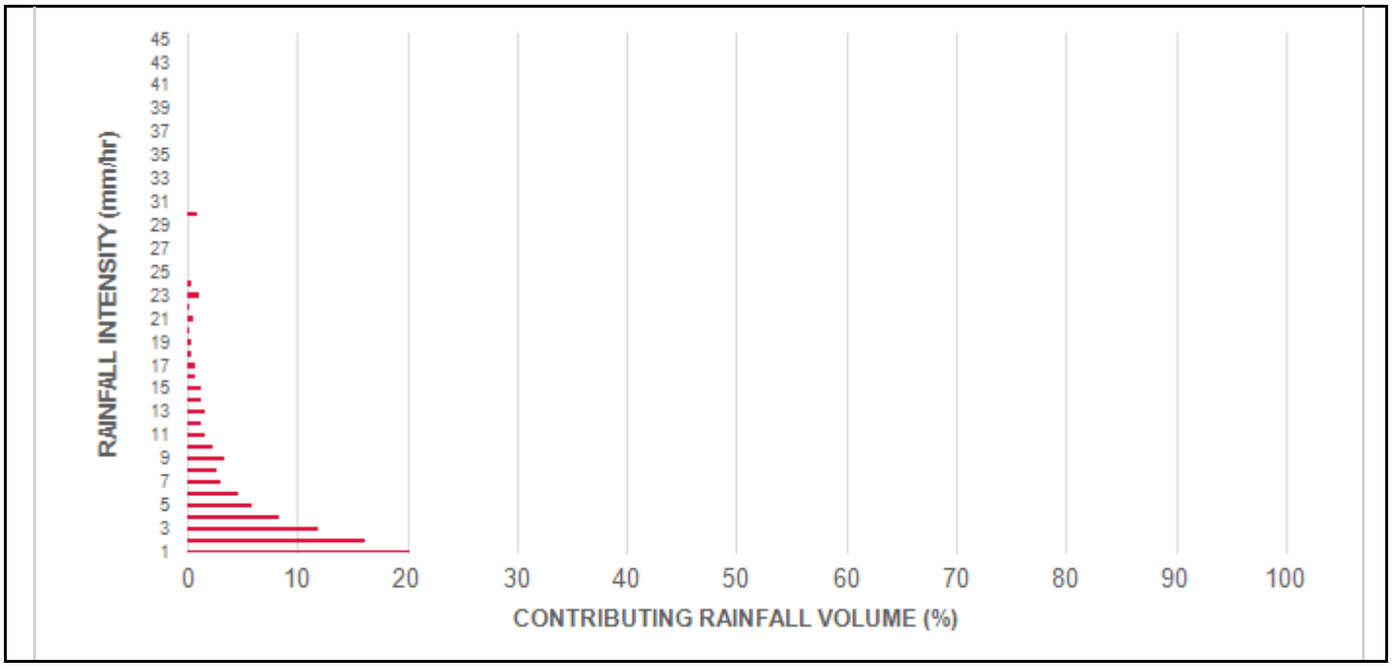
Stormceptor® EF Sizing Report

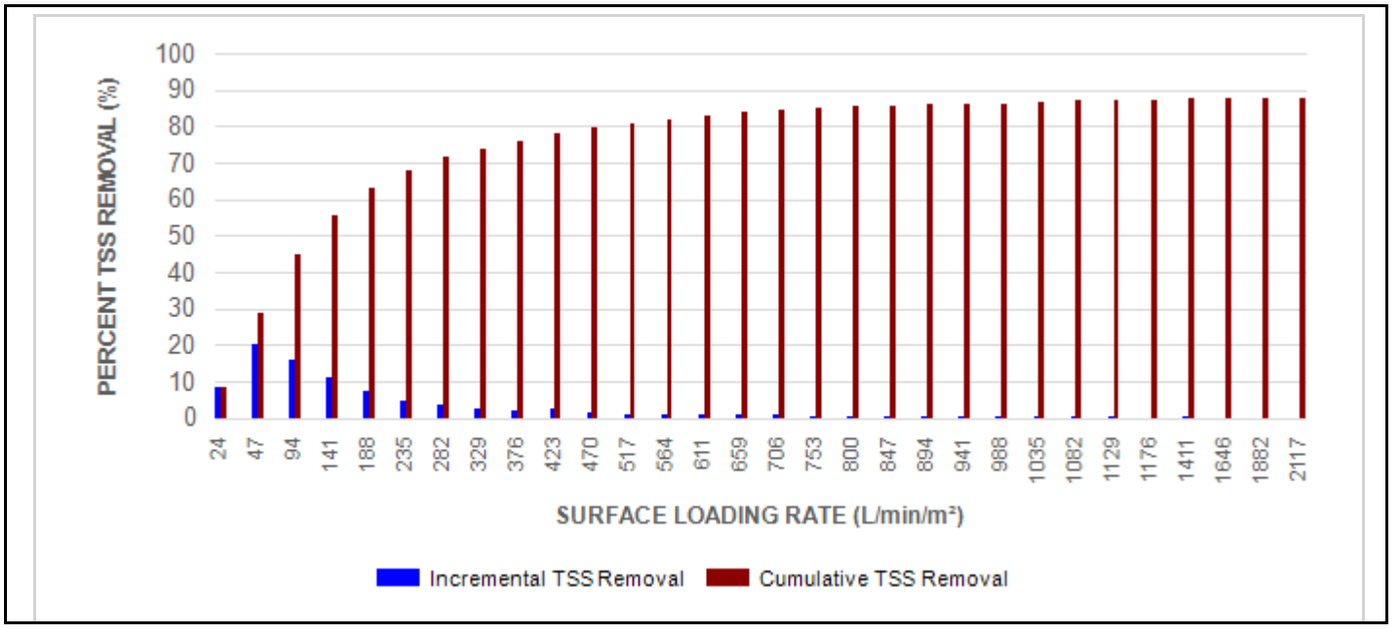
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.5	8.6	8.6	0.47	28.0	24.0	100	8.6	8.6
1	20.3	29.0	0.94	56.0	47.0	100	20.3	29.0
2	16.2	45.2	1.88	113.0	94.0	97	15.8	44.7
3	12.0	57.2	2.82	169.0	141.0	91	10.9	55.6
4	8.4	65.6	3.76	226.0	188.0	86	7.2	62.8
5	5.9	71.6	4.70	282.0	235.0	82	4.9	67.7
6	4.6	76.2	5.64	339.0	282.0	79	3.7	71.4
7	3.1	79.3	6.59	395.0	329.0	77	2.4	73.7
8	2.7	82.0	7.53	452.0	376.0	75	2.1	75.8
9	3.3	85.3	8.47	508.0	423.0	73	2.4	78.2
10	2.3	87.6	9.41	564.0	470.0	71	1.6	79.9
11	1.6	89.2	10.35	621.0	517.0	69	1.1	80.9
12	1.3	90.5	11.29	677.0	564.0	66	0.9	81.8
13	1.7	92.2	12.23	734.0	611.0	65	1.1	82.9
14	1.2	93.5	13.17	790.0	659.0	64	0.8	83.7
15	1.2	94.6	14.11	847.0	706.0	64	0.7	84.4
16	0.7	95.3	15.05	903.0	753.0	63	0.4	84.9
17	0.7	96.1	15.99	960.0	800.0	63	0.5	85.4
18	0.4	96.5	16.93	1016.0	847.0	63	0.2	85.6
19	0.4	96.9	17.87	1072.0	894.0	62	0.3	85.9
20	0.2	97.1	18.82	1129.0	941.0	62	0.1	86.0
21	0.5	97.5	19.76	1185.0	988.0	62	0.3	86.3
22	0.2	97.8	20.70	1242.0	1035.0	61	0.1	86.4
23	1.0	98.8	21.64	1298.0	1082.0	60	0.6	87.0
24	0.3	99.1	22.58	1355.0	1129.0	59	0.2	87.2
25	0.0	99.1	23.52	1411.0	1176.0	58	0.0	87.2
30	0.9	100.0	28.22	1693.0	1411.0	52	0.5	87.7
35	0.0	100.0	32.93	1976.0	1646.0	45	0.0	87.7
40	0.0	100.0	37.63	2258.0	1882.0	39	0.0	87.7
45	0.0	100.0	42.33	2540.0	2117.0	35	0.0	87.7
Estimated Net Annual Sediment (TSS) Load Reduction =								**88 %**

Climate Station ID: 6105978 *Years of Rainfall Data*: 20

RAINFALL DATA FROM OTTAWA CDA RCS RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL
FOR THE RECOMMENDED STORMCEPTOR® MODEL



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Maximum Pipe Diameter / Peak Conveyance

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

SCOUR PREVENTION AND ONLINE CONFIGURATION

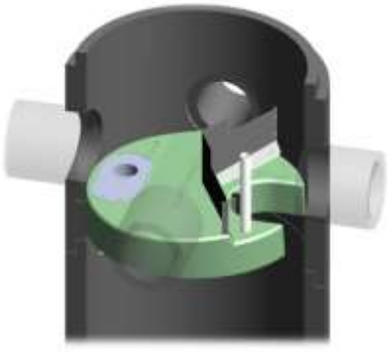
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test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

DESIGN FLEXIBILITY

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

OIL CAPTURE AND RETENTION

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



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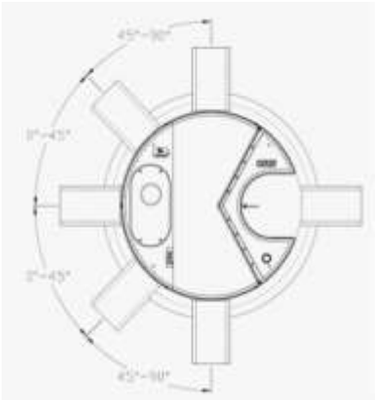

INLET-TO-OUTLET DROP

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

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft^3)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity
** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft^3)

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

STANDARD STORMCEPTOR EF/EFO DRAWINGS

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

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

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

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

PART 1 – GENERAL

1.1 WORK INCLUDED

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

1.2 REFERENCE STANDARDS & PROCEDURES

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

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

1.3 SUBMITTALS

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

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

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

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

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

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m^3 sediment / 265 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

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

3.2 SIZING METHODOLOGY

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

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m^2 to 1400 L/min/m^2, and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m^2 and 1400 L/min/m^2 shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m^2 shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m^2. No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m^2.

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m^2 shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m^2, and shall be calculated using a simple proportioning formula, with 1400 L/min/m^2 in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m^2.

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

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in

accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

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

3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m^2 to 2600 L/min/m^2) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.** However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.

STANDARD PERFORMANCE SPECIFICATION FOR "OIL GRIT SEPARATOR" (OGS) STORMWATER QUALITY TREAMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

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

1.2 REFERENCE STANDARDS & PROCEDURES

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

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

1.3 SUBMITTALS

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

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

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

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

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

2.1.1

4ft (1219mm) Diameter OGS Units:	1.19m^3 sediment / 265L oil
6ft (1829mm) Diameter OGS Units:	3.48m^3 sediment / 609Ll oil
8ft (2438mm) Diameter OGS Units:	8.78m^3 sediment / 1,071L oil
10ft (3048mm) Diameter OGS Units:	17.78m^3 sediment / 1,673L oil
12ft (3657mm) Diameter OGS Units:	31.23m^3 sediment / 2,476L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality

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

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing shall be determined using historical rainfall data and a sediment removal performance curve derived from the actual third-party verified laboratory testing data. The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

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

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

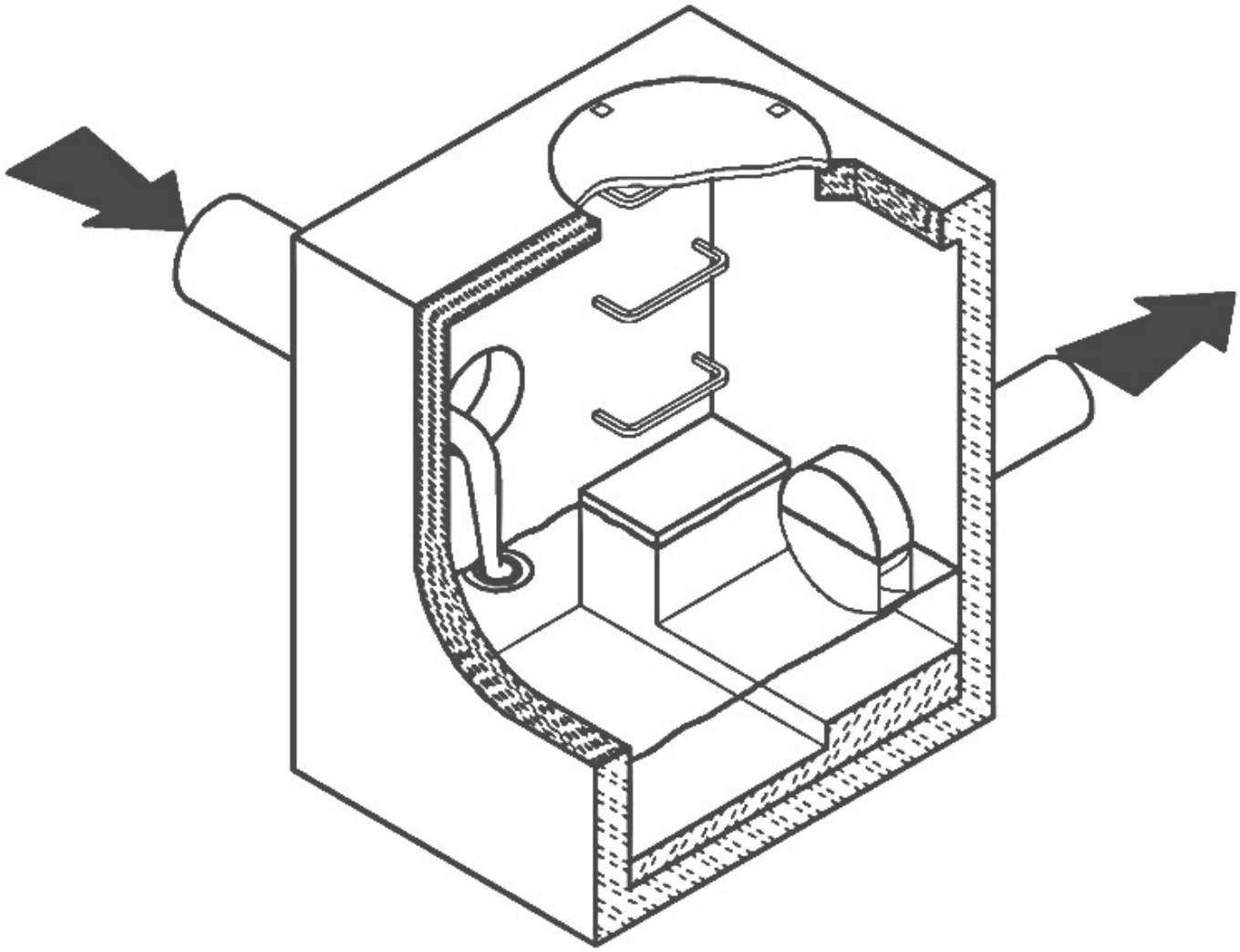
The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators**, with results reported within the Canadian ETV or ISO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

3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m^2 to 2600 L/min/m^2) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators**. However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.

CSO/STORMWATER MANAGEMENT

HYDROVEX® VHV / SVHV

Vertical Vortex Flow Regulator



JOHN MEUNIER

APPLICATIONS

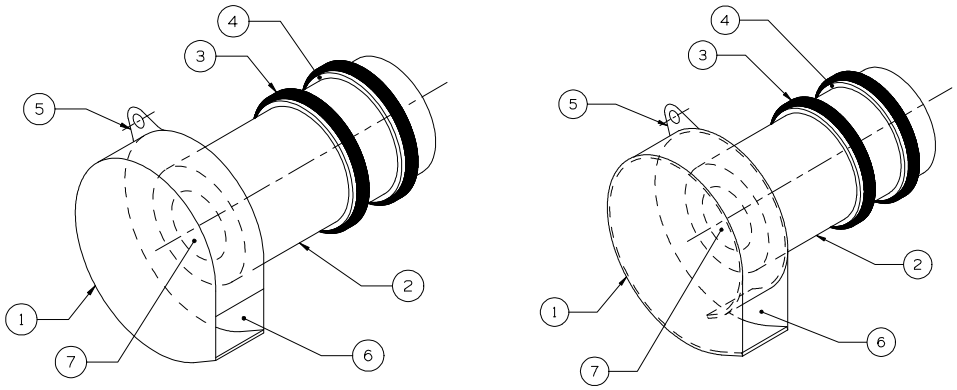
One of the major problems of urban wet weather flow management is the runoff generated after a heavy rainfall. During a storm, uncontrolled flows may overload the drainage system and cause flooding. Due to increased velocities, sewer pipe wear is increased dramatically and results in network deterioration. In a combined sewer system, the wastewater treatment plant may also experience significant increases in flows during storms, thereby losing its treatment efficiency.

