Stormwater Management Report and Servicing Brief

Proposed Halo Car Wash
3555 Borrisokane Rd
Barrhaven, Ontario

Prepared for:

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

Attention: Mr. Jordan Lupovici

Revised July 07, 2023
April 22, 2022

LRL File No.: 210691

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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 3555 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 (±513 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 future development to the south is 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 ditch

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 roadside ditch along Borrisokane Rd.

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 which will be extended from the existing stub located within Flagstaff Drive at the northeast corner of the site. Since the average water demand exceeds 50 m^3/day, a looped system separated by an isolation valve is proposed. For servicing layout, refer to Site Servicing Plan C401 (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)

Below is a summary of anticipated water demands calculated by using the parameters mentioned in Table 1 together with anticipated car wash demand & demands from south parcels (Part 3 & Part 5) as per the Servicing Brief prepared by Pearson Engineering, dated Nov 17, 2022. Refer to Appendix B for calculation details.

- Average Day Demand = 1.85 L/s
- Maximum Day Demand = 3.14 L/s
- Peak Hour Demand = 7.74 L/s

The City of Ottawa provided boundary conditions associated with the estimated water demand (correspondence included in Appendix B). Table 2 below summarizes the boundary conditions for the proposed development.

Table 2: Summary of Boundary Conditions

Design Parameter	Anticipated Demand (L/s)	Boundary Conditions @ Flagstaff Dr.	
		*Existing Conditions (m H2O / psi)	*Future Conditions (SUC Pressure Zone) (m H2O / psi)
Average Daily Demand	1.85	156.4/89.4	146.7/75.6
Peak Hour	7.74	142.4/69.5	142.7/68.9
Max Day + Fire Flow	3.14 + 65	137.4/62.4	142.3/69.3
**Ground elevation assumed at 93.5 m for Connection 1 @ Flagstaff Dr.*			

Hydraulic analysis of the proposed watermain & servicing network was performed using EPANET (Version 2.2). Below is the summary of calculated residual pressures above finished grade at the service entry node (J-7) at Halo Car Wash Building.

Existing Conditions (Pressure Zone 3SW)

- Scenario 1: Average Day = 89.24 psi
- Scenario 2: Peak Hour = 69.05 psi
- Scenario 3: Max Day + Fire Flow = 62.21 psi

Future Conditions (Pressure Zone SUC)

- Scenario 4: Average Day = 75.45 psi
- Scenario 5: Peak Hour = 69.48 psi
- Scenario 6: Max Day + Fire Flow = 69.17 psi

The available pressure mentioned above corroborates with the City design criteria mentioned in Table 1, except for the average day demand (Scenario 1) when the maximum pressure exceeds 80 psi. Therefore, a pressure reducing valve (PRV) is needed as the residual pressure is not to exceed 80 psi. For modeling results, see Appendix B.

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

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

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. Two (2) 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 Dr. 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 3 summarizes the City of Ottawa Design Guidelines design parameters used in the estimation of wastewater flow.

Table 3: 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. Anticipated flow from future development is also included sanitary sewer design sheet, refer to Appendix C for calculation details.

7 STORMWATER MANAGEMENT

7.1 Existing Stormwater Infrastructure

There is an existing roadside ditch along 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, a treatment train approach is proposed. First, the stormwater TSS removal of 80.9% is achieved using StormTech Isolator Row Plus located downstream of STM MH08 and STM MH10. Second, TSS removal of 53.0% is achieved using Hydro International OGS unit (model FD-4HC) installed downstream of STM MH11. Together, the treatment train approach will provide a combined TSS removal of 90.9%. Greater detail of the treatment train sizing can be found in Appendix D.

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.

$$\boldsymbol{Q = 2.78CIA}$$

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). Storage required as a result of quantity control will be accomplished through surface storage in the parking lot and underground storage.

A network of storm sewers is proposed to service the site which will outlet to the existing ditch along Borrisokane Rd and eventually to the existing 800mm dia. culvert crossing Borrisokane Rd. Refer to Site Servicing Plan C401 and Appendix D for calculation details.

The existing site is delineated by catchments EWS-01 which currently drains uncontrolled towards the west and outlet to the existing ditch. Refer to Pre-development Watershed Plan C701 (Appendix E). The site has been analyzed and post-development watersheds have been allocated. A few watersheds WS-09 and WS-10 consisting of grass area will flow un-controlled off the site. For additional details, refer to Post-development Watershed Plan C702 (Appendix E). Overland flow in Halo Car Wash area within watersheds WS-01A, WS-01B, WS-02, WS-03, WS-04, WS-05, WS-06, WS-07 & WS-08 will be captured by a several CB/CBMHs. An ICD, Hydrovex Vortex Flow Regulator 125VHV-2 (or approved equivalent), is proposed at STM MH11 to restrict

the collected runoff and control the release rate at 24.86 L/s (H=2.06 m). For additional details on select ICD, refer to Appendix D. Table 4 summarizes post-development drainage areas. Additional details and calculations can be found in Appendix D.

Table 4: Drainage Areas and Runoff Coefficients

Watersheds	Area (ha)	Weighted Runoff Coefficient (C)
WS-01A (controlled)	0.045	0.29
WS-01B (controlled)	0.017	0.79
WS-02 (controlled)	0.049	0.90
WS-03 (controlled)	0.030	0.87
WS-04 (controlled)	0.101	0.58
WS-05 (controlled)	0.053	0.90
WS-06 (controlled)	0.123	0.87
WS-07 (controlled)	0.039	0.76
WS-08 (controlled)	0.027	0.20
WS-09 (uncontrolled)	0.029	0.20
WS-10 (uncontrolled)	0.020	0.20
Total	**0.534**	**0.67**

Table 5 summarizes the release rates, storage volume required and available storage in the proposed site. Refer to Appendix D for runoff and storage calculation details.