A simple means of controlling excessive water runoff is by controlling excessive flows at their origin (manholes). **John Meunier Inc.** manufactures the **HYDROVEX® VHV / SVHV** line of vortex flow regulators to control stormwater flows in sewer networks, as well as manholes.

The vortex flow regulator design is based on the fluid mechanics principle of the forced vortex. This grants flow regulation without any moving parts, thus reducing maintenance. The operation of the regulator, depending on the upstream head and discharge, switches between orifice flow (gravity flow) and vortex flow. Although the concept is quite simple, over 12 years of research have been carried out in order to get a high performance.

The **HYDROVEX® VHV / SVHV** Vertical Vortex Flow Regulators **(refer to Figure 1)** are manufactured entirely of stainless steel, and consist of a hollow body (**1**) (in which flow control takes place) and an outlet orifice (**7**). Two rubber "O" rings (**3**) seal and retain the unit inside the outlet pipe. Two stainless steel retaining rings (**4**) are welded on the outlet sleeve to ensure that there is no shifting of the "O" rings during installation and use.

1. **BODY**
2. **SLEEVE**
3. **O-RING**
4. **RETAINING RINGS (SQUARE BAR)**
5. **ANCHOR PLATE**
6. **INLET**
7. **OUTLET ORIFICE**



VHV ***SVHV***

FIGURE 1: HYDROVEX® VHV-SVHV VERTICAL VORTREX FLOW REGULATORS

ADVANTAGES

- The **HYDROVEX® VHV / SVHV** line of flow regulators are manufactured entirely of stainless steel, making them durable and corrosion resistant.
- Having no moving parts, they require minimal maintenance.
- The geometry of the **HYDROVEX® VHV / SVHV** flow regulators allows a control equal to an orifice plate, having a cross section area 4 to 6 times smaller. This decreases the chance of blockage of the regulator, due to sediments and debris found in stormwater flows. **Figure 2** illustrates the comparison between a regulator model 100 SVHV-2 and an equivalent orifice plate. One can see that for the same height of water, the regulator controls a flow approximately four times smaller than an equivalent orifice plate.
- Installation of the **HYDROVEX® VHV / SVHV** flow regulators is quick and straightforward and is performed after all civil works are completed.
- Installation requires no special tools or equipment and may be carried out by any contractor.
- Installation may be carried out in existing structures.

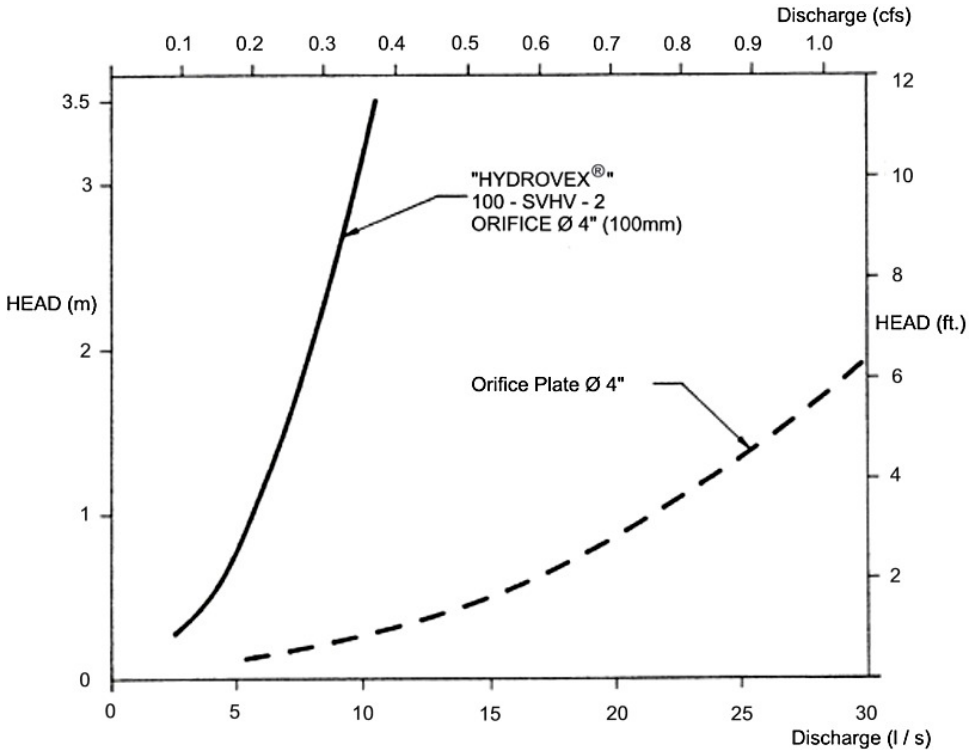


FIGURE 2: DISCHARGE CURVE SHOWING A HYDROVEX® FLOW REGULATOR VS AN ORIFICE PLATE

SELECTION

Selection of a **VHV or SVHV** regulator can be easily made using the selection charts found at the back of this brochure (see **Figure 3)**. These charts are a graphical representation of the maximum upstream water pressure (head) and the maximum discharge at the manhole outlet. The maximum design head is the difference between the maximum upstream water level and the invert of the outlet pipe. All selections should be verified by John Meunier Inc. personnel prior to fabrication.

Example:

✓ Maximum design head	2m (6.56 ft.)
✓ Maximum discharge	6 L/s (0.2 cfs)
✓ Using **Figure 3** - VHV	model required is a **75 VHV-1**

INSTALLATION REQUIREMENTS

All **HYDROVEX® VHV / SVHV** flow regulators can be installed in circular or square manholes. **Figure 4** gives the various minimum dimensions required for a given regulator. ***It is imperative to respect the minimum clearances shown to ensure easy installation and proper functioning of the regulator.***

SPECIFICATIONS

In order to specify a **HYDROVEX®** regulator, the following parameters must be defined:

- The model number (ex: 75-VHV-1)
- The diameter and type of outlet pipe (ex: 6" diam. SDR 35)
- The desired discharge (ex: 6 l/s or 0.21 CFS)
- The upstream head (ex: 2 m or 6.56 ft.) *
- The manhole diameter (ex: 36" diam.)
- The minimum clearance "H" (ex: 10 inches)
- The material type (ex: 304 s/s, 11 Ga. standard)

* ***Upstream head is defined as the difference in elevation between the maximum upstream water level and the invert of the outlet pipe where the HYDROVEX® flow regulator is to be installed.***

PLEASE NOTE THAT WHEN REQUESTING A PROPOSAL, WE SIMPLY REQUIRE THAT YOU PROVIDE US WITH THE FOLLOWING:

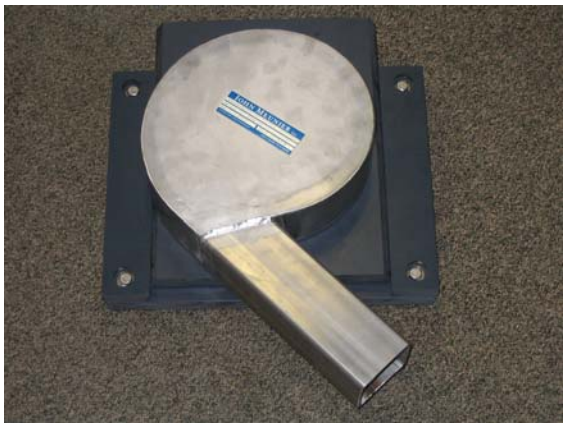
- ***project design flow rate***
- ***pressure head***
- ***chamber's outlet pipe diameter and type***

Typical VHV model in factory

OPTIONS

FV – SVHV (mounted on sliding plate)

VHV-1-O (standard model with odour control inlet)



FV – VHV-O (mounted on sliding plate with odour control inlet)

VHV with Gooseneck assembly in existing chamber without minimum release at the bottom

VHV with air vent for minimal slopes

HYDROVEX®

VHV Vertical Vortex Flow Regulator

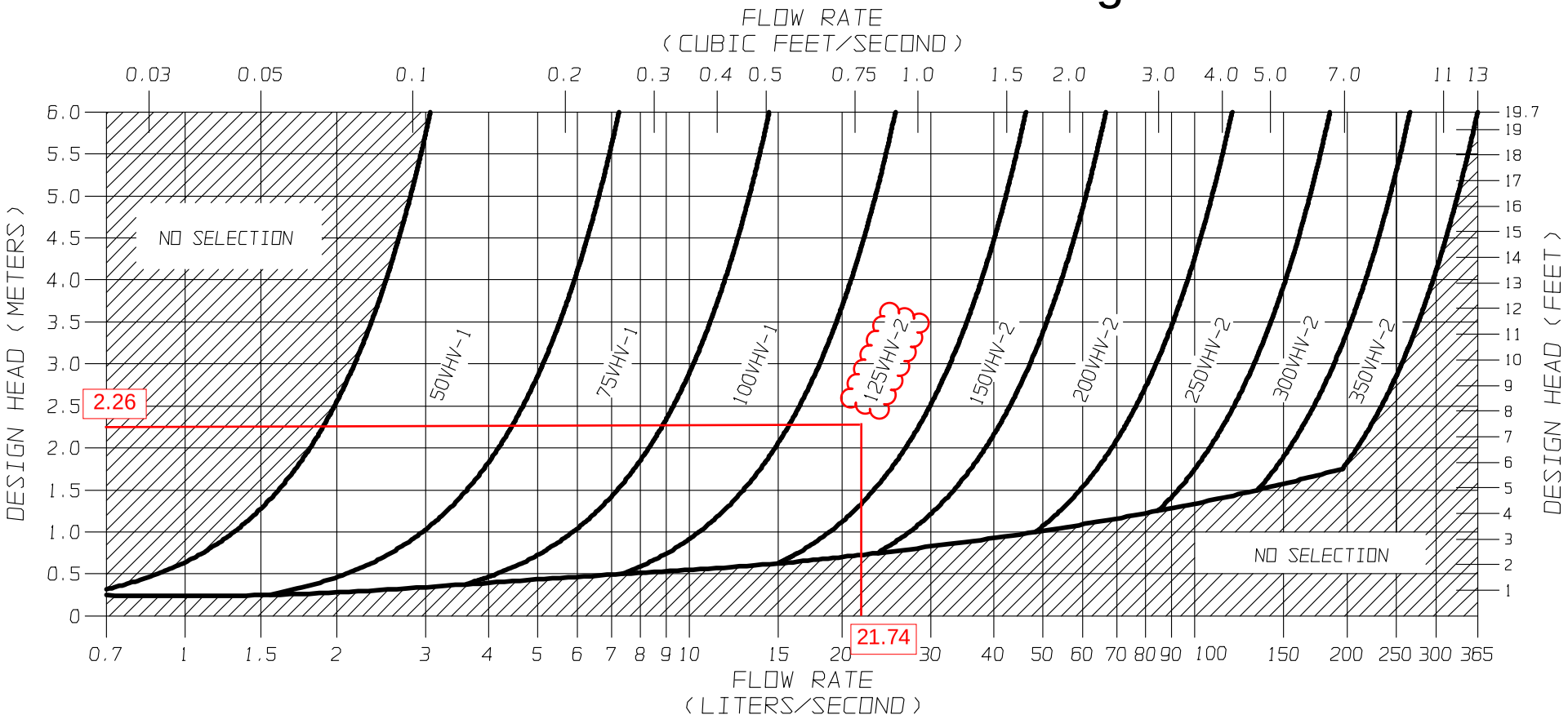
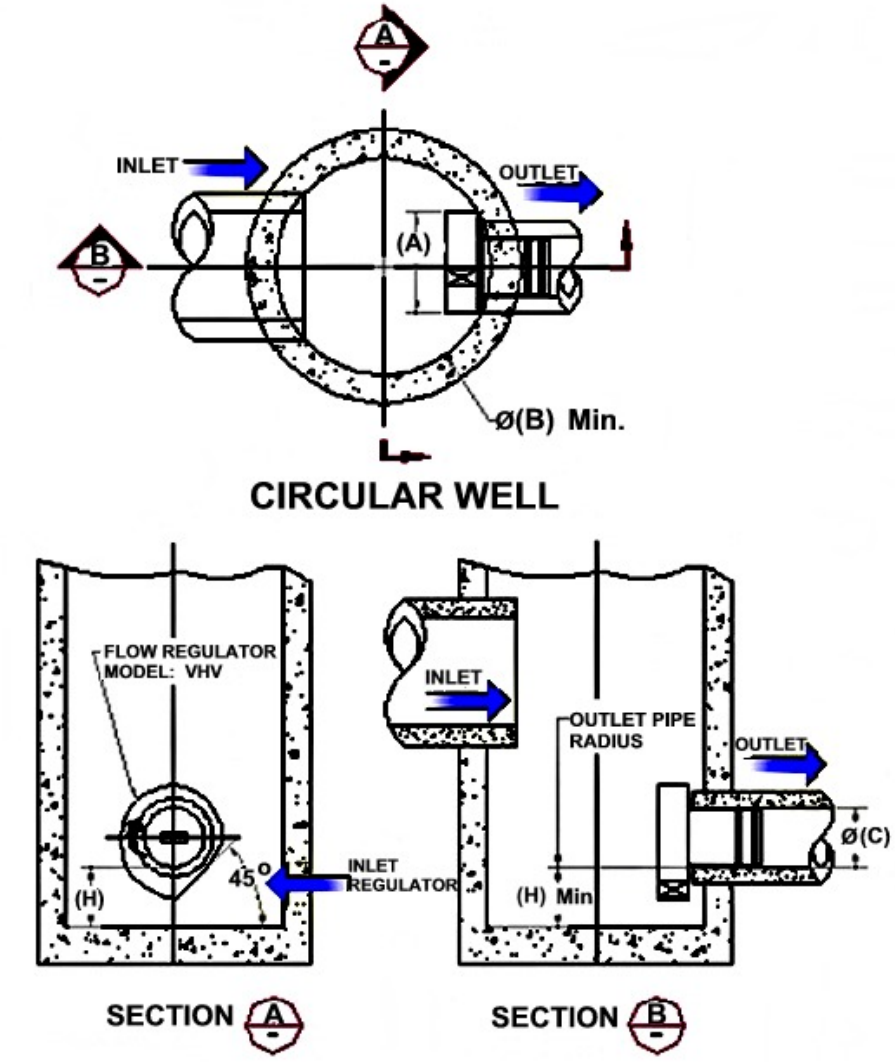


FIGURE 3 - VHV

JOHN MEUNIER

FLOW REGULATOR TYPICAL INSTALLATION IN CIRCULAR MANHOLE
FIGURE 4 (MODEL VHV)

Model Number	Regulator Diameter		Minimum Manhole Diameter		Minimum Outlet Pipe Diameter		Minimum Clearance	
	A (mm)	**A** (in.)	**B** (mm)	**B** (in.)	**C** (mm)	**C** (in.)	**H** (mm)	**H** (in.)
50VHV-1	150	6	600	24	150	6	150	6
75VHV-1	250	10	600	24	150	6	150	6
100VHV-1	325	13	900	36	150	6	200	8
125VHV-2	275	11	900	36	150	6	200	8
150VHV-2	350	14	900	36	150	6	225	9
200VHV-2	450	18	1200	48	200	8	300	12
250VHV-2	575	23	1200	48	250	10	350	14
300VHV-2	675	27	1600	64	250	10	400	16
350VHV-2	800	32	1800	72	300	12	500	20



INSTALLATION

The installation of a **HYDROVEX®** regulator may be undertaken once the manhole and piping is in place. Installation consists of simply fitting the regulator into the outlet pipe of the manhole. **John Meunier Inc.** recommends the use of a lubricant on the outlet pipe, in order to facilitate the insertion and orientation of the flow controller.

MAINTENANCE

HYDROVEX® regulators are manufactured in such a way as to be maintenance free; however, a periodic inspection (every 3-6 months) is suggested in order to ensure that neither the inlet nor the outlet has become blocked with debris. The manhole should undergo periodically, particularly after major storms, inspection and cleaning as established by the municipality

GUARANTY

The **HYDROVEX®** line of **VHV / SVHV** regulators are guaranteed against both design and manufacturing defects for a period of 5 years. Should a unit be defective, **John Meunier Inc.** is solely responsible for either modification or replacement of the unit.

John Meunier Inc.
ISO 9001 : 2008

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Revised: 2011-05-03

APPENDIX E

Civil Engineering Drawings

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BARRHAVEN, ON

REVISION 01

KEY PLAN (N.T.S.)

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CONSTRUCTION DETAIL PLAN	C902

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REV.01 - ISSUED FOR APPROVAL - APRIL 22th 2022
LRL PROJECT no: 210691

LICENSED PROFESSIONAL ENGINEER
M. BASNET
100501996
2022/04/22
PROVINCE OF ONTARIO

NOT AUTHENTIC UNLESS SIGNED AND DATED

GENERAL NOTES

1. ALL WORKS MATERIALS SHALL CONFIRM TO THE LAST REVISION OF THE STANDARDS AND SPECIFICATIONS FOR THE CITY OF OTTAWA, ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD) AND SPECIFICATIONS (OPSS), WHERE APPLICABLE. LOCAL UTILITY STANDARDS AND MINISTRY OF TRANSPORTATION STANDARDS WILL APPLY WHERE REQUIRED.
2. THE CONTRACTORS SHALL CONFIRM THE LOCATION OF ALL EXISTING UTILITIES WITHIN THE SITE AND ADJACENT WORK AREAS. THE CONTRACTORS SHALL BE RESPONSIBLE FOR PROTECTING ALL EXISTING UTILITIES TO THE SATISFACTION OF THE AUTHORITY HAVING JURISDICTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REPAIR OR REPLACEMENT OF ANY SERVICES OR UTILITIES DISTURBED DURING CONSTRUCTION , TO THE SATISFACTION OF THE AUTHORITY HAVING JURISDICTION.
3. ALL DIMENSIONS SHALL BE CHECKED AND VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO THE START OF CONSTRUCTION, ANY DISCREPANCIES SHALL BE REPORTED IMMEDIATELY TO THE ENGINEER. LOST TIME DUE TO FAILURE OF THE CONTRACTORS TO CONFIRM UTILITY LOCATIONS AND NOTIFY ENGINEER OF POSSIBLE CONFLICTS PRIOR TO CONSTRUCTION WILL BE AT CONTRACTORS EXPENSE.
4. ANY AREA BEYOND THE LIMIT OF THE SITE DISTURBED DURING CONSTRUCTION SHALL BE RESTORED TO ORIGINAL CONDITION OR BETTER TO THE SATISFACTION OF THE AUTHORITY HAVING JURISDICTION AT THE CONTRACTOR'S EXPENSE.
   RELOCATING OF EXISTING SERVICES AND/OR UTILITIES SHALL BE AS SHOWN ON THE DRAWINGS OR DETECTED BY THE ENGINEER AT THE EXPENSE OF DEVELOPERS.
5. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH THE 'OCCUPATIONAL HEALTH AND SAFETY ACT AND REGULATIONS FOR CONSTRUCTION PROJECTS'. THE GENERAL CONTRACTORS SHALL BE DEEMED TO BE THE 'CONTRACTOR' AS DEFINED IN THE ACT.
6. ALL THE CONSTRUCTION SIGNAGE MUST CONFIRM TO THE MINISTRY OF TRANSPORTATION OF ONTARIO MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES PER LATEST AMENDMENT.
7. THE CONTRACTOR IS ADVISED THAT WORKS BY OTHERS MAY BE ONGOING DURING THE PERIOD OF THE CONTRACT. THE CONTRACTOR SHALL COORDINATE CONSTRUCTION ACTIVITIES TO PREVENT CONFLICTS.
8. ALL DIMENSIONS ARE IN METRES UNLESS SPECIFIED OTHERWISE.
9. THERE WILL BE NO SUBSTITUTION OF MATERIALS UNLESS PRIOR WRITTEN APPROVAL IS RECEIVED FROM THE ENGINEER.
10. ALL CONSTRUCTION SHALL BE CARRIED OUT IN ACCORDANCE WITH THE RECOMMENDATIONS MADE IN THE GEOTECHNICAL REPORT.
11. FOR DETAILS RELATING TO STORMWATER MANAGEMENT AND ROOF DRAINAGE REFER TO THE SITE SERVICING AND STORMWATER MANAGEMENT REPORT.
12. ALL SEWERS CONSTRUCTED WITH GRADES LESS THAN 1.0% SHALL BE INSTALLED USING LASER ALIGNMENT AND CHECKED WITH LEVEL INSTRUMENT PRIOR TO BACKFILLING.
13. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL PERMITS REQUIRED AND TO BEAR THE COST OF THE SAME.
14. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ADDITIONAL BEDDING, OR ADDITIONAL STRENGTH PIPE IF THE MAXIMUM TRENCH WIDTH AS SPECIFIED BY OPSD IS EXCEEDED.
15. ALL PIPE/CULVERT SECTION SIZES REFER TO INSIDE DIMENSIONS.
16. SHOULD DEEPLY BURIED ARCHAEOLOGICAL REMAINS BE FOUND ON THE PROPERTY DURING CONSTRUCTION ACTIVITIES, THE HERITAGE OPERATIONS UNIT OF THE ONTARIO MINISTRY OF CULTURE MUST BE NOTIFIED IMMEDIATELY.
17. ALL NECESSARY CLEARING AND GRUBBING SHALL BE COMPLETED BY THE CONTRACTOR. REVIEW WITH CONTRACT ADMINISTRATOR AND THE CITY OF OTTAWA PRIOR TO ANY TREE CUTTING/REMOVAL.
18. DRAWINGS SHALL BE READ ON CONJUNCTION WITH ARCHITECTURAL SITE PLAN.
19. THE CONTRACTOR SHALL PROVIDE THE PROJECT ENGINEER ON SET OF AS CONSTRUCTED SITE SERVICING AND GRADING DRAWINGS.
20. BENCHMARKS: IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THAT THE SITE BENCHMARK(S) HAS NOT BEEN ALTERED OR DISTURBED AND THAT ITS RELATIVE ELEVATION AND DESCRIPTION AGREES WITH THE INFORMATION DEPICTED ON THIS PLAN.

EROSION AND SEDIMENT CONTROL NOTES

GENERAL

THE CONTRACTOR SHALL IMPLEMENT BEST MANAGEMENT PRACTICES, TO PROVIDE FOR PROTECTION OF THE AREA DRAINAGE SYSTEM AND THE RECEIVING WATERCOURSE, DURING CONSTRUCTION ACTIVITIES. THE CONTRACTOR ACKNOWLEDGES THAT FAILURE TO IMPLEMENT APPROPRIATE EROSION AND SEDIMENT CONTROL MEASURES MAY BE SUBJECT TO PENALTIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY.

THE CONTRACTOR ACKNOWLEDGES THAT SURFACE EROSION AND SEDIMENT RUNOFF RESULTING FROM THEIR CONSTRUCTION OPERATIONS HAS POTENTIAL TO CAUSE A DETRIMENTAL IMPACT TO ANY DOWNSTREAM WATERCOURSE OR SEWER, AND THAT ALL CONSTRUCTION OPERATIONS THAT MAY IMPACT UPON WATER QUALITY SHALL BE CARRIED OUT IN MANNER THAT STRICTLY MEETS THE REQUIREMENT OF ALL APPLICABLE LEGISLATION AND REGULATIONS.

AS SUCH, THE CONTRACTOR SHALL BE RESPONSIBLE FOR CARRYING OUT THEIR OPERATIONS, AND SUPPLYING AND INSTALLING ANY APPROPRIATE CONTROL MEASURES, SO AS TO PREVENT SEDIMENT LADEN RUNOFF ENTERING ANY SEWER OR WATERCOURSE WITHIN OR DOWNSTREAM OF THE WORKING AREA.

THE CONTRACTOR ACKNOWLEDGES THAT NO ONE MEASURE IS LIKELY TO BE 100% EFFECTIVELY FOR EROSION PROTECTION AND CONTROLLING SEDIMENT RUNOFF AND DISCHARGES FROM THE SITE. THEREFORE, WHERE NECESSARY THE CONTRACTOR SHALL IMPLEMENT ADDITIONAL MEASURES ARRANGED IN SUCH MANNER AS TO MITIGATE SEDIMENT RELEASE FROM THE CONSTRUCTION OPERATIONS AND ACHIEVE SPECIFIC MAXIMUM PERMITTED CRITERIA WHERE APPLICABLE. SUGGESTED ON-SITE MEASURES MAY INCLUDE, BUT SHALL NOT BE LIMITED TO, THE FOLLOWING METHODS: SEDIMENT PONDS, FILTER BAGS, PUMP FILTERS, SETTLING TANKS, SILT FENCE, STRAW BALES, FILTER CLOTHS, CATCH BASIN FILTERS, CHECK DAMS AND/OR OTHER RECOGNIZED TECHNOLOGIES AND METHOD AVAILABLE AT THE TIME OF CONSTRUCTION. SPECIFIC MEASURES SHALL BE INSTALLED IN ACCORDANCE WITH REQUIREMENTS OF OPSS 577 WHERE APPROPRIATE, OR IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.

WHERE, IN THE OPINION OF THE CONTRACT ADMINISTRATOR OR REGULATORY AGENCY, THE INSTALLED CONTROL MEASURES FAIL TO PERFORM ADEQUATELY, THE CONTRACTOR SHALL SUPPLY AND INSTALL ADDITIONAL OR ALTERNATIVE MEASURES AS DIRECTED BY THE CONTRACT ADMINISTRATOR OR REGULATORY AGENCY, AS SUCH, THE CONTRACTOR SHALL HAVE ADDITIONAL CONTROL MATERIALS ON SITE AT ALL TIME WHICH ARE EASILY ACCESSIBLE AND MAY BE IMPLEMENTED BY HIM AT THE MOMENT'S NOTICE.

PRIOR TO COMMENCING WORK, THE CONTRACTOR SHALL SUBMIT TO THE CONTRACT ADMINISTRATOR SIX COPIES OF A DETAILED EROSION AND SEDIMENT CONTROL PLAN (ESCP). THE ESCP WILL CONSIST OF WRITTEN DESCRIPTION AND DETAILED DRAWINGS INDICATING THE ON-SITE ACTIVITIES AND MEASURES TO BE USED TO CONTROL EROSION AND SEDIMENT MOVEMENT FOR EACH STEP OF THE WORK.

CONTRACTOR'S RESPONSIBILITIES

THE CONTRACTOR SHALL ENSURE THAT ALL WORKERS, INCLUDING SUB-CONTRACTOR, IN THE WORKING ARE ARE AWARE OF THE IMPORTANCE OF THE EROSION AND SEDIMENT CONTROL MEASURES AND INFORMED OF THE CONSEQUENCES OF THE FAILURE TO COMPLY WITH THE REQUIREMENTS OF ALL REGULATORY AGENCIES.

THE CONTRACTOR SHALL PERIODICALLY, AND WHEN REQUESTED BY THE CONTRACT ADMINISTRATOR, CLEAN OUT ACCUMULATED SEDIMENT DEPOSITS AS REQUIRED AT THE SEDIMENT CONTROL DEVICES, INCLUDING THOSE DEPOSITS THAT MAY ORIGINATE FROM OUTSIDE THE CONSTRUCTION AREA. ACCUMULATED SEDIMENT SHALL BE REMOVED IN SUCH A MANNER THAT PREVENTS THE DEPOSITION OF THIS MATERIAL INTO THE SEWER WATERCOURSE AND AVOIDS DAMAGE TO CONTROL MEASURES. THE SEDIMENT SHALL BE REMOVED FROM THE SITE AT THE CONTRACTOR'S EXPENSE AND MANAGED IN COMPLIANCE WITH REQUIREMENTS FRO EXCESS EARTH MATERIAL, AS SPECIFIED ELSEWHERE IN THE CONTRACT.

THE CONTRACTOR SHALL IMMEDIATELY REPORT TO THE CONTRACT ADMINISTRATOR ANY ACCIDENTAL DISCHARGES OF SEDIMENT MATERIAL INTO EITHER THE WATERCOURSE OR THE STORM SEWER SYSTEM. FAILURE TO REPORT WILL BE CONSTITUTE A BRACH OF THIS SPECIFICATION AND THE CONTRACTOR MAY ALSO BE SUBJECT TO THE PENALTIES IMPOSED BY THE APPLICABLE REGULATORY AGENCY. APPROPRIATE RESPONSE MEASURES, INCLUDING ANY REPAIRS TO EXISTING CONTROL MEASURES OR THE IMPLEMENTATION OF ADDITIONAL CONTROL MEASURES, SHALL BE CARRIED OUT BY THE CONTRACTOR WITHOUT DELAY.

THE SEDIMENT CONTROL MEASURES SHALL ONLY BE REMOVED WHEN, IN THE OPINION OF THE CONTRACT ADMINISTRATOR, THE MEASURE OR MEASURES, IS NO LONGER REQUIRED. NO CONTROL MEASURE MAY BE PERMANENTLY REMOVED WITHOUT PRIOR AUTHORIZATION FROM THE CONTRACT ADMINISTRATOR. ALL SEDIMENT AND EROSION CONTROL MEASURES SHALL BE REMOVED IN A MANNER THAT AVOIDS THE ENTRY OF ANY EQUIPMENT, OTHER THAN HAND-HELD EQUIPMENT, INTO ANY WATERCOURSE, AND PREVENTS THE RELEASE OF ANY SEDIMENT OR DEBRIS INTO ANY SEWER OR WATERCOURSE WITHIN OR DOWNSTREAM OF THE WORKING AREA. ALL ACCUMULATED SEDIMENT SHALL BE REMOVED FROM THE WORKING AREA AT THE CONTRACTOR'S EXPENSE AND MANAGED IN COMPLIANCE WITH THE REQUIREMENTS FOR EXCESS EARTH MATERIAL

WHERE, IN THE OPINION OF EITHER THE CONTRACT ADMINISTRATOR OR A REGULATORY AGENCY, ANY OF THE TERMS SPECIFIED HEREIN HAVE NOT BEEN COMPLIED WITH OR PERFORMED IN A SUITABLE MANNER, OR TAT ALL, THE CONTRACTOR ADMINISTRATOR OR A REGULATORY AGENCY HAS THE RIGHT TO IMMEDIATELY WITHDRAW ITS PERMISSION TO CONTINUE THE WORK BUT MAY RENEW ITS PERMISSION UPON BEING SATISFIED THAT THE DEFAULTS OR DEFICIENCIES IN THE PERFORMANCE OF THIS SPECIFICATION BY THE CONTRACTOR HAVE BEEN REMEDIED.

SPILL CONTROL NOTES

1. ALL CONSTRUCTION EQUIPMENT SHALL BE RE-FUELED, MAINTAINED, AND STORED NO LESS THAN 30 METRES FROM WATERCOURSE, STEAMS, CREEKS, WOODLOTS, AND ANY ENVIRONMENTALLY SENSITIVE AREAS, OR AS OTHERWISE SPECIFIED.
2. THE CONTRACTOR MUST IMPLEMENT ALL NECESSARY MEASURES IN ORDER TO PREVENT LEAKS, DISCHARGES OR SPILLS OF POLLUTANTS, DELETERIOUS MATERIALS, OR OTHER SUCH MATERIALS OR SUBSTANCES WHICH WOULD OR COULD CAUSE AN ADVERSE IMPACT TO THE NATURAL ENVIRONMENT.
3. IN THE EVENT OF A LEAK, DISCHARGE OR SPILL OF POLLUTANT, DELETERIOUS MATERIAL OR OTHER SUCH MATERIAL OR SUBSTANCE WHICH WOULD OR COULD CAUSE AN ADVERSE IMPACT TO THE NATURAL ENVIRONMENT, THE CONTRACTOR SHALL:
   - 3.1. IMMEDIATELY NOTIFY APPROPRIATE FEDERAL, PROVINCIAL, AND LOCAL GOVERNMENT MINISTRIES, DEPARTMENTS, AGENCIES, AND AUTHORITIES OF THE INCIDENT IN ACCORDANCE WITH ALL CURRENT LAWS, LEGISLATION, ACTS, BY-LAWS, PERMITS, APPROVALS, ETC.
   - 3.2. TAKE IMMEDIATE MEASURES TO CONTAIN THE MATERIAL OR SUBSTANCE, AND TO TAKE SUCH MEASURES TO MITIGATE AGAINST ADVERSE IMPACTS TO THE NATURAL ENVIRONMENT.
   - 3.3. RESTORE THE AFFECTED AREA TO THE ORIGINAL CONDITION OR BETTER TO THE SATISFACTION OF THE AUTHORITIES HAVING JURISDICTION.