Table 5: Summary of Stormwater Release Rates & Storage

Watersheds	Area (ha)	Release Rate (L/s)			Storage Required (m^3)			Total Storage Provided (m^3)
		100-yr	5-yr	2-yr	100-yr	5-yr	2-yr	
Controlled (WS-01 to WS-08)	0.485	24.86	24.86	24.86	199.45	71.96	46.81	206.62
Uncontrolled (WS-09 to WS-10)	0.049	6.09	2.84	2.10	N/A	N/A	N/A	N/A
Total	**0.534**	**30.95**	**27.70**	**26.96**	**199.45**	**71.96**	**46.81**	**206.62**

The runoff exceeding the allowable release rate will be stored on-site via surficial ponding and underground storage in StormTech Chambers. For 100-yr storm event, it is calculated that a total of 199.45 m^3 of storage will be required to attenuate flows to the allowable release rate of 24.86 L/s (controlled release). The required storage will be accommodated through surface ponding in the parking lot which will provide 115.86 m^3 of storage and underground storage in StormTech chambers providing 90.76 m^3 of additional storage. It is important to note that the required storage for 2- and 5-yr storm will be accommodated underground within the StormTech chambers. The storm events greater than 100-yr will flow overland towards Borrisokane roadside ditch from the

spillover point (depressed curve) provided at 100-yr HWL elevation of 93. 20, refer to Grading Plan (C301). The maximum ponding elevation and depths can be found on Stormwater Management Plan C601 (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 3555 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 hydrants along Flagstaff Dr will service the proposed development.
- The proposed development will be serviced with a new 100 mm dia. water servicing which will connect to the proposed dual 200 mm dia. watermain to be extended from Flagstaff Dr.
- Boundary conditions received from the City of Ottawa show that adequate pressure is available to service the proposed development.

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 proposed 200 mm dia. SAN sewer to be extended from the existing stub.

Stormwater Management

- Stormwater quality control requirements of 80% TSS removal will be met with a treatment train approach by using StormTech Isolator Row Plus & Hydro International OGS (FD-4HC) or approved equivalent.
- The storm water release rates from the proposed development will meet contemplated allowable release rate of 30.95 L/s (24.86 L/s controlled and 6.09 L/s uncontrolled).
- Stormwater quantity control objectives will be met using an Inlet Control Device (ICD) to restrict flow and on-site stormwater surface storage and underground storage.

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

Maxime Longtin
Civil Engineering Technologist

Mohan Basnet, P.Eng.
Civil Engineer

APPENDIX A

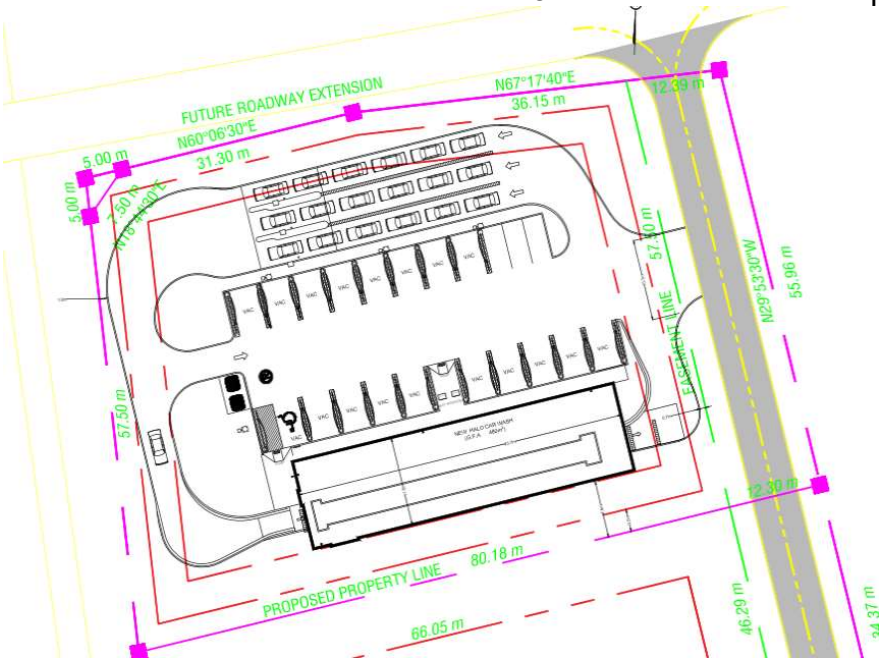
Pre-consultation / Correspondance

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 Rc
Date : February 7, 2023
Designed by : M. Basnet

Water Demand

Site area = 0.534 ha (Part 1)

Average day demand = *35000* *L / ha·day* (based on Table 4.2 of Ottawa Design Guidelines-Water Distribution)
= 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 (L/s)

	Part 1	Part 3*	Part 5*	Total (L/s)
Average day demand =	**1.29**	**0.15**	**0.41**	**1.85**
Maximum daily demand =	**2.29**	**0.23**	**0.62**	**3.14**
Maximum hour demand =	**6.72**	**0.28**	**0.74**	**7.74**

Note:*Water demands for south parcels (Part 3 and 5) were taken from Functional Servicing Brief, prepared by Pearson Engineering, dated Nov 17, 2022

Water Service Pipe Sizing (Part 1)

$Q = VA$ Where: V = velocity
A = area of water service pipe
Q = water supply flow rate

By deriving the above formula with an assumed max. 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**

Mohan Basnet

From: Bramah, Bruce <bruce.bramah@ottawa.ca>
Sent: February 14, 2023 3:45 PM
To: Mohan Basnet
Cc: Kelly, Siobhan; Jordan Lupovici; Maxime Longtin
Subject: RE: Halo Car Wash_3535 Borrisokane Rd_Revised Boundary Condition (LRL210691)