MUD MAT NOTES

1. THE GRANULAR MATERIAL WILL REQUIRE PERIODIC REPLACEMENT AS IT BECOMES CONTAMINATED BY VEHICLE TRAFFIC.
2. SEDIMENT SHALL BE CLEANED FROM PUBLIC ROADS AT THE END OF EACH DAY.
3. SEDIMENT SHALL BE REMOVED FROM PUBLIC ROADS BY SHOVELING OR SWEEPING AND DISPOSED OR PROPERLY IN A CONTROLLED SEDIMENT DISPOSAL AREA.

SITE GRADING NOTES

1. PRIOR TO THE COMMENCEMENT OF THE SITE GRADING WORKS, ALL SILTATION CONTROL DEVICES SHALL BE INSTALLED AND OPERATIONAL PER EROSION CONTROL PLAN.
2. ALL GRANULAR AND PAVEMENT FOR ROADS/PARKING AREAS SHALL BE CONSTRUCTED IN ACCORDANCE WITH GEOTECHNICAL ENGINEER'S RECOMMENDATIONS.
3. ALL TOPSOIL AND ORGANIC MATERIAL SHALL BE STRIPPED WITHIN THE ROAD AND PARKING AREAS ALLOWANCE PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.
4. CONCRETE CURB SHALL BE IN ACCORDANCE WITH THE CITY OF OTTAWA STD. SC1.1 PROVISION SHALL BE MADE OR CURB DEPRESSIONS AS INDICATED ON ARCHITECTURAL SITE PLAN. CONCRETE SIDEWALK SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STD SC1.4. ALL CURBS, CONCRETE ISLANDS, AND SIDEWALKS SHOWN O THIS DRAWING ARE TO BR PRICED IN SITE WORKS PORTION OF THE CONTRACT.
5. PAVEMENT REINSTATEMENT FOR SERVICE AND UTILITY CUTS SHALL BE IN ACCORDANCE WITH THE CITY OF OTTAWA STD. R10 AND OPSD 509.010 AND OPSS 310.
6. GRANULAR 'A' SHALL BE PLACED TO A MINIMUM THICKNESS OF 30MM AROUND ALL STRUCTURES WITHIN THE PAVEMENT AREA.
7. SUB-EXCAVATE SOFT AREAS AND FILL WITH GRANULAR 'B' COMPACTED IN MAXIMUM 30MM LIFTS.
8. ALL WORK ON THE MUNICIPAL RIGHT OF WAY AND EASEMENTS TO BE INSPECTED BY THE MUNICIPALITY PRIOR BACKFILLING.
9. CONTRACTOR TO OBTAIN A ROAD OCCUPANCY PERMIT 48 HOURS PRIOR TO COMMENCING ANY WORK WITHIN THE MUNICIPAL ROAD ALLOWANCE, IF REQUIRED BY THE MUNICIPALITY.
10. ALL PAVEMENT MARKING FEATURES AND SITE SIGNAGE SHALL BE PLACED PER ARCHITECTURAL SITE PLAN. LINE PAINTING AND DIRECTIONAL SYMBOLS SHALL BE APPLIED WITH A MINIMUM OF TWO COATS OF ORGANIC SOLVENT PAINT.
11. REFER TO ARCHITECTURAL SITE PLAN FOR DIMENSIONS AND SITE DETAILS.
12. STEP JOINTS ARE TO BE USED WHERE PROPOSED ASPHALT MEETS EXISTING ASPHALT. ALL JOINTS MUST BE SEALED.
13. SIDEWALKS TO BE 13MM & BEVELED AT 2:1 OR 6MM WITH NO BEVEL REQUIRED BELOW THE FINISHED FLOOR SLAB ELEVATION AT ENTRANCES REQUIRED TO BE BARRIER-FREE, UNLESS OTHERWISE NOTED. ALL IN ACCORDANCE WITH OBC 3.8.1.3 & OTTAWA ACCESSIBILITY DESIGN STANDARDS.
14. WHERE APPLICABLE THE CONTRACTOR IS TO SUBMIT SHOP DRAWINGS TO THE ENGINEER FOR APPROVAL PRIOR TO CONSTRUCTION. SHOP DRAWINGS MUST BE SITE SPECIFIC, SIGNED AND SEALED BY A LICENSED STRUCTURAL ENGINEER. THE CONTRACTOR WILL ALSO BE REQUIRED TO SUPPLY AND GEOTECHNICAL CERTIFICATION OF THE AS-CONSTRUCTED RETAINING WALL TO THE ENGINEER PRIOR TO FINAL ACCEPTANCE.

ROADWORK SPECIFICATIONS

15. ROADWORK TO BE COMPLETED IN ACCORDANCE WITH GEOTECHNICAL REPORT, PREPARED BY LRL ASSOCIATES. DATED NOVEMBER 2020.
16. AL TOPSOIL AND ORGANIC MATERIAL SHALL BE STRIPPED WITHIN THE ROAD ALLOWANCE PRIOR TO THE COMMENCEMENT OF CONSTRUCTION AND STOCK PILLED ON SITE AS DIRECTED BY NATIONAL MUNICIPALITY.
17. THE SUBGRADE SHALL BE CROWNED AND SLOPED AT LEAST 2% AND PROOF ROLLED WITH HEAVY ROLLERS.
18. SUB-EXCAVATE SOFT AREAS AND FILL WITH GRANULAR 'A', TYPE II COMPACTED IN MAXIMUM 300MM LIFTS.
19. ALL GRANULAR FOR ROADS SHALL BE COMPACTED TO MINIMUM OF 100% STANDARD PROCTOR DENSITY MAXIMUM DRY DENSITY (SPMDD).

SANITARY, FOUNDATION DRAIN, STORM SEWER AND WATERMAIN NOTES

GENERAL

1. LASER ALIGNMENT CONTROL TO BE UTILIZED ON ALL SEWER INSTALLATIONS.
2. CLAY SEALS TO BE INSTALLED AS PER CITY STANDARD DRAWING S8. THE SEALS SHOULD BE AT LEAST 1.5M LONG (IN THE TRENCH DIRECTION) AND SHOULD EXTEND FROM TRENCH WALL TO TRENCH WALL. THE SEALS SHOULD EXTEND FROM THE FROST LINE AND FULLY PENETRATE THE BEDDING, SUB-BEDDING, AND COVER MATERIAL. THE BARRIERS SHOULD CONSIST OF RELATIVELY DRY AND COMPATIBLE BROWN SILTY CLAY PLACED IN MAXIMUM 225MM LIFTS AND COMPACTED TO A MINIMUM OF 95% SPMDD. THE CLAY SEALS SHOULD BE PLACED AT THE SITE BOUNDARIES AND AT 60M INTERVALS IN THE SERVICE TRENCHES.
3. SERVICES TO BUILDING TO BE TERMINATED 1.0M FROM THE OUTSIDE FACE OF BUILDING UNLESS OTHERWISE NOTED.
4. ALL MAINTENANCE STRUCTURE AND CATCH BASIN EXCAVATIONS TO BE BACKFILLED WITH GRANULAR MATERIAL COMPACTED TO 98% STANDARD PROCTOR DENSITY. A MINIMUM OF 300MM AROUND STRUCTURES.
5. "MODULOC" OR APPROVED PRE-CAST MAINTENANCE STRUCTURE AND CATCH BASIN ADJUSTERS TO BE USED IN LIEU OF BRICKING. PARGE ADJUSTING UNITS ON THE OUTSIDE ONLY.
6. SAFETY PLATFORMS SHALL BE PER OPSD 404.02.
7. DROP STRUCTURES SHALL BE IN ACCORDANCE WITH OPSD 1003.01, IF APPLICABLE.
8. THE CONTRACTOR IS TO PROVIDE CCTV CAMERA INSPECTIONS OF ALL SEWERS, INCLUDING PICTORIAL REPORT, ONE (1) CD COPY AND TWO (2) VIDEO RECORDING IN A FORMAT ACCEPTABLE TO ENGINEER. ALL SEWER ARE TO BE FLUSHED PRIOR TO CAMERA INSPECTION. ASPHALT WEAR COURSE SHALL NOT BE PLACED UNTIL THE VIDEO INSPECTION OF SEWERS AND NECESSARY REPAIRS HAVE BEEN COMPLETED TO THE SATISFACTION OF THE ENGINEER.
9. CONTRACTOR SHALL PERFORM LEAKAGE TESTING, IN THE PRESENCE OF THE CONSULTANT, FOR SANITARY SEWERS IN ACCORDANCE WITH OPSS 407. CONTRACTOR SHALL PERFORM VIDEO INSPECTION OF ALL SEWERS. A COPY OF THE VIDEO AND INSPECTION REPORT SHALL BE SUBMITTED TO THE CONSULTANT FOR REVIEW AND APPROVAL PRIOR TO PLACEMENT OF WEAR COURSE ASPHALT.

SANITARY

10. ALL SANITARY SEWER INSTALLATION SHALL CONFORM TO THE LATEST REVISIONS OF THE CITY OF OTTAWA AND THE ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD). AND SPECIFICATIONS (OPSS).
11. ALL SANITARY GRAVITY SEWER SHALL BE PVC SDR 35, IPEX 'RING-TITE' (OR APPROVED EQUIVALENT) PER CSA STANDARD B182.2 OR LATEST AMENDMENT, UNLESS SPECIFIED OTHERWISE.
12. EXISTING MAINTENANCE STRUCTURES TO BE RE-BENCHED WHERE A NEW CONNECTION IS MADE.
13. SANITARY GRAVITY SEWER TRENCH AND BEDDING SHALL BE PER CITY OF OTTAWA STD. S6 AND S7 CLASS 'B' BEDDING, UNLESS SPECIFIED OTHERWISE.
14. SANITARY MAINTENANCE STRUCTURE FRAME AND COVERS SHALL BE PER CITY OF OTTAWA STD. S24 AND S25.
15. SANITARY MAINTENANCE STRUCTURES SHALL BE BENCHED PER OPSD 701.021.
16. 100MM THICK HIGH-DENSITY GRADE 'A' POLYSTYRENE INSULATION TO BE INSTALLED IN ACCORDANCE WITH CITY STD W22 WHERE INDICATED ON DRAWING SSP-1.

STORM

17. ALL REINFORCED CONCRETE STORM SEWER PIPE SHALL BE IN ACCORDANCE WITH CSA A257.2, OR LATEST AMENDMENT. ALL NON-REINFORCED CONCRETE STORM SEWER PIPE SHALL BE IN ACCORDANCE WITH CSA A257.1, OR LATEST AMENDMENT. PIPE SHALL BE JOINED WITH STD. RUBBER GASKETS AS PER CSA A257.3, OR LATEST AMENDMENT.
18. ALL STORM SEWER TRENCH AND BEDDING SHALL BE IN ACCORDANCE WITH THE CITY OF OTTAWA STD. S6 AND S7 CLASS 'B' UNLESS OTHERWISE SPECIFIED. BEDDING AND COVER MATERIAL SHALL BE SPECIFIED BY PROJECT GEOTECHNICAL ENGINEER.
19. ALL PVC STORM SEWERS ARE TO BE SDR 35 APPROVED PER C.S.A. B182.2 OR LATEST AMENDMENT, UNLESS OTHERWISE SPECIFIED.
20. CATCH BASIN SHALL BE IN ACCORDANCE WITH OPSD 705.010.
21. CATCH BASIN LEADS SHALL BE IN 200MM DIA. AT 1% SLOPE (MIN) UNLESS SPECIFIED OTHERWISE.
22. ALL CATCH BASINS SHALL HAVE 600MM SUMPS, UNLESS SPECIFIED OTHERWISE.
23. ALL CATCH BASIN LEAD INVERTS TO BE 1.5M BELOW FINISHED GRADE UNLESS SPECIFIED OTHERWISE.
24. THE STORM SEWER CLASSES HAVE BEEN DESIGNED BASED ON BEDDING CONDITIONS SPECIFIED ABOVE. WHERE THE SPECIFIED TRENCH WIDTH IS EXCEEDED , THE CONTRACTOR IS REQUIRED TO PROVIDE AND SHALL BE RESPONSIBLE FOR EXTRA TEMPORARY AND/OR PERMANENT REPAIRS MADE NECESSARY BY THE WIDENED TRENCH.
25. ALL ROAD AND PARKING LOT CATCH BASINS TO BE INSTALLED WITH ORTHOGONALLY PLACED SUBDRAINS IN ACCORDANCE WITH DETAIL. PERFORATED SUBDRAIN FOR ROAD AND PARKING LOT CATCH BASIN SHALL BE INSTALLED PER CITY STD R1 UNLESS OTHERWISE NOTED.
26. PERFORATED SUBDRAIN FOR REAR YARD AND LANDSCAPING APPLICATIONS SHALL BE INSTALLED PER CITY STD S29, S30 AND S31, WHERE APPLICABLE.
27. RIP-RAP TREATMENT SEWER AND CULVERT OUTLETS PER OPSD 810.010.
28. ALL STORM SEWER/ CULVERTS TO BE INSTALLED WITH FROST TREATMENT PER OPSD 803.031 WHERE APPLICABLE.
29. ALL STORM MANHOLES WITH PIPE LESS THAN 900MM IN DIAMETER SHALL BE CONSTRUCTED WITH A 300MM SUMP AS PER SDG, CLAUSE 6.2.6.

WATERMAIN

30. ALL WATERMAIN INSTALLATION SHALL CONFORM TO THE LATEST REVISIONS OF THE CITY OF OTTAWA AND THE ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD) AND SPECIFICATIONS (OPSS).
31. ALL PVC WATERMAINS SHALL BE AWWA C-900 CLASS 150, SDR 18 OR APPROVED EQUIVALENT.
32. ALL WATER SERVICES LESS THAN OR EQUAL TO 50MM IN DIAMETER TO BE TYPE 'K' COPPER.
33. WATERMAIN TRENCH AND BEDDING SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STANDARD W17. UNLESS SPECIFIED OTHERWISE. BEDDING AND COVER MATERIAL SHALL BE SPECIFIED BY THE PROJECT GEOTECHNICAL ENGINEER.
34. ALL PVC WATERMAINS, SHALL BE INSTALLED WITH A 10 GAUGE STRANDED COPPER TWU OR RWU TRACER WIRE IN ACCORDANCE WITH CITY OF OTTAWA STD. W.36.
35. CATHODIC PROTECTION IS REQUIRED ON ALL METALLIC FITTINGS PER CITY OF OTTAWA STD.25.5 AND W25.6.
36. VALVE BOXES SHALL BE INSTALLED PER CITY OF OTTAWA STD W24.
37. WATERMAIN IN FILL AREAS TO BE INSTALLED WITH RESTRAINED JOINTS PER CITY OF OTTAWA STD.25.5 AND W25.6.
38. THRUST BLOCKING OF WATERMAINS TO BE INSTALLED PER CITY OF OTTAWA STD. W25.3 AND W25.4.
39. THE CONTRACTOR SHALL PROVIDE ALL TEMPORARY CAPS, PLUGS, BLOW-OFFS, AND NOZZLES REQUIRED FOR TESTING AND DISINFECTION OF THE WATERMAIN.
40. WATERMAIN CROSSING OVER AND BELOW SEWERS SHALL BE IN ACCORDANCE WITH THE CITY OF OTTAWA STD. W25,2 AND W25, RESPECTIVELY.
41. WATER SERVICES ARE TO BE INSULATED PER CITY STD. W23 WHERE SEPARATION BETWEEN SERVICES AND MAINTENANCE HOLES ARE LESS THAN 2.4M.
42. THE MINIMUM VERTICAL CLEARANCE BETWEEN WATERMAIN AND SEWER/UTILITY IS 0.5M PER MOE GUIDELINES. FOR CROSSING UNDER SEWERS, ADEQUATE STRUCTURAL SUPPORT FOR THE SEWER IS REQUIRED TO PREVENT EXCESSIVE DEFLECTION OF JOINTS AND SETTLING. THE LENGTH OF WATER PIPE SHALL BE CENTERED AT THE POINT OF CROSSING TO ENSURE THAT THE JOINTS WILL BE EQUIDISTANT AND AS FAR AS POSSIBLE FROM THE SEWER.
43. ALL WATERMAINS SHALL HAVE A MINIMUM COVER OR 2.4M, OTHERWISE THERMAL INSULATION IS REQUIRED AS PER STD DWG W22.
44. GENERAL WATER PLANT TO UTILITY CLEARANCE AS PER STD DWG R20.
45. FIRE HYDRANT INSTALLATION AS PER STD DWG W19, ALL BOTTOM OF HYDRANT FLANGE ELEVATIONS TO BE INSTALLED 0.10M ABOVE PROPOSED FINISHED GRADE AT HYDRANT; FIRE HYDRANT LOCATION AS PER STD DWG W18.
46. BUILDING SERVICE TO BE CAPPED 1.0M OFF THE FACE OF THE BUILDING UNLESS OTHERWISE NOTED AND MUST BE RESTRAINED A MINIMUM OF 12M BACK FROM STUB.
47. ALL WATERMAINS SHALL BE HYDROSTATICALLY TESTED IN ACCORDANCE WITH THE CITY OF OTTAWA AND ONTARIO GUIDELINES UNLESS OTHERWISE DIRECTED. PROVISIONS FOR FLUSHING WATER LINE PRIOR TO TESTING, ETC. MUST BE PROVIDED.
48. ALL WATERMAINS SHALL BE BACTERIOLOGICALLY TESTED IN ACCORDANCE WITH THE CITY OF OTTAWA AND ONTARIO GUIDELINES. ALL CHLORINATED WATER TO BE DISCHARGED AND PRETREATED TO ACCEPTABLE LEVELS PRIOR TO DISCHARGE. ALL DISCHARGED WATER MUST BE CONTROLLED AND TREATED SO AS NOT TO ADVERSELY EFFECT ENVIRONMENT. IT IS RESPONSIBILITY OF THE CONTRACTOR TO ENSURE THAT ALL MUNICIPAL AND/OR PROVINCIAL REQUIREMENTS ARE FOLLOWED.
49. ALL WATERMAIN STUBS SHALL BE TERMINATED WITH A PLUG AND 50MM BLOW OFF UNLESS OTHERWISE NOTED.

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NOT FOR CONSTRUCTION TENDER OR PERMIT

No.	REVISIONS	BY	DATE
01	ISSUED FOR APPROVAL	M.L.	22 APR 2022

NOT AUTHENTIC UNLESS SIGNED AND DATED

LRL
ENGINEERING | INGÉNIERIE
5430 Canotek Road | Ottawa, ON, K1J 9G2
www.lrl.ca | (613) 842-3434

CLIENT
HALO CAR WASH INC.

DESIGNED BY:	DRAWN BY:	APPROVED BY:
M.L. / P.P.	M.L.	M.B.

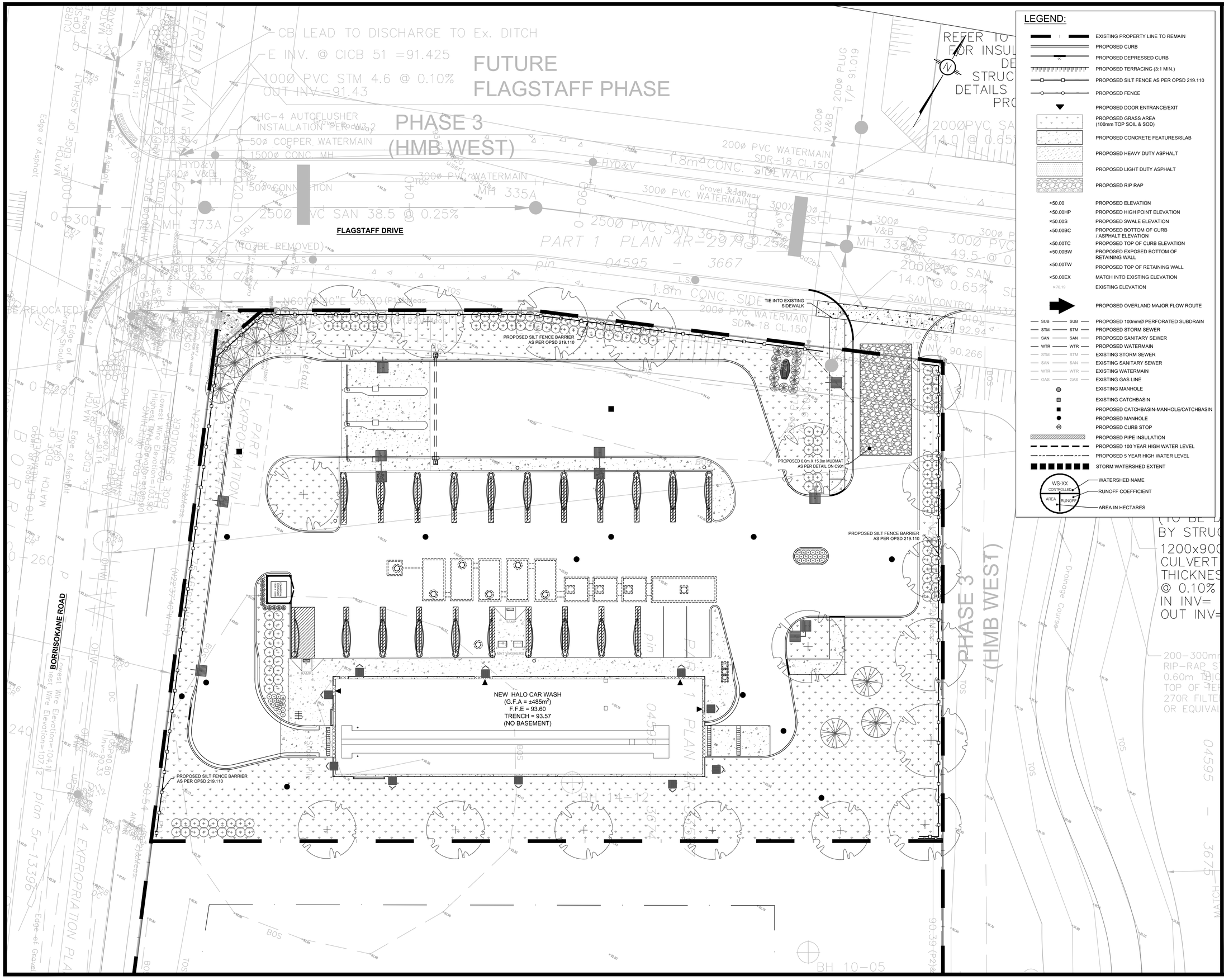
PROJECT
HALO CAR WASH
3535 BORRISOKANE RD
BARRHAVEN, ON

DRAWING TITLE
GENERAL NOTES

PROJECT NO.
210691

DATE
JANUARY 2022

C001



LEGEND:

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- PROPOSED TERRACING (3:1 MIN.)
- PROPOSED SILT FENCE AS PER OPSD 219.110
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5m 2 0 5m

SCALE: 1:200

NOT FOR CONSTRUCTION TENDER OR PERMIT

No.	REVISIONS	BY	DATE
01	ISSUED FOR APPROVAL	M.L.	22 APR 2022

LICENSED PROFESSIONAL ENGINEER
M. BASNET
100501996
2022/04/22
PROVINCE OF ONTARIO

NOT AUTHENTIC UNLESS SIGNED AND DATED

LRL
ENGINEERING | INGÉNIERIE
5430 Canotek Road I Ottawa, ON, K1J 9G2
www.lrl.ca I (613) 842-3434

CLIENT
HALO CAR WASH INC.

DESIGNED BY:	DRAWN BY:	APPROVED BY:
M.L. / P.P.	M.L.	M.B.

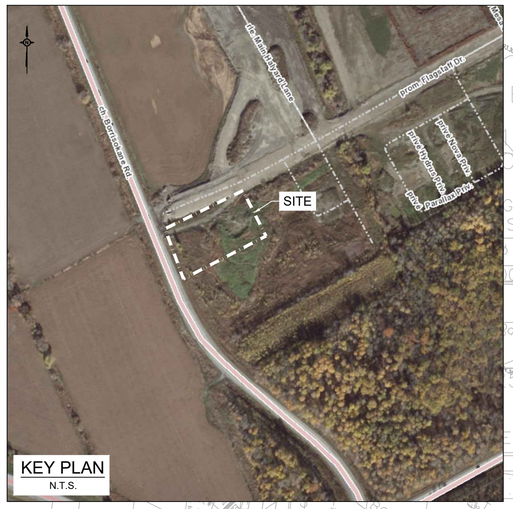
PROJECT
HALO CAR WASH
3535 BORRISOKANE RD
BARRHAVEN, ON

DRAWING TITLE
EROSION AND SEDIMENT CONTROL PLAN

PROJECT NO.
210691

DATE
JANUARY 2022

C101



KEY PLAN
N.T.S.

DETAILS OF DEVELOPMENT			
DATA		REQUIRED	PROVIDED
	ZONING	IL - LIGHT INDUSTRIAL	
SETBACKS	FY	7.5m	18.9m
	RY	7.5m	27.8m
	INT.SY	7.5m	7.5m
	EXT.SY	7.5m	39.9m
NET LOT AREA (sqm)		5342 sqm	
BUILDING COVERAGE		65 % (MAX)	8.9 %
BUILDING HEIGHT		18 m (MAX)	8.0 m
GROSS FLOOR AREA		473 sqm	
No. of UNITS		1	
LOADING SPACES		N/A	N/A
PARKING:		N/A	20 + 1 HC
No. OF STOREYS			1
OTHER:			

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5m 2 0 5m
SCALE: 1:200

NOT FOR CONSTRUCTION TENDER OR PERMIT

No.	REVISIONS	BY	DATE
01	ISSUED FOR APPROVAL	M.L.	22 APR 2022

LICENSED PROFESSIONAL ENGINEER
M. BASNET
100501996
2022/04/22
PROVINCE OF ONTARIO

NOT AUTHENTIC UNLESS SIGNED AND DATED

LRJ
ENGINEERING | INGÉNIERIE
5430 Canotek Road | Ottawa, ON, K1J 9G2
www.lrl.ca | (613) 842-3434

CLIENT
HALO CAR WASH INC.

DESIGNED BY:	DRAWN BY:	APPROVED BY:
M.L. / P.P.	M.L.	M.B.

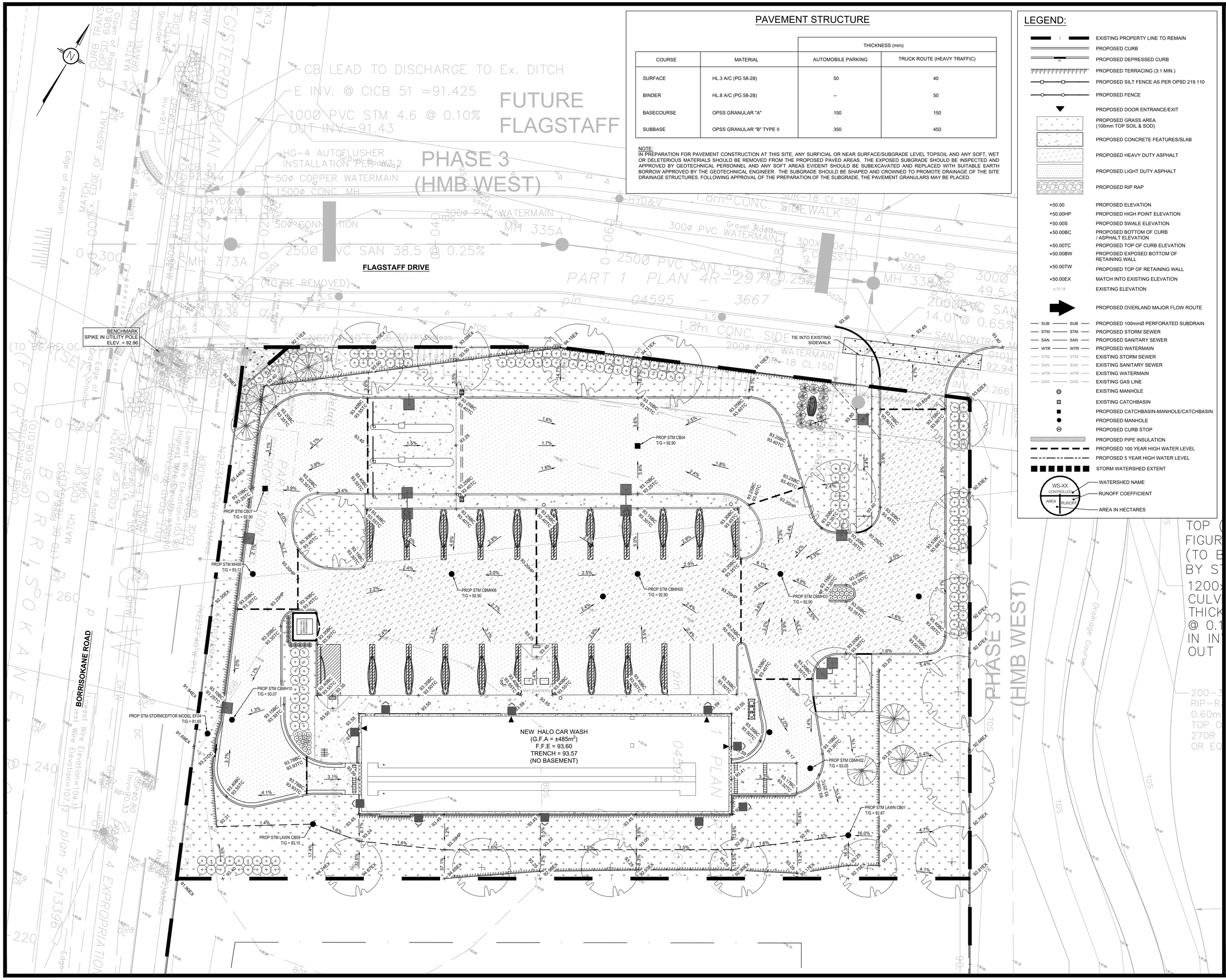
PROJECT
HALO CAR WASH
3535 BORRISOKANE RD
BARRHAVEN, ON

DRAWING TITLE
SITE DEVELOPMENT PLAN

PROJECT NO.
210691

DATE
JANUARY 2022

C201



PAVEMENT STRUCTURE

COURSE	MATERIAL	THICKNESS (mm) AUTOMOBILE PARKING	THICKNESS (mm) TRUCK ROUTE (HEAVY TRAFFIC)
SURFACE	HL.3 A/C (PG 58-28)	50	40
BINDER	HL.8 A/C (PG 58-28)	--	50
BASECOURSE	OPSS GRANULAR "A"	150	150
SUBBASE	OPSS GRANULAR "B" TYPE II	350	450

NOTE:
IN PREPARATION FOR PAVEMENT CONSTRUCTION AT THIS SITE, ANY SURFICIAL OR NEAR SURFACE/SUBGRADE LEVEL TOPSOIL AND ANY SOFT, WET OR DELETERIOUS MATERIALS SHOULD BE REMOVED FROM THE PROPOSED PAVED AREAS. THE EXPOSED SUBGRADE SHOULD BE INSPECTED AND APPROVED BY GEOTECHNICAL PERSONNEL AND ANY SOFT AREAS EVIDENT SHOULD BE SUBEXCAVATED AND REPLACED WITH SUITABLE EARTH BORROW APPROVED BY THE GEOTECHNICAL ENGINEER. THE SUBGRADE SHOULD BE SHAPED AND CROWNED TO PROMOTE DRAINAGE OF THE SITE DRAINAGE STRUCTURES. FOLLOWING APPROVAL OF THE PREPARATION OF THE SUBGRADE, THE PAVEMENT GRANULARS MAY BE PLACED.