Hi Mohan,

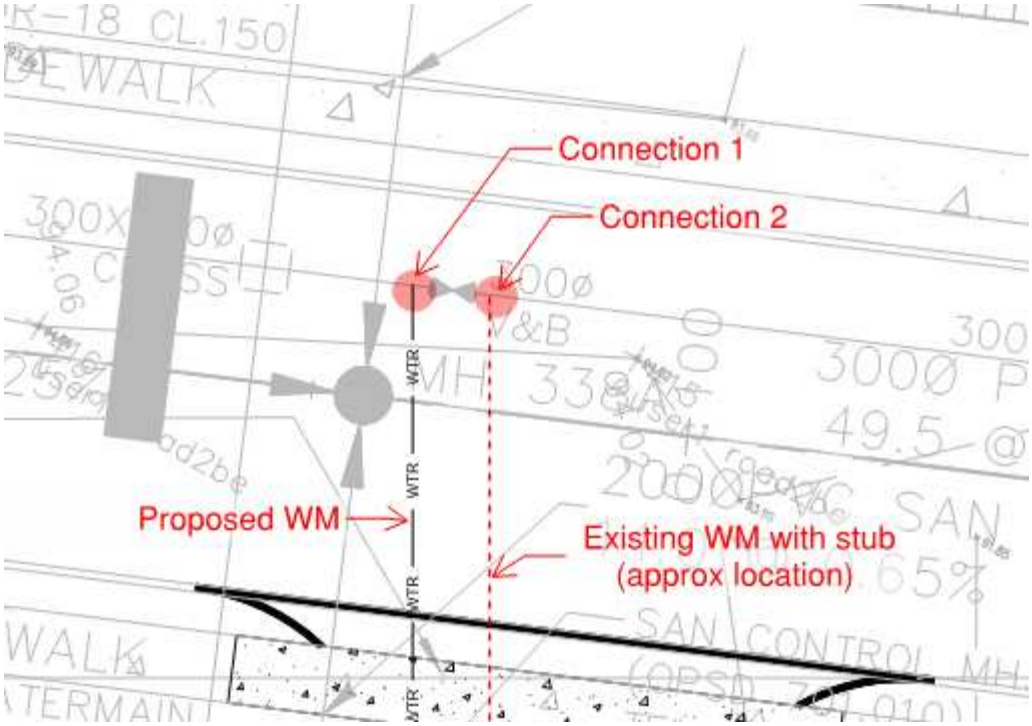
Yes, the HGL would be the same for both connections.
Thanks,
--
Bruce Bramah, EIT
Project Manager
Planning, Real Estate and Economic Development Department / Direction générale de la planification, des biens immobiliers et du développement économique
Development Review - South Branch
City of Ottawa | Ville d'Ottawa
110 Laurier Avenue West Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1
613.580.2424 ext./poste 29686, Bruce.Bramah@ottawa.ca

From: Mohan Basnet <mbasnet@lrl.ca>
Sent: February 14, 2023 2:30 PM
To: Bramah, Bruce <bruce.bramah@ottawa.ca>
Cc: Kelly, Siobhan <siobhan.kelly@ottawa.ca>; Jordan Lupovici <jlupovici@halowash.com>; Maxime Longtin <mlongtin@lrl.ca>
Subject: RE: Halo Car Wash_3535 Borrisokane Rd_Revised Boundary Condition (LRL210691)

Thank you Bruce!

The BC received shows only 1 connection. However, actually there are 2 connections.

Is the BC received is applicable for both connections?



Thank you,

Mohan Basnet, P.Eng.
Civil Engineer
LRL Engineering
5430 Canotek Road
Ottawa, Ontario K1J 9G2
T (613) 842-3434
C (613) 229-6819
F (613) 842-4338
E mbasnet@lrl.ca
W www.lrl.ca

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.

LRL
ENGINEERING | INGÉNIERIE

From: Bramah, Bruce <bruce.bramah@ottawa.ca>
Sent: February 13, 2023 2:44 PM
To: Mohan Basnet <mbasnet@lrl.ca>
Cc: Kelly, Siobhan <siobhan.kelly@ottawa.ca>; Jordan Lupovici <jlupovici@halowash.com>; Maxime Longtin <mlongtin@lrl.ca>
Subject: RE: Halo Car Wash_3535 Borrisokane Rd_Revised Boundary Condition (LRL210691)

Good afternoon,

Please see the attached Boundary Conditions.
Thank you,
--
Bruce Bramah, EIT
Project Manager
Planning, Real Estate and Economic Development Department / Direction générale de la planification, des biens immobiliers et du développement économique
Development Review - South Branch
City of Ottawa | Ville d'Ottawa
110 Laurier Avenue West Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1
613.580.2424 ext./poste 29686, Bruce.Bramah@ottawa.ca

From: Mohan Basnet <mbasnet@lrl.ca>
Sent: February 08, 2023 10:36 AM
To: Bramah, Bruce <bruce.bramah@ottawa.ca>
Cc: Kelly, Siobhan <siobhan.kelly@ottawa.ca>; Jordan Lupovici <jlupovici@halowash.com>; Maxime Longtin <mlongtin@lrl.ca>
Subject: RE: Halo Car Wash_3535 Borrisokane Rd_Revised Boundary Condition (LRL210691)

Hi Bruce:

We are working to address SPA-2nd review comments for the proposed Halo Car Wash Development at 3535 Borrisokane Rd and require a boundary conditions at this site to proceed. Please use the following data to provide the revised boundary conditions.

- Service location/type: Dual connections at flagstaff drive (existing 200mm dia. stub + proposed 200mm dia. WM), please see attached draft servicing plan C401.
- Type of development: Proposed Car Wash building
- Average daily demand: 1.85 L/s (Part 1+Part 3+Part 5)
- Maximum daily demand: 3.14 L/s (Part 1+Part 3+Part 5)
- Peak hourly demand: 7.74 L/s (Part 1+Part 3+Part 5)
- FUS fire flow demand: 65.00 L/s (Part 1-Halo Car Wash)

Please note that water demands for the south parcels (Part 3 and Part 5) were taken from the Servicing Brief prepared by Pearson Engineering (Nov 17, 2022).

For your reference, I have also included copies of revised water demand calculations and FUS fire flow calculations along with this email.

Please let me know if you have any questions.

Thank you
Mohan Basnet, P.Eng.
Civil Engineer

LRL Engineering
5430 Canotek Road
Ottawa, Ontario K1J 9G2
T (613) 842-3434
C (613) 229-6819
F (613) 842-4338
E mbasnet@lrl.ca
W www.lrl.ca

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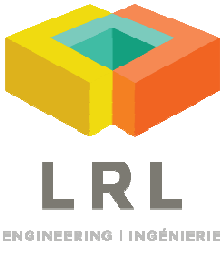
We will continue to be reachable by cell phone or by calling LRL at 613-842-3434 which will prompt you to enter the extension of the person you are trying to reach.
In addition, we will continue to have access to all e-mail correspondence and do our best to return all inquiries in a timely manner.