LEGEND:

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3535 BORRISOKANE RD
BARRHAVEN, ON

DRAWING TITLE
GRADING AND DRAINAGE PLAN

PROJECT NO.
210691

DATE
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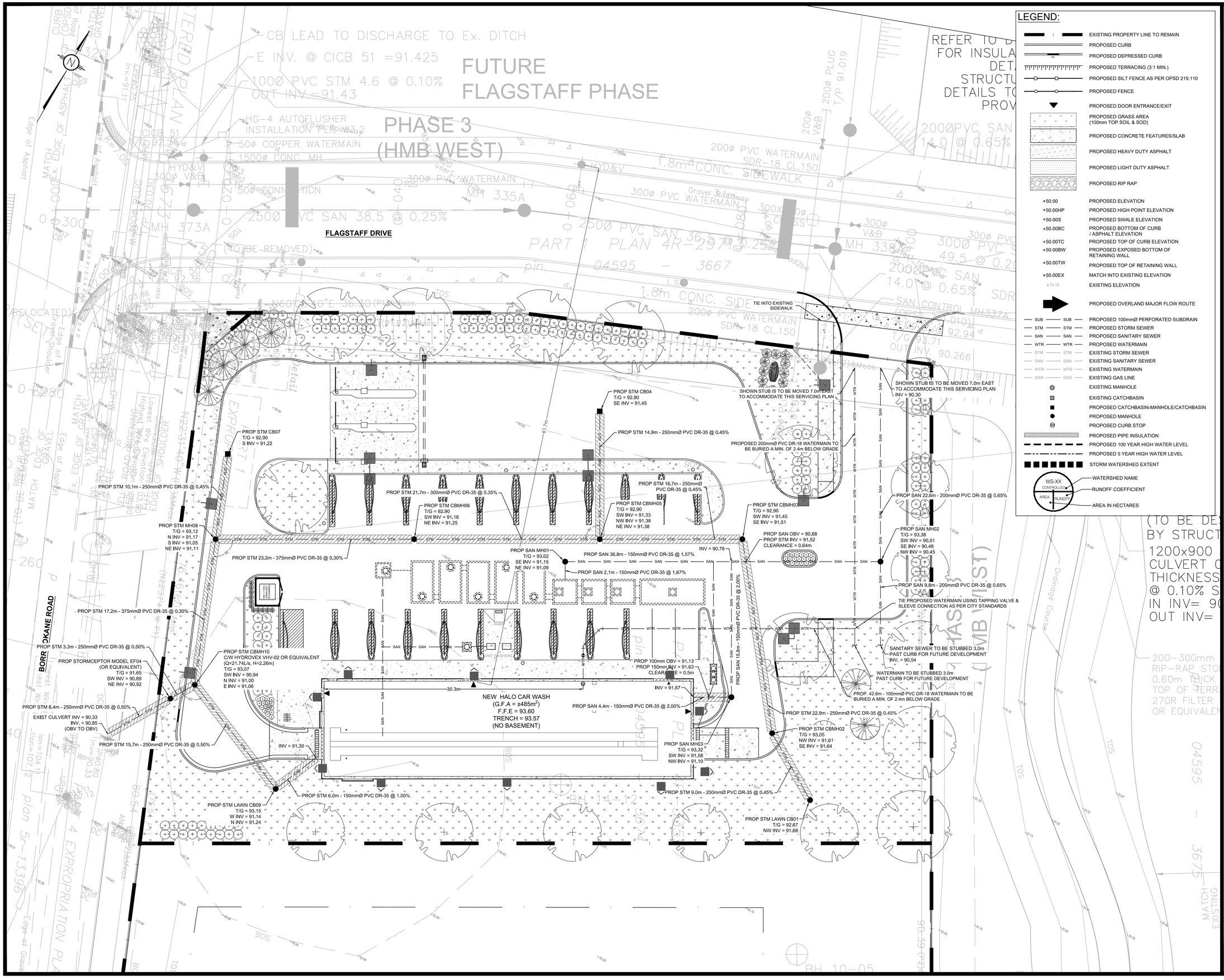
C301



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CLIENT

HALO CAR WASH INC.

DESIGNED BY:	DRAWN BY:	APPROVED BY:
M.L. / P.P.	M.L.	M.B.

PROJECT

HALO CAR WASH
3535 BORRISOKANE RD
BARRHAVEN, ON

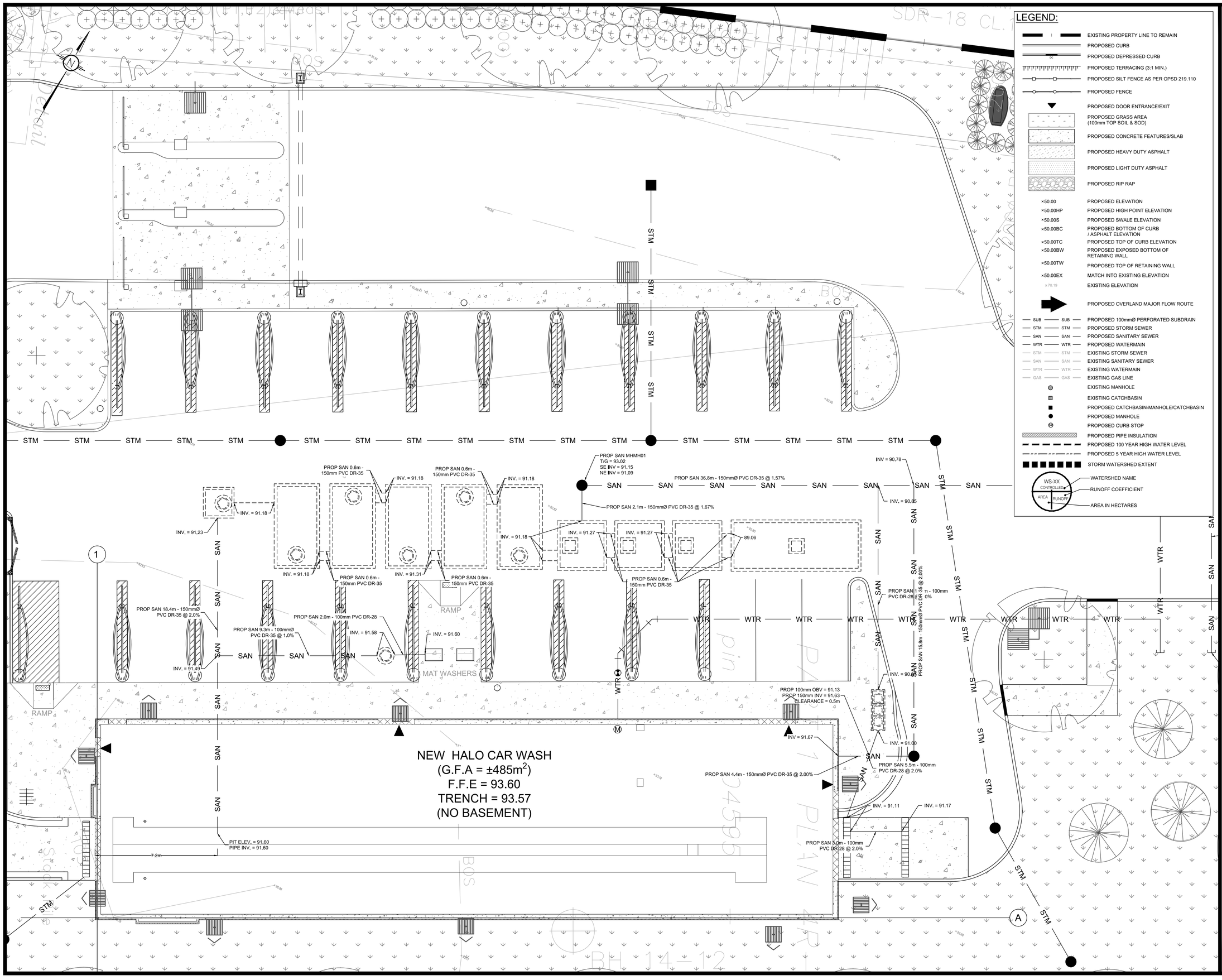
DRAWING TITLE

SERVICING PLAN

PROJECT NO.
210691

DATE
JANUARY 2022

C401



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DESIGNED BY:	DRAWN BY:	APPROVED BY:
M.L. / P.P.	M.L.	M.B.

PROJECT

HALO CAR WASH
3535 BORRISOKANE RD
BARRHAVEN, ON

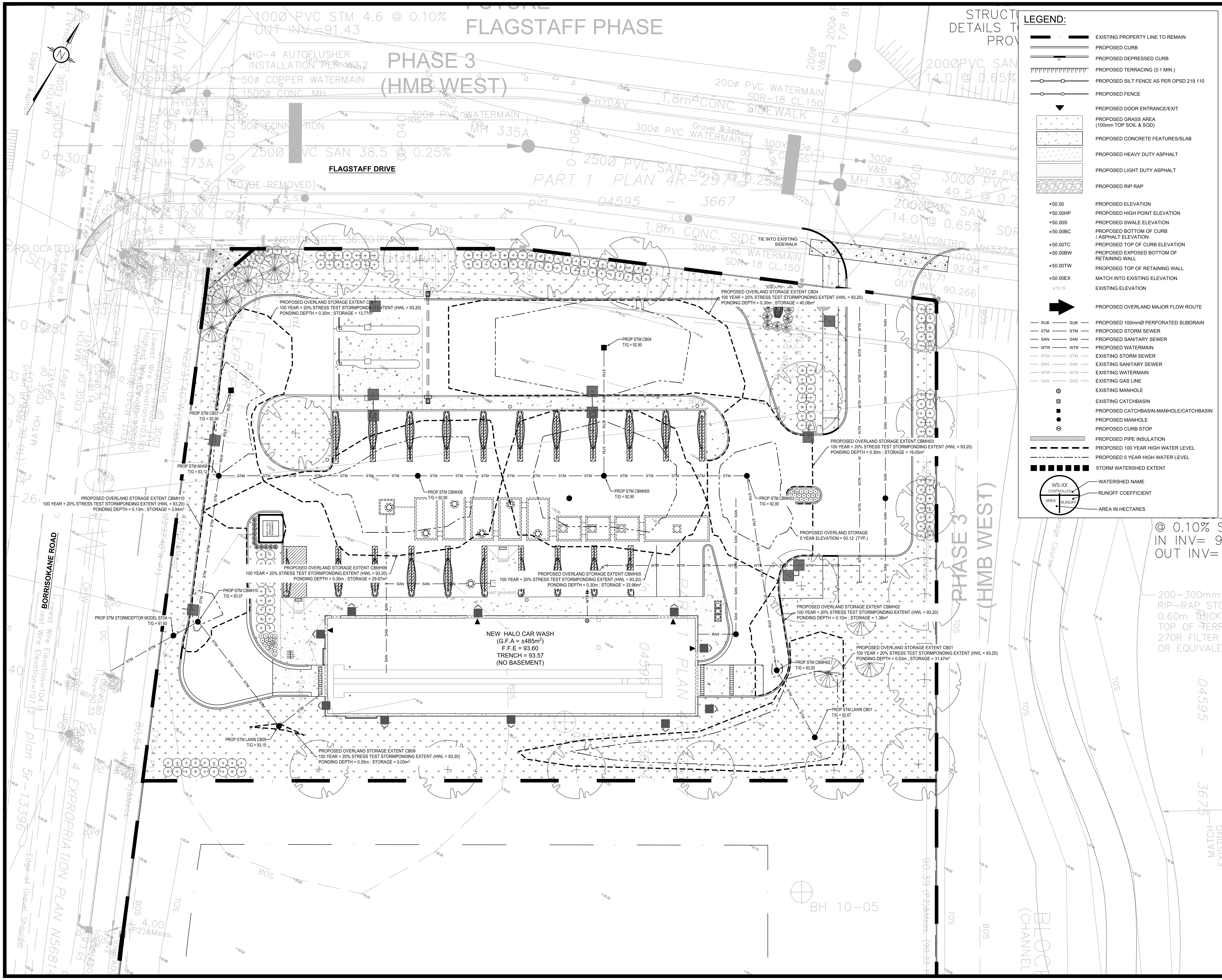
DRAWING TITLE

CAR WASH WASTEWATER TREATMENT & RECLAMATION SYSTEM

PROJECT NO. 210691

DATE JANUARY 2022

C402



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5m 2 0 5m

SCALE: 1:200

NOT FOR CONSTRUCTION TENDER OR PERMIT

No.	REVISIONS	BY	DATE
01	ISSUED FOR APPROVAL	M.L.	22 APR 2022

LICENSED PROFESSIONAL ENGINEER
M. BASNET
100501996
2022/04/22
PROVINCE OF ONTARIO

NOT AUTHENTIC UNLESS SIGNED AND DATED

LRL
ENGINEERING | INGÉNIERIE
5430 Canotek Road | Ottawa, ON, K1J 9G2
www.lrl.ca | (613) 842-3434

CLIENT
HALO CAR WASH INC.

DESIGNED BY:	DRAWN BY:	APPROVED BY:
M.L. / P.P.	M.L.	M.B.

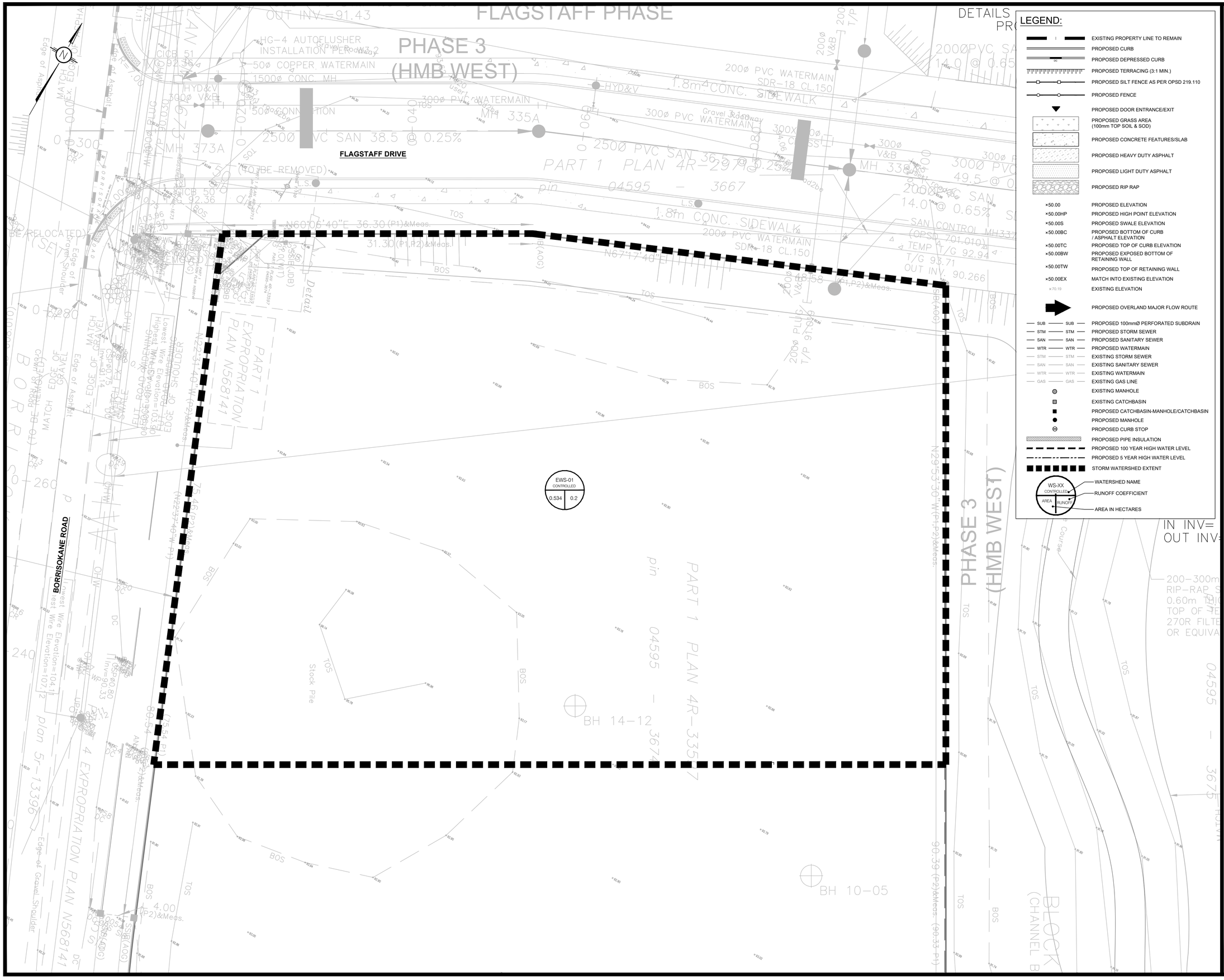
PROJECT
HALO CAR WASH
3535 BORRISOKANE RD
BARRHAVEN, ON

DRAWING TITLE
STORMWATER MANAGEMENT PLAN

PROJECT NO.
210691

DATE
JANUARY 2022

C601



LEGEND:

- EXISTING PROPERTY LINE TO REMAIN
- PROPOSED CURB
- PROPOSED DEPRESSED CURB
- PROPOSED TERRACING (3:1 MIN.)
- PROPOSED SILT FENCE AS PER OPSD 219.110
- PROPOSED FENCE
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- PROPOSED CONCRETE FEATURES/SLAB
- PROPOSED HEAVY DUTY ASPHALT
- PROPOSED LIGHT DUTY ASPHALT
- PROPOSED RIP RAP
- ×50.00 PROPOSED ELEVATION
- ×50.00HP PROPOSED HIGH POINT ELEVATION
- ×50.00S PROPOSED SWALE ELEVATION
- ×50.00BC PROPOSED BOTTOM OF CURB / ASPHALT ELEVATION
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- SUB SUB PROPOSED 100mmØ PERFORATED SUBDRAIN
- STM STM PROPOSED STORM SEWER
- SAN SAN PROPOSED SANITARY SEWER
- WTR WTR PROPOSED WATERMAIN
- STM STM EXISTING STORM SEWER
- SAN SAN EXISTING SANITARY SEWER
- WTR WTR EXISTING WATERMAIN
- GAS GAS EXISTING GAS LINE
- EXISTING MANHOLE
- EXISTING CATCHBASIN
- PROPOSED CATCHBASIN-MANHOLE/CATCHBASIN
- PROPOSED MANHOLE
- PROPOSED CURB STOP
- PROPOSED PIPE INSULATION
- PROPOSED 100 YEAR HIGH WATER LEVEL
- PROPOSED 5 YEAR HIGH WATER LEVEL
- STORM WATERSHED EXTENT

WS-XX / CONTROLLED / AREA / RUNOFF
- WATERSHED NAME
- RUNOFF COEFFICIENT
- AREA IN HECTARES

5m 2 0 5m

SCALE: 1:200

NOT FOR CONSTRUCTION TENDER OR PERMIT

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No.	REVISIONS	BY	DATE
01	ISSUED FOR APPROVAL	M.L.	22 APR 2022

LICENSED PROFESSIONAL ENGINEER
M. BASNET
100501996
2022/04/22
PROVINCE OF ONTARIO

NOT AUTHENTIC UNLESS SIGNED AND DATED

LRL
ENGINEERING | INGÉNIERIE
5430 Canotek Road I Ottawa, ON, K1J 9G2
www.lrl.ca I (613) 842-3434

CLIENT
HALO CAR WASH INC.

DESIGNED BY:	DRAWN BY:	APPROVED BY:
M.L. / P.P.	M.L.	M.B.

PROJECT
HALO CAR WASH
3535 BORRISOKANE RD
BARRHAVEN, ON

DRAWING TITLE
PRE-DEVELOPMENT
WATERSHED PLAN

PROJECT NO.
210691

DATE
JANUARY 2022

C701

FLAGSTAFF PHASE

PHASE 3
(HMB WEST)

FLAGSTAFF DRIVE

BORRISOKANE ROAD

TIE INTO EXISTING SIDEWALK

NEW HALO CAR WASH
(G.F.A = ±485m²)
F.F.E = 93.60
TRENCH = 93.57
(NO BASEMENT)

WS-06 CONTROLLED 0.032 0.68

WS-03 CONTROLLED 0.071 0.70

WS-05 CONTROLLED 0.056 0.90

WS-04 CONTROLLED 0.056 0.90

WS-02 CONTROLLED 0.056 0.85

WS-01 CONTROLLED 0.064 0.41

WS-07 CONTROLLED 0.046 0.46

WS-09 UN-CONTROLLED 0.042 0.22

WS-08 UN-CONTROLLED 0.027 0.20

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WS-XX (CONTROLLED / UN-CONTROLLED) — AREA | RUNOFF
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5m 2 0 5m
SCALE: 1:200

NOT FOR CONSTRUCTION TENDER OR PERMIT

No.	REVISIONS	BY	DATE
01	ISSUED FOR APPROVAL	M.L.	22 APR 2022

LICENSED PROFESSIONAL ENGINEER
M. BASNET
100501996
2022/04/22
PROVINCE OF ONTARIO

NOT AUTHENTIC UNLESS SIGNED AND DATED

LRL
ENGINEERING | INGÉNIERIE
5430 Canotek Road I Ottawa, ON, K1J 9G2
www.lrl.ca I (613) 842-3434

CLIENT
HALO CAR WASH INC.

DESIGNED BY:	DRAWN BY:	APPROVED BY:
M.L. / P.P.	M.L.	M.B.

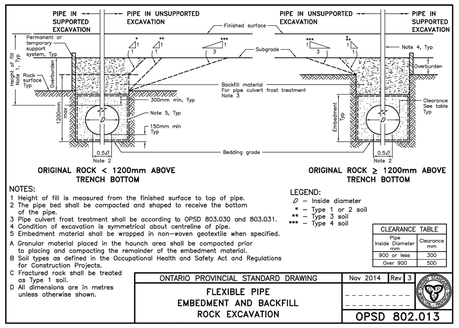
PROJECT
HALO CAR WASH
3535 BORRISOKANE RD
BARRHAVEN, ON

DRAWING TITLE
POST-DEVELOPMENT
WATERSHED PLAN

PROJECT NO.
210691

DATE
JANUARY 2022

C702

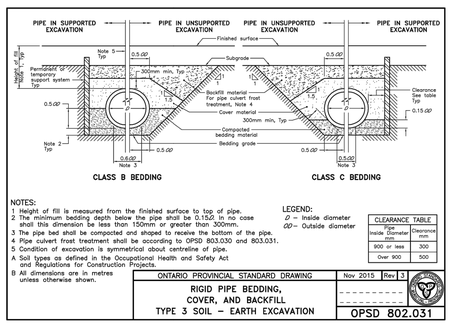


NOTES:
1 Height of fill is measured from the finished surface to top of pipe.
2 The pipe bed shall be compacted and shaped to receive the bottom of the pipe.
3 Pipe culvert frost treatment shall be according to OPSD 803.030 and 803.031.
4 Condition of excavation is symmetrical about centreline of pipe.
5 Embedment material shall be wrapped in non-woven geotextile when specified.
A Granular material placed in the haunch area shall be compacted prior to placing and compacting the remainder of the embedment material.
B Soil types as defined in the Occupational Health and Safety Act and Regulations for Construction Projects.
C Fractured rock shall be treated as Type 1 soil.
D All dimensions are in metres unless otherwise shown.

LEGEND:
$\varnothing$ – Inside diameter
* – Type 1 or 2 soil
** – Type 3 soil
*** – Type 4 soil

CLEARANCE TABLE	
Pipe Inside Diameter mm	Clearance mm
900 or less	300
Over 900	500

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev 3
FLEXIBLE PIPE EMBEDMENT AND BACKFILL ROCK EXCAVATION		
OPSD 802.013		

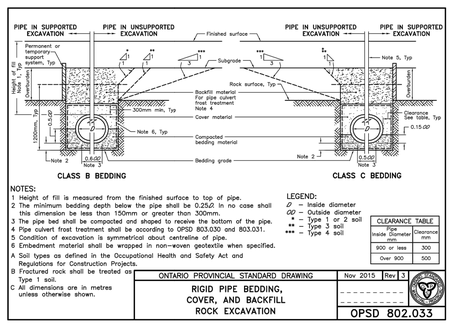


NOTES:
1 Height of fill is measured from the finished surface to top of pipe.
2 The minimum bedding depth below the pipe shall be 0.15∅ in no case shall this dimension be less than 150mm or greater than 300mm.
3 The pipe bed shall be compacted and shaped to receive the bottom of the pipe.
4 Pipe culvert frost treatment shall be according to OPSD 803.030 and 803.031.
5 Condition of excavation is symmetrical about centreline of pipe.
A Soil types as defined in the Occupational Health and Safety Act and Regulations for Construction Projects.
B All dimensions are in metres unless otherwise shown.

LEGEND:
$\varnothing$ – Inside diameter
$\varnothing\varnothing$– Outside diameter

CLEARANCE TABLE	
Pipe Inside Diameter mm	Clearance mm
900 or less	300
Over 900	500

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev 3
RIGID PIPE BEDDING, COVER, AND BACKFILL TYPE 3 SOIL – EARTH EXCAVATION		
OPSD 802.031		



NOTES:
1 Height of fill is measured from the finished surface to top of pipe.
2 The minimum bedding depth below the pipe shall be 0.25∅ in no case shall this dimension be less than 150mm or greater than 300mm.
3 The pipe bed shall be compacted and shaped to receive the bottom of the pipe.
4 Pipe culvert frost treatment shall be according to OPSD 803.030 and 803.031.
5 Condition of excavation is symmetrical about centreline of pipe.
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A Soil types as defined in the Occupational Health and Safety Act and Regulations for Construction Projects.
B Fractured rock shall be treated as Type 1 soil.
C All dimensions are in metres unless otherwise shown.

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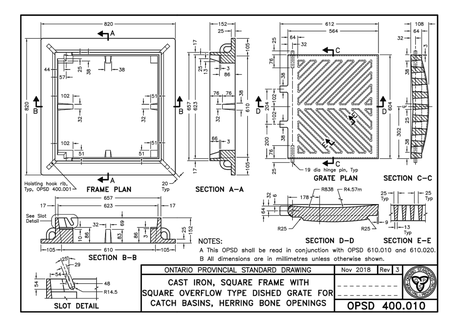
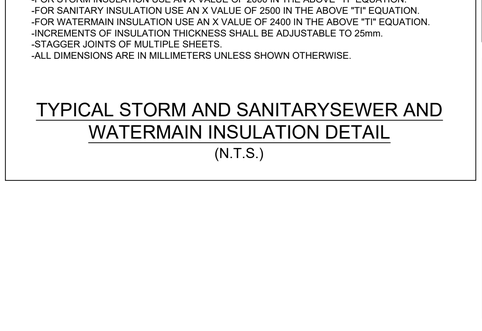
CLEARANCE TABLE	
Pipe Inside Diameter mm	Clearance mm
900 or less	300
Over 900	500

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev 3
RIGID PIPE BEDDING, COVER, AND BACKFILL ROCK EXCAVATION		
OPSD 802.033		



NOTES:
A This OPSD shall be read in conjunction with OPSD 610.010 and 610.020.
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2018	Rev 3
CAST IRON, SQUARE FRAME WITH SQUARE OVERFLOW TYPE DISHED GRATE FOR CATCH BASINS, HERRING BONE OPENINGS		
OPSD 400.010		

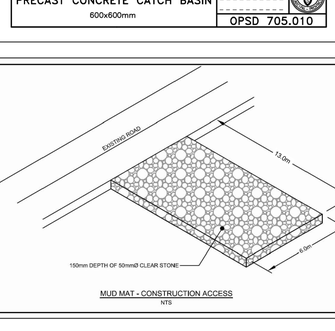


LEGEND:
$\varnothing$ – Inside diameter

NOTES:
1 Height of fill is measured from the finished surface to top of pipe.
2 The pipe bed shall be compacted and shaped to receive the bottom of the pipe.
3 Pipe culvert frost treatment shall be according to OPSD 803.030 and 803.031.
4 Condition of excavation is symmetrical about centreline of pipe.
A Granular material placed in the haunch area shall be compacted prior to placing and compacting the remainder of the embedment material.
B Soil types as defined in the Occupational Health and Safety Act and Regulations for Construction Projects.
C All dimensions are in metres unless otherwise shown.

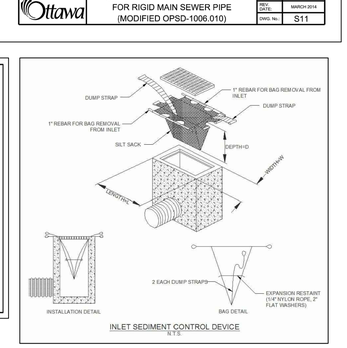
CLEARANCE TABLE	
Pipe Inside Diameter mm	Clearance mm
900 or less	300
Over 900	500

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev 3
FLEXIBLE PIPE EMBEDMENT AND BACKFILL EARTH EXCAVATION		
OPSD 802.010		



NOTE:
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev 2
LIGHT-DUTY SILT FENCE BARRIER		
OPSD 219.110		



NOTES:
1 When sidewalk is continuously adjacent, the dropped curb at entrances shall be reduced to 75mm.
2 For slipforming procedure a 5% batter is acceptable.
A Treatment at entrances shall be according to OPSD 351.010.
B Outlet treatment shall be according to the OPSD 610 Series.
C The transition from one curb type to another shall be a minimum length of 3.0m, except in conjunction with guide rail where it shall be according to the OPSD 900 Series.
D All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2012	Rev 2
CONCRETE BARRIER CURB		
OPSD 600.110		

NOTES:
1 Sidewalk thickness at residential driveways and adjacent to curb shall be 150mm. At commercial and industrial driveways, the thickness shall be 200mm.
2 Sidewalk width shall be wider when specified.
3 This OPSD shall be read in conjunction with OPSD 310.030, 310.031, 310.032, 310.033 and 310.039.
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev 2
CONCRETE SIDEWALK		
OPSD 310.010		

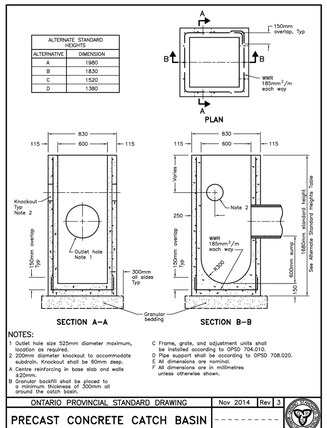
NOTES:
1 The sump is measured from the lowest invert.
A Granular backfill shall be placed to a minimum thickness of 300mm all around the maintenance hole.
B Precast concrete components shall be according to OPSD 701.030, 701.031, or 701.032.
C Structure exceeding 5.0m in depth shall include safety platform according to OPSD 404.020.
D Pipe support according to OPSD 708.020.
E For benching and pipe opening details, see OPSD 701.021.
F For adjustment unit and frame installation, see OPSD 704.010.
G All dimensions are nominal.
H All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev 5
PRECAST CONCRETE MAINTENANCE HOLE 1200mm DIAMETER		
OPSD 701.010		

STOCKPILE EROSION PROTECTION
N.T.S.

NOTES:
-FOR STORM INSULATION USE AN X VALUE OF 2000 IN THE ABOVE "TI" EQUATION.
-FOR SANITARY INSULATION USE AN X VALUE OF 2500 IN THE ABOVE "TI" EQUATION.
-FOR WATERMAIN INSULATION USE AN X VALUE OF 2400 IN THE ABOVE "TI" EQUATION.
-INCREMENTS OF INSULATION THICKNESS SHALL BE ADJUSTABLE TO 25mm.
-STAGGER JOINTS OF MULTIPLE SHEETS.
-ALL DIMENSIONS ARE IN MILLIMETERS UNLESS SHOWN OTHERWISE.

TYPICAL STORM AND SANITARYSEWER AND WATERMAIN INSULATION DETAIL
(N.T.S.)



NOTES:
1 Outlet hole size 525mm diameter maximum, location as required.
2 200mm diameter knockout to accommodate subdrain. Knockout shall be 60mm deep.
A Centre reinforcing in base slab and walls @ 200mm.
B Granular backfill shall be placed to a minimum thickness of 300mm all around the catch basin.
C Frame, grate, and adjustment units shall be installed according to OPSD 704.010.
D Pipe support shall be according to OPSD 708.020.
E All dimensions are nominal.
F All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev 3
PRECAST CONCRETE CATCH BASIN 600x600mm		
OPSD 705.010		

Ottawa	SEWER SERVICE CONNECTIONS FOR RIGID MAIN SEWER PIPE (MODIFIED OPSD-1006.010)	DATE:	MARCH 2008
		REV. DATE:	MARCH 2014
		DWG. No:	S11

USE AND INTERPRETATION OF DRAWINGS

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UNAUTHORIZED CHANGES:

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NOT FOR CONSTRUCTION TENDER OR PERMIT

No.	REVISIONS	BY	DATE
01	ISSUED FOR APPROVAL	M.L.	22 APR 2022

LICENSED PROFESSIONAL ENGINEER
M. BASNET
100501996
2022/04/22
PROVINCE OF ONTARIO

NOT AUTHENTIC UNLESS SIGNED AND DATED

LRL
ENGINEERING I INGÉNIERIE
5430 Canotek Road I Ottawa, ON, K1J 9G2
www.lrl.ca I (613) 842-3434

CLIENT
HALO CAR WASH INC.

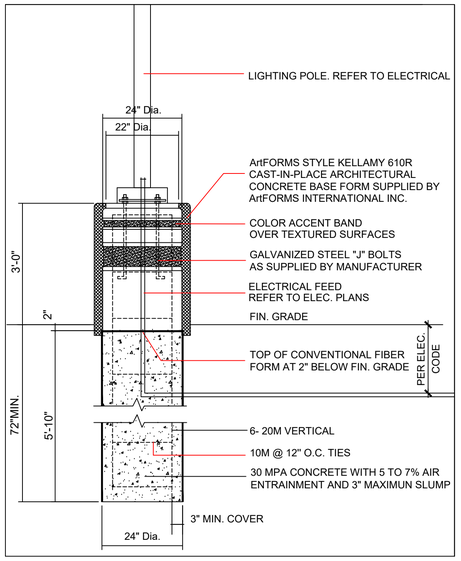
DESIGNED BY:	DRAWN BY:	APPROVED BY:
M.L. / P.P.	M.L.	M.B.