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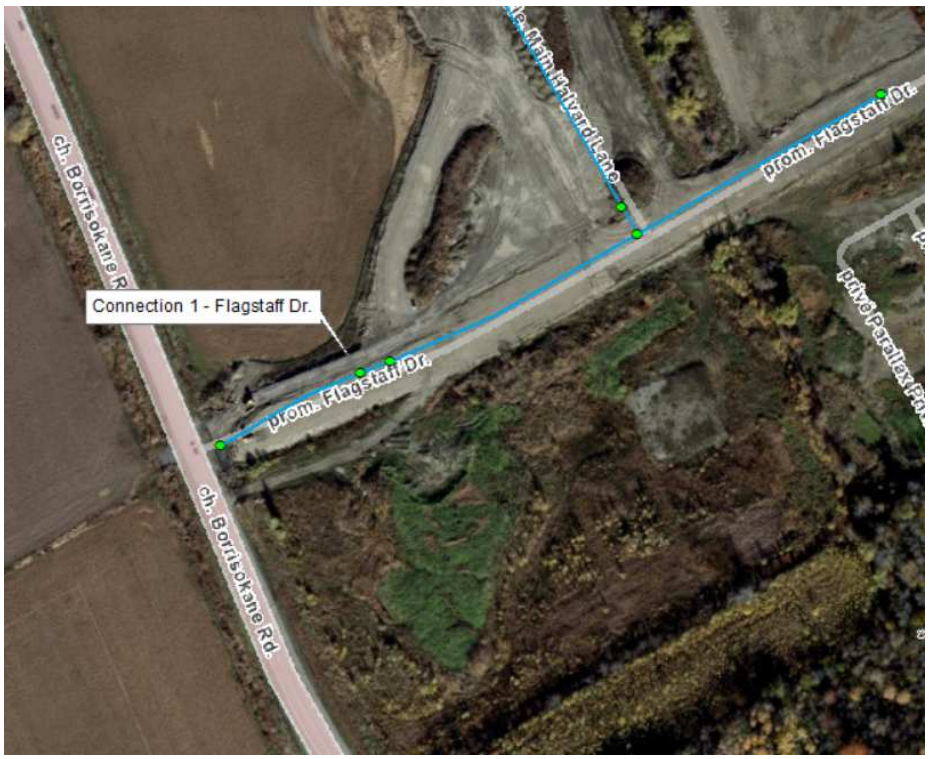
Boundary Conditions
3535 Borrisokane Rd (Halo Car Wash)

Provided Information

Scenario	Demand	
	L/min	L/s
Average Daily Demand	111	1.85
Maximum Daily Demand	188	3.14
Peak Hour	464	7.74
Fire Flow Demand #1	3,900	65.00

Location



Results

Existing Conditions (Pressure Zone 3SW)

Connection 1 – Flagstaff Dr.

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	156.4	89.4
Peak Hour	142.4	69.5
Max Day plus Fire Flow	137.4	62.4

[1] Ground Elevation = 93.5 m

Future Conditions (Pressure Zone SUC)

Connection 1 – Flagstaff Dr.

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	146.7	75.6
Peak Hour	142.7	69.9
Max Day plus Fire Flow	142.3	69.3

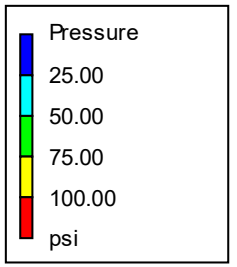
[1] Ground Elevation = 93.5 m

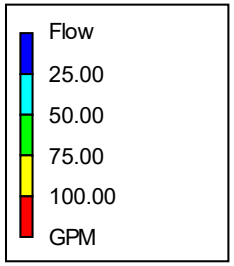
Notes

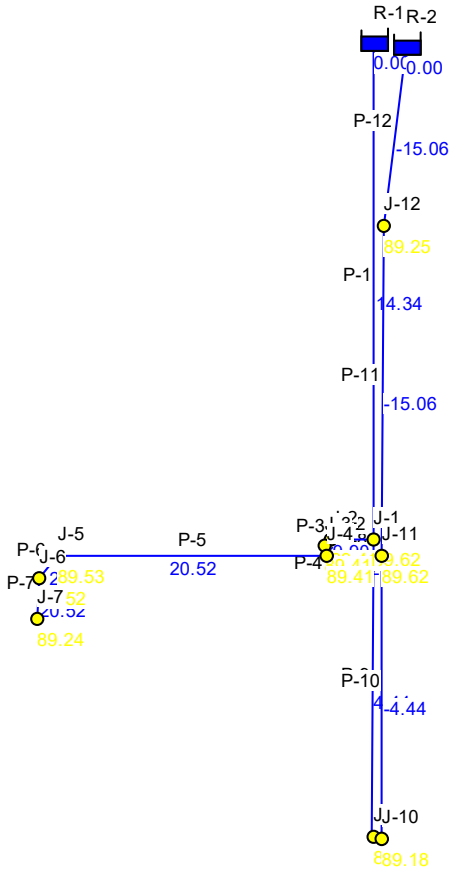
1. As per the Ontario Building Code in areas that may be occupied, the static pressure at any fixture shall not exceed 552 kPa (80 psi.) Pressure control measures to be considered are as follows, in order of preference:
    a. If possible, systems to be designed to residual pressures of 345 to 552 kPa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

Disclaimer

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







Scenario 1: Average Day

```
******************************************************************
*                          E P A N E T                           *
*                  Hydraulic and Water Quality                   *
*                  Analysis for Pipe Networks                    *
*                        Version 2.2                             *
******************************************************************
```

Input File: 210691_Avg Day.net

Link - Node Table:

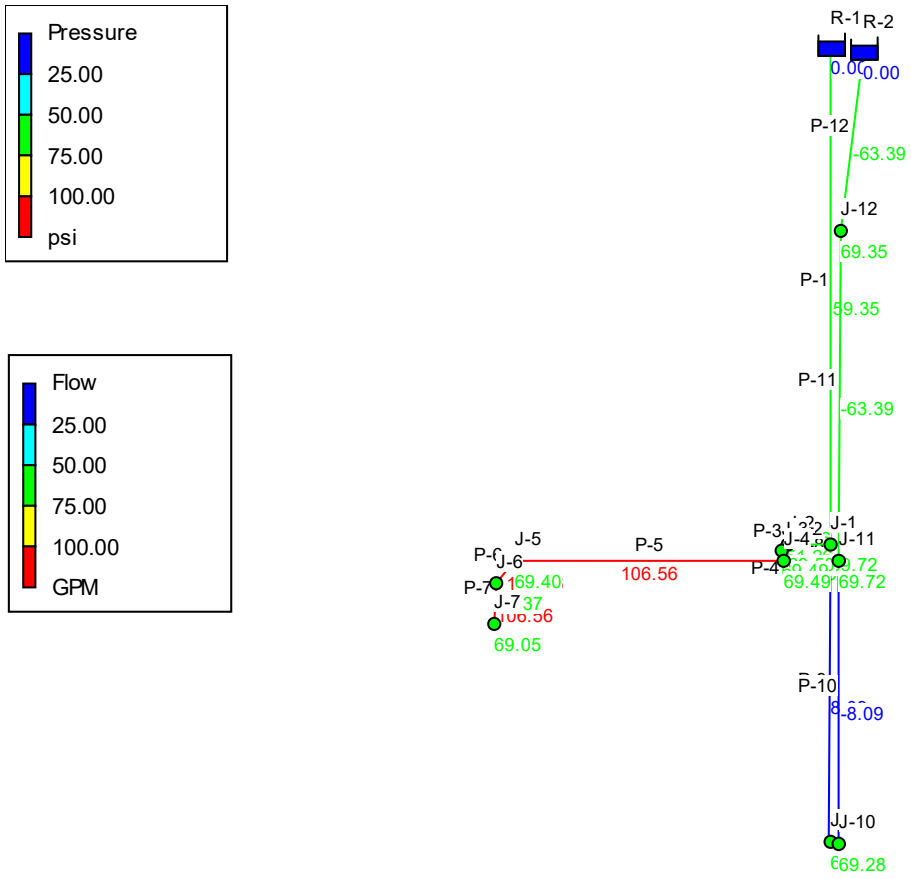
Link ID	Start Node	End Node	Length ft	Diameter in
P-1	R-1	J-1	150.88	8
P-3	J-2	J-3	2.95	4
P-4	J-3	J-4	2.95	4
P-5	J-4	J-5	80.03	4
P-6	J-5	J-6	9.84	4
P-7	J-6	J-7	13.12	4
P-8	J-4	J-11	15	4
P-9	J-1	J-9	88.56	8
P-10	J-10	J-11	85.28	8
P-11	J-11	J-12	101.68	8
P-12	J-12	R-2	54.45	8
P-2	J-1	J-2	12.5	4

Node Results:

Node ID	Demand GPM	Head ft	Pressure psi	Quality	
J-1	0.00	512.99	89.62	0.00	
J-2	0.00	512.99	89.41	0.00	
J-3	0.00	512.99	89.41	0.00	
J-4	0.00	512.99	89.41	0.00	
J-5	0.00	512.96	89.53	0.00	
J-6	0.00	512.96	89.52	0.00	
J-7	20.52	512.96	89.24	0.00	
J-9	4.44	512.99	89.18	0.00	
J-10	4.44	512.99	89.18	0.00	
J-11	0.00	512.99	89.62	0.00	
J-12	0.00	512.99	89.25	0.00	
R-1	-14.34	512.99	0.00	0.00	Reservoir
R-2	-15.06	512.99	0.00	0.00	Reservoir

Link Results:

Link ID	Flow GPM	Velocity fps	Unit Headloss ft/Kft	Status
P-1	14.34	0.09	0.01	Open
P-3	9.90	0.25	0.06	Open
P-4	9.90	0.25	0.08	Open
P-5	20.52	0.52	0.31	Open
P-6	20.52	0.52	0.30	Open
P-7	20.52	0.52	0.31	Open
P-8	-10.62	0.27	0.09	Open
P-9	4.44	0.03	0.00	Open
P-10	-4.44	0.03	0.00	Open
P-11	-15.06	0.10	0.01	Open
P-12	-15.06	0.10	0.01	Open
P-2	9.90	0.25	0.08	Open



Scenario 2: Peak Hour

```
******************************************************************
*                          E P A N E T                           *
*                   Hydraulic and Water Quality                  *
*                   Analysis for Pipe Networks                   *
*                         Version 2.2                            *
******************************************************************
```

Input File: 210691_Peak Hour.net

Link - Node Table:

Link ID	Start Node	End Node	Length ft	Diameter in
P-1	R-1	J-1	150.88	8
P-3	J-2	J-3	2.95	4
P-4	J-3	J-4	2.95	4
P-5	J-4	J-5	80.03	4
P-6	J-5	J-6	9.84	4
P-7	J-6	J-7	13.12	4
P-8	J-4	J-11	15	4
P-9	J-1	J-9	88.56	8
P-10	J-10	J-11	85.28	8
P-11	J-11	J-12	101.68	8
P-12	J-12	R-2	54.45	8
P-2	J-1	J-2	12.5	4

Node Results:

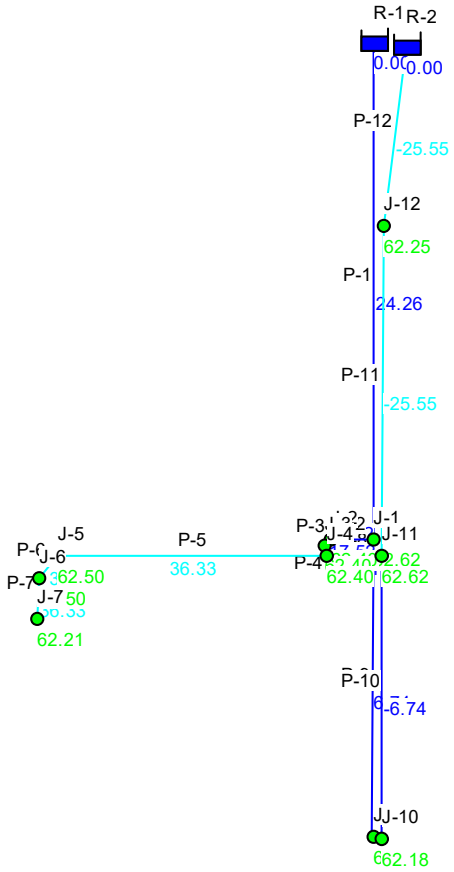
Node ID	Demand GPM	Head ft	Pressure psi	Quality	
J-1	0.00	467.06	69.72	0.00	
J-2	0.00	467.04	69.50	0.00	
J-3	0.00	467.03	69.49	0.00	
J-4	0.00	467.03	69.49	0.00	
J-5	0.00	466.51	69.40	0.00	
J-6	0.00	466.45	69.37	0.00	
J-7	106.56	466.36	69.05	0.00	
J-9	8.09	467.06	69.28	0.00	
J-10	8.09	467.06	69.28	0.00	
J-11	0.00	467.06	69.72	0.00	
J-12	0.00	467.07	69.35	0.00	
R-1	-59.35	467.07	0.00	0.00	Reservoir
R-2	-63.39	467.07	0.00	0.00	Reservoir