PROJECT
HALO CAR WASH
3535 BORRISOKANE RD
BARRHAVEN, ON

DRAWING TITLE
CONSTRUCTION DETAIL PLAN

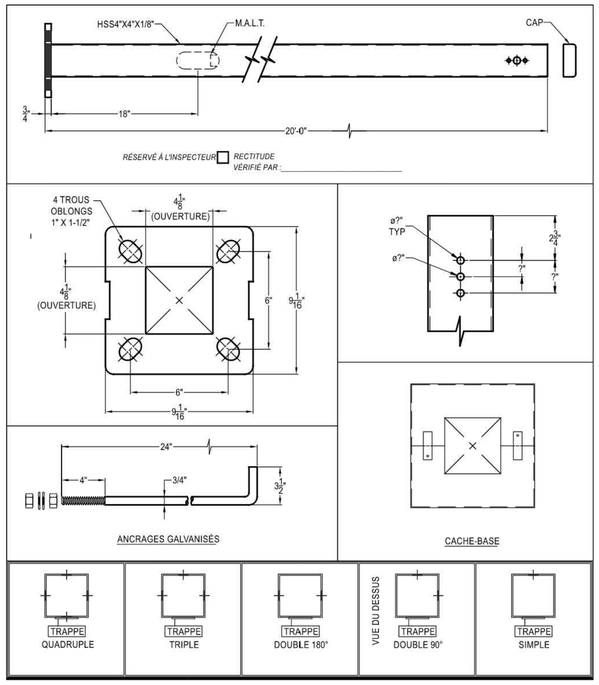
PROJECT NO.
210691
DATE
JANUARY 2022

C901



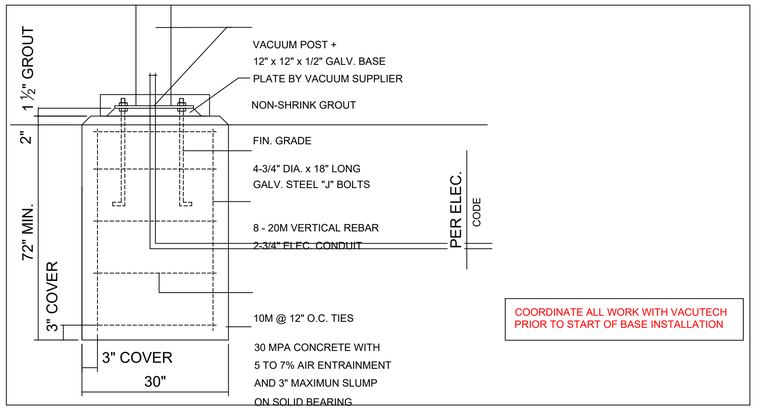
LIGHT STANDARD BASE DETAIL

N.T.S.



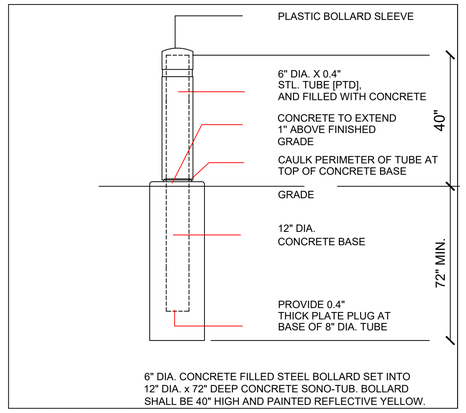
LIGHT STANDARD BASE ANCHOR CAGE DETAIL (SUPPLIED BY OWNER)

N.T.S.



VACUUM STAND BASE

N.T.S.



BOLLARD DETAIL

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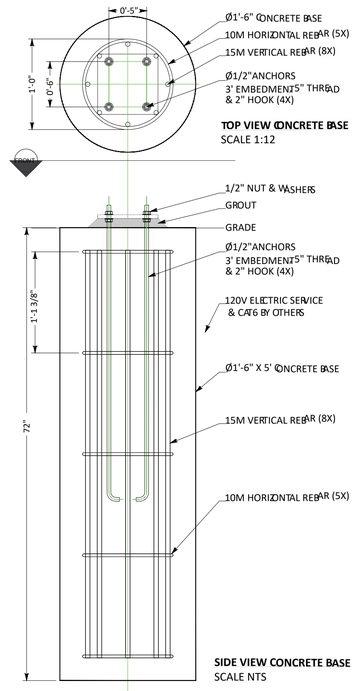
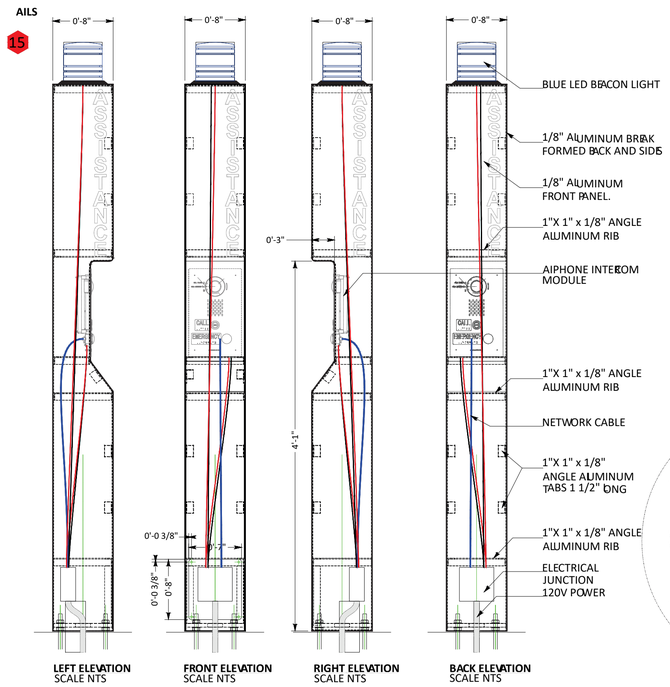
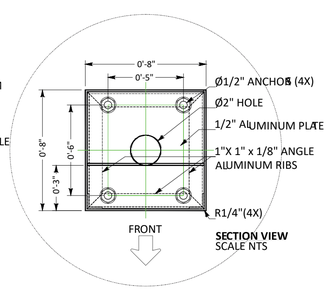


ASSISTANCE INTERCOM STATIONS

N.T.S.





ASSISTANCE INTERCOM STATIONS

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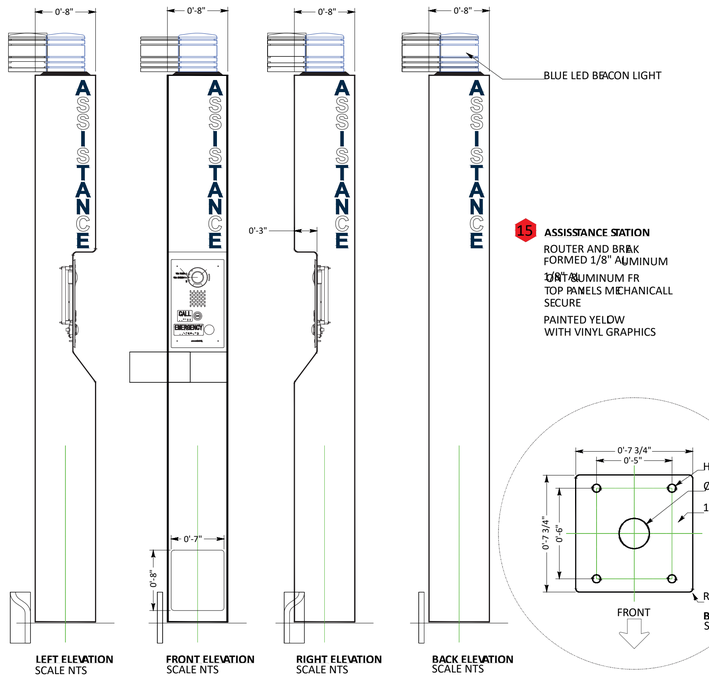

ASSISTANCE INTERCOM STATIONS

N.T.S.

NOTE:
DETAIL TO BE VERIFIED AND STAMPED BY A STRUCTURAL ENGINEER PRIOR TO CONSTRUCTION

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NOT FOR CONSTRUCTION TENDER OR PERMIT

No.	REVISIONS	BY	DATE
01	ISSUED FOR APPROVAL	M.L.	22 APR 2022

LICENSED PROFESSIONAL ENGINEER
S. LECLERC
90439027
Apr 22/22
PROVINCE OF ONTARIO

NOT AUTHENTIC UNLESS SIGNED AND DATED

LRL
ENGINEERING | INGÉNIERIE
5430 Canotek Road I Ottawa, ON, K1J 9G2
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CLIENT

HALO CAR WASH INC.

DESIGNED BY:	DRAWN BY:	APPROVED BY:
M.L. / P.P.	M.L.	M.B.

PROJECT

HALO CAR WASH
3535 BORRISOKANE RD
BARRHAVEN, ON

DRAWING TITLE

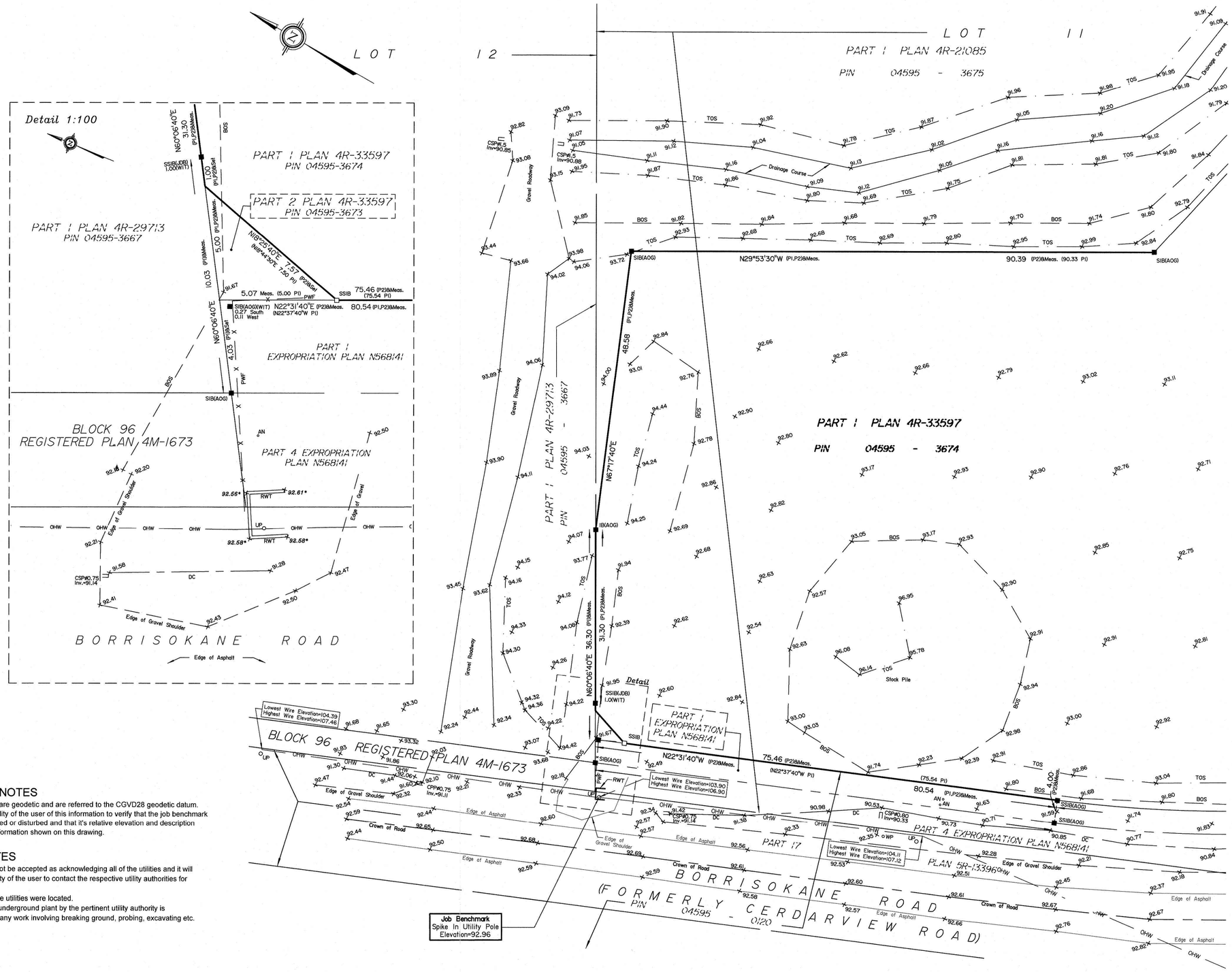
CONSTRUCTION DETAIL PLAN

PROJECT NO.
210691

DATE
JANUARY 2022

C902

APPENDIX F
Survey, As-Builts



ELEVATION NOTES

1. Elevations shown are geodetic and are referred to the CGVD28 geodetic datum.
2. It is the responsibility of the user of this information to verify that the job benchmark has not been altered or disturbed and that it's relative elevation and description agrees with the information shown on this drawing.

UTILITY NOTES

1. This drawing cannot be accepted as acknowledging all of the utilities and it will be the responsibility of the user to contact the respective utility authorities for confirmation.
2. Only visible surface utilities were located.
3. A field location of underground plant by the pertinent utility authority is mandatory before any work involving breaking ground, probing, excavating etc.

TOPOGRAPHICAL PLAN OF SURVEY OF

PART OF LOT 11
CONCESSION 3 (RIDEAU FRONT)
Geographic Township of Nepean
CITY OF OTTAWA

Surveyed by Annis, O'Sullivan, Vollebekk Ltd.

Scale 1 : 400

16 12 8 4 0 8 16 Metres

Metric

DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

Surveyor's Certificate

I CERTIFY THAT :

1. This survey and plan are correct and in accordance with the Surveys Act and the Surveyors Act and the regulations made under them.
2. The survey was completed on the 19th day of January, 2022.

JAN 21/22
Date

T. Hartwick
Ontario Land Surveyor

Notes & Legend

		Denotes
⊡	"	Survey Monument Planted
■	"	Survey Monument Found
SIB	"	Standard Iron Bar
SSIB	"	Short Standard Iron Bar
IB	"	Iron Bar
CC	"	Cut Cross
(WIT)	"	Witness
Meas.	"	Measured
(AOG)	"	Annis, O'Sullivan, Vollebekk Ltd.
(PI)	"	Plan 4R-33597
(P2)	"	(AOG) Plan dated October 29, 2021.
—— OHW ——	"	Overhead Wires
CSP	"	Corrugated Steel Pipe
CPP	"	Corrugated Plastic Pipe
CCP	"	Concrete Pipe
CLF	"	Chain Link Fence
PWF	"	Post and Wire Fence
BOS	"	Bottom of Slope
TOS	"	Top of Slope
DC	"	Ditch Centerline
Inv.	"	Invert
RWT	"	Timber Retaining Wall
○ WP	"	Wood Pole
○ UP	"	Utility Pole
∘ AN	"	Anchor
Ø	"	Diameter
+ 65.00	"	Location of Elevations
+ 65.00*	"	Top of Retaining Wall Elevation

Distances shown on this plan are ground distances and can be converted to grid distances by multiplying by the combined scale factor of 0.999933.

Bearings are grid, derived from Can-Net 2016 Real Time Network GPS observations referenced to Specified Control Points 01919791338 and 01919871649, MTM Zone 9 (76°30' West Longitude) NAD-83 (original).

ASSOCIATION OF ONTARIO LAND SURVEYORS
PLAN SUBMISSION FORM
V-22497

THIS PLAN IS NOT VALID UNLESS IT IS AN EMBOSSED ORIGINAL COPY ISSUED BY THE SURVEYOR In accordance with Regulation 1026, Section 29 (3).

ANNIS, O'SULLIVAN, VOLLEBEKK LTD.
14 Concourse Gate, Suite 500
Nepean, Ont. K2E 7S6
Phone: (613) 727-0850 / Fax: (613) 727-1079
Email: Nepean@aovltd.com
Ontario Land Surveyors

Job No. 22410-21 Borrisokane January21_2022(2) JA/CA