Link Results:

Link ID	Flow GPM	Velocity fps	Unit Headloss ft/Kft	Status
P-1	59.35	0.38	0.08	Open
P-3	51.26	1.31	1.68	Open
P-4	51.26	1.31	1.68	Open
P-5	106.56	2.72	6.49	Open
P-6	106.56	2.72	6.49	Open
P-7	106.56	2.72	6.48	Open
P-8	-55.30	1.41	1.92	Open
P-9	8.09	0.05	0.00	Open
P-10	-8.09	0.05	0.00	Open
P-11	-63.39	0.40	0.08	Open
P-12	-63.39	0.40	0.08	Open
P-2	51.26	1.31	1.67	Open

Pressure
25.00
50.00
75.00
100.00
psi

Flow
25.00
50.00
75.00
100.00
GPM



Scenario 3: Max Day + Fire Flow

```
*********************************************************************
*                          E P A N E T                              *
*                   Hydraulic and Water Quality                     *
*                   Analysis for Pipe Networks                      *
*                         Version 2.2                               *
*********************************************************************
```

Input File: 210691_Max Day+FF.net

Link - Node Table:

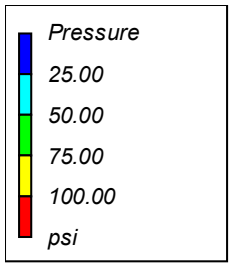
Link ID	Start Node	End Node	Length ft	Diameter in
P-1	R-1	J-1	150.88	8
P-3	J-2	J-3	2.95	4
P-4	J-3	J-4	2.95	4
P-5	J-4	J-5	80.03	4
P-6	J-5	J-6	9.84	4
P-7	J-6	J-7	13.12	4
P-8	J-4	J-11	15	4
P-9	J-1	J-9	88.56	8
P-10	J-10	J-11	85.28	8
P-11	J-11	J-12	101.68	8
P-12	J-12	R-2	54.45	8
P-2	J-1	J-2	12.5	4

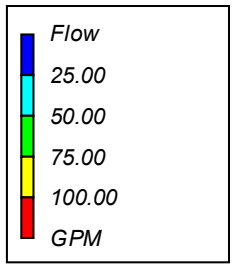
Node Results:

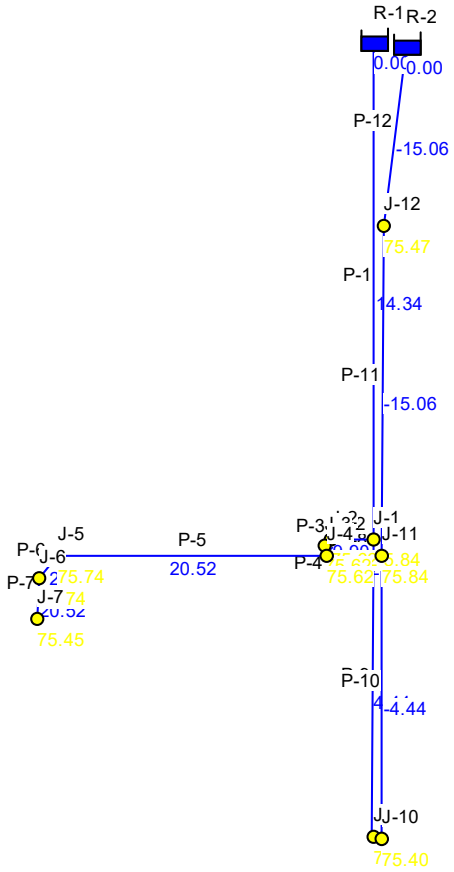
Node ID	Demand GPM	Head ft	Pressure psi	Quality	
J-1	0.00	450.67	62.62	0.00	
J-2	0.00	450.66	62.40	0.00	
J-3	0.00	450.66	62.40	0.00	
J-4	0.00	450.66	62.40	0.00	
J-5	0.00	450.59	62.50	0.00	
J-6	0.00	450.58	62.50	0.00	
J-7	36.33	450.57	62.21	0.00	
J-9	6.74	450.67	62.18	0.00	
J-10	6.74	450.67	62.18	0.00	
J-11	0.00	450.67	62.62	0.00	
J-12	0.00	450.67	62.25	0.00	
R-1	-24.26	450.67	0.00	0.00	Reservoir
R-2	-25.55	450.67	0.00	0.00	Reservoir

Link Results:

Link ID	Flow GPM	Velocity fps	Unit Headloss ft/Kft	Status
P-1	24.26	0.15	0.01	Open
P-3	17.52	0.45	0.23	Open
P-4	17.52	0.45	0.23	Open
P-5	36.33	0.93	0.88	Open
P-6	36.33	0.93	0.88	Open
P-7	36.33	0.93	0.88	Open
P-8	-18.81	0.48	0.26	Open
P-9	6.74	0.04	0.00	Open
P-10	-6.74	0.04	0.00	Open
P-11	-25.55	0.16	0.02	Open
P-12	-25.55	0.16	0.02	Open
P-2	17.52	0.45	0.23	Open







Scenario 4: Average Day
(Pressure Zone SUC)

```
******************************************************************
*                          E P A N E T                           *
*                   Hydraulic and Water Quality                  *
*                   Analysis for Pipe Networks                   *
*                         Version 2.2                            *
******************************************************************
```

Input File: 210691_Avg Day - SUC.net

Link - Node Table:

Link ID	Start Node	End Node	Length ft	Diameter in
P-1	R-1	J-1	150.88	8
P-3	J-2	J-3	2.95	4
P-4	J-3	J-4	2.95	4
P-5	J-4	J-5	80.03	4
P-6	J-5	J-6	9.84	4
P-7	J-6	J-7	13.12	4
P-8	J-4	J-11	15	4
P-9	J-1	J-9	88.56	8
P-10	J-10	J-11	85.28	8
P-11	J-11	J-12	101.68	8
P-12	J-12	R-2	54.45	8
P-2	J-1	J-2	12.5	4

Node Results:

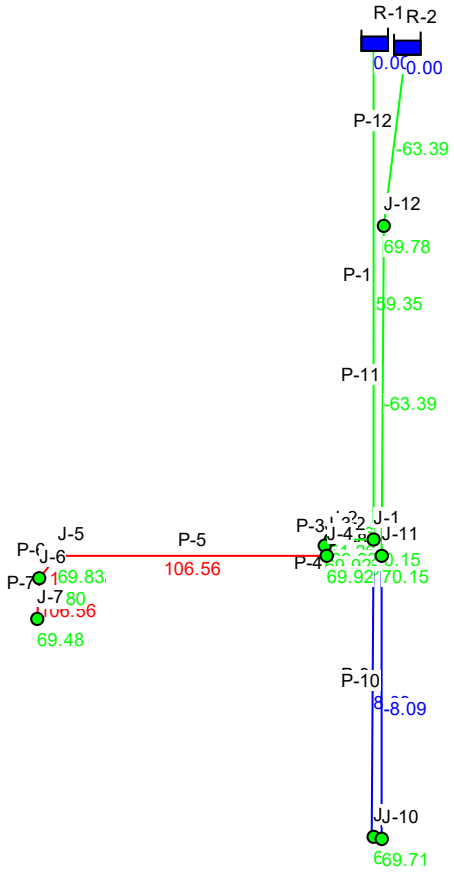
Node ID	Demand GPM	Head ft	Pressure psi	Quality	
J-1	0.00	481.18	75.84	0.00	
J-2	0.00	481.18	75.62	0.00	
J-3	0.00	481.18	75.62	0.00	
J-4	0.00	481.18	75.62	0.00	
J-5	0.00	481.15	75.74	0.00	
J-6	0.00	481.15	75.74	0.00	
J-7	20.52	481.15	75.45	0.00	
J-9	4.44	481.18	75.40	0.00	
J-10	4.44	481.18	75.40	0.00	
J-11	0.00	481.18	75.84	0.00	
J-12	0.00	481.18	75.47	0.00	
R-1	-14.34	481.18	0.00	0.00	Reservoir
R-2	-15.06	481.18	0.00	0.00	Reservoir

Link Results:

Link ID	Flow GPM	Velocity fps	Unit Headloss ft/Kft	Status
P-1	14.34	0.09	0.01	Open
P-3	9.90	0.25	0.08	Open
P-4	9.90	0.25	0.08	Open
P-5	20.52	0.52	0.31	Open
P-6	20.52	0.52	0.31	Open
P-7	20.52	0.52	0.31	Open
P-8	-10.62	0.27	0.09	Open
P-9	4.44	0.03	0.00	Open
P-10	-4.44	0.03	0.00	Open
P-11	-15.06	0.10	0.01	Open
P-12	-15.06	0.10	0.01	Open
P-2	9.90	0.25	0.08	Open

Pressure
25.00
50.00
75.00
100.00
psi

Flow
25.00
50.00
75.00
100.00
GPM



Scenario 5: Peak Hour

(Pressure Zone SUC)

```
*********************************************************************
*                          E P A N E T                              *
*                   Hydraulic and Water Quality                     *
*                   Analysis for Pipe Networks                      *
*                         Version 2.2                               *
*********************************************************************
```

Input File: 210691_Peak Hour - SUC.net

Link - Node Table:

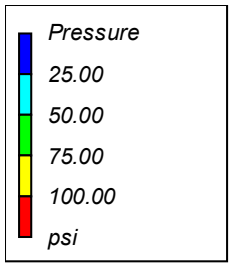
Link ID	Start Node	End Node	Length ft	Diameter in
P-1	R-1	J-1	150.88	8
P-3	J-2	J-3	2.95	4
P-4	J-3	J-4	2.95	4
P-5	J-4	J-5	80.03	4
P-6	J-5	J-6	9.84	4
P-7	J-6	J-7	13.12	4
P-8	J-4	J-11	15	4
P-9	J-1	J-9	88.56	8
P-10	J-10	J-11	85.28	8
P-11	J-11	J-12	101.68	8
P-12	J-12	R-2	54.45	8
P-2	J-1	J-2	12.5	4

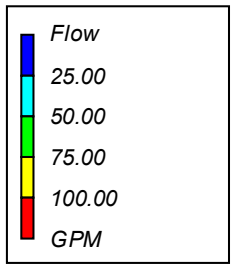
Node Results:

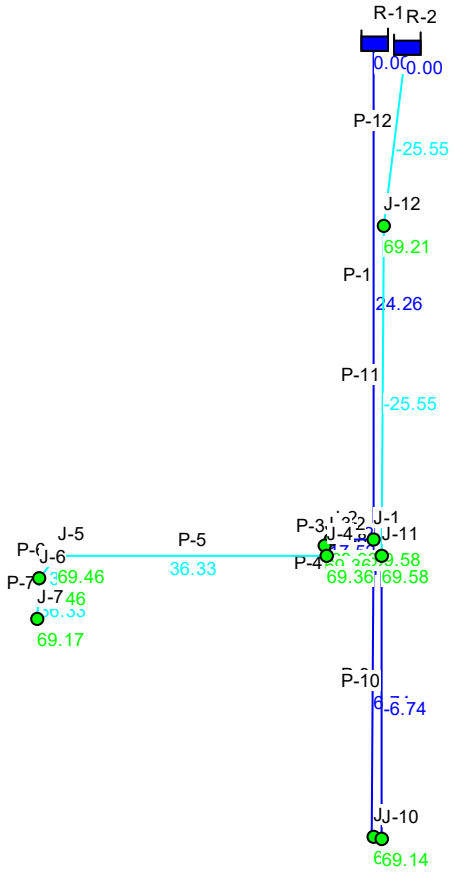
Node ID	Demand GPM	Head ft	Pressure psi	Quality	
J-1	0.00	468.05	70.15	0.00	
J-2	0.00	468.03	69.92	0.00	
J-3	0.00	468.02	69.92	0.00	
J-4	0.00	468.02	69.92	0.00	
J-5	0.00	467.50	69.83	0.00	
J-6	0.00	467.44	69.80	0.00	
J-7	106.56	467.35	69.48	0.00	
J-9	8.09	468.05	69.71	0.00	
J-10	8.09	468.05	69.71	0.00	
J-11	0.00	468.05	70.15	0.00	
J-12	0.00	468.06	69.78	0.00	
R-1	-59.35	468.06	0.00	0.00	Reservoir
R-2	-63.39	468.06	0.00	0.00	Reservoir

Link Results:

Link ID	Flow GPM	Velocity fps	Unit Headloss ft/Kft	Status
P-1	59.35	0.38	0.08	Open
P-3	51.26	1.31	1.67	Open
P-4	51.26	1.31	1.68	Open
P-5	106.56	2.72	6.49	Open
P-6	106.56	2.72	6.48	Open
P-7	106.56	2.72	6.49	Open
P-8	-55.30	1.41	1.92	Open
P-9	8.09	0.05	0.00	Open
P-10	-8.09	0.05	0.00	Open
P-11	-63.39	0.40	0.08	Open
P-12	-63.39	0.40	0.08	Open
P-2	51.26	1.31	1.67	Open







Scenario 6: Max Day + Fire Flow

(Pressure Zone SUC)

```
******************************************************************
*                          E P A N E T                           *
*                  Hydraulic and Water Quality                   *
*                  Analysis for Pipe Networks                    *
*                        Version 2.2                             *
******************************************************************
```

Input File: 210691_Max Day+FF - SUC.net

Link - Node Table:

Link ID	Start Node	End Node	Length ft	Diameter in
P-1	R-1	J-1	150.88	8
P-3	J-2	J-3	2.95	4
P-4	J-3	J-4	2.95	4
P-5	J-4	J-5	80.03	4
P-6	J-5	J-6	9.84	4
P-7	J-6	J-7	13.12	4
P-8	J-4	J-11	15	4
P-9	J-1	J-9	88.56	8
P-10	J-10	J-11	85.28	8
P-11	J-11	J-12	101.68	8
P-12	J-12	R-2	54.45	8
P-2	J-1	J-2	12.5	4

Node Results:

Node ID	Demand GPM	Head ft	Pressure psi	Quality	
J-1	0.00	466.74	69.58	0.00	
J-2	0.00	466.73	69.36	0.00	
J-3	0.00	466.73	69.36	0.00	
J-4	0.00	466.73	69.36	0.00	
J-5	0.00	466.66	69.46	0.00	
J-6	0.00	466.65	69.46	0.00	
J-7	36.33	466.64	69.17	0.00	
J-9	6.74	466.74	69.14	0.00	
J-10	6.74	466.74	69.14	0.00	
J-11	0.00	466.74	69.58	0.00	
J-12	0.00	466.74	69.21	0.00	
R-1	-24.26	466.74	0.00	0.00	Reservoir
R-2	-25.55	466.74	0.00	0.00	Reservoir

Link Results:

Link ID	Flow GPM	Velocity fps	Unit Headloss ft/Kft	Status
P-1	24.26	0.15	0.01	Open
P-3	17.52	0.45	0.23	Open
P-4	17.52	0.45	0.24	Open
P-5	36.33	0.93	0.88	Open
P-6	36.33	0.93	0.88	Open
P-7	36.33	0.93	0.88	Open
P-8	-18.81	0.48	0.26	Open
P-9	6.74	0.04	0.00	Open
P-10	-6.74	0.04	0.00	Open
P-11	-25.55	0.16	0.02	Open
P-12	-25.55	0.16	0.02	Open
P-2	17.52	0.45	0.23	Open

APPENDIX C

Wastewater Calculations

LRL File No. 210691
Project: Proposed Development-Halo Car Wash
Location: 3535 Borrisokane Rd, Barrhaven, ON
Date: February 17, 2023

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 Bulletin 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)	FLOW (l/s)	LENGTH (m)	DIA. (mm)	SLOPE (%)	MATERIAL	CAP. (FULL) (l/s)	VEL. (FULL) (m/s)
	Bldg.	SAN MH03																		0.003	1.4	150	2.00%	PVC	21.54	1.22
	SAN MH03	SAN MH06																		0.003	14.7	150	2.00%	PVC	21.54	1.22
	**SAN MH01	SAN MH06									0.534					6.139	0.534	0.534	0.176	6.318	19.4	150	1.26%	PVC	17.09	0.97
	SAN MH06	SAN MH02																		6.320	17.4	150	1.26%	PVC	17.09	0.97
	*Future Dev.	SAN MH02																		2.360	34.4	200	0.65%	PVC	26.44	0.84
	SAN MH02	SAN MH04																		8.680	22.6	200	0.65%	PVC	26.44	0.84

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: 2023-02-17	Sheet No. 1 of 1

Note:
* Peak Design Flow from Future Development (Part 3 + Part 5) was taken from Servicing Brief Prepared by Pearson Engineering, dated November 17, 2022
**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: July 7, 2023
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-01A (controlled)	0.040	0.000	0.006	0.045	0.29
WS-01B (controlled)	0.003	0.000	0.015	0.017	0.79
WS-02 (controlled)	0.000	0.000	0.049	0.049	0.90
WS-03 (controlled)	0.001	0.000	0.028	0.030	0.87
WS-04 (controlled)	0.046	0.000	0.055	0.101	0.58
WS-05 (controlled)	0.000	0.000	0.053	0.053	0.90
WS-06 (controlled)	0.005	0.000	0.118	0.123	0.87
WS-07 (controlled)	0.008	0.000	0.031	0.039	0.76
WS-08 (controlled)	0.027	0.000	0.000	0.027	0.20
WS-09 (uncontrolled)	0.029	0.000	0.000	0.029	0.20
WS-10 (uncontrolled)	0.020	0.000	0.000	0.020	0.20
Total	**0.179**	**0.000**	**0.355**	**0.534**	**0.67**

LRL File No. 210691
Project: Proposed Development-Halo Car Wash
Location: 3555 Borrisokane Rd (Barrhaven, ON)
Date: July 7, 2023
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
Release Rate =	30.95	L/s

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 =	0.20	
I =	178.6	mm/hr
Tc =	10	min
Total Area =	0.534	ha
Release Rate =	52.99	L/s

Allowable Release Rate = 30.95 L/s
(5-yr pre-development level corresponding to EWS-01, see drawing C701)

Post-development Stormwater Management

					$\sum R_{2\&5}$	$\sum R_{100}$
	Total Site Area =	**0.534**	ha	**∑R=**	**0.67**	**0.83**
Controlled	WS-01A	0.045	ha	R=	0.29	0.36
	WS-01B	0.017	ha	R=	0.79	0.99
	WS-02	0.049	ha	R=	0.90	1.00
	WS-03	0.030	ha	R=	0.87	1.00
	WS-04	0.101	ha	R=	0.58	0.73
	WS-05	0.053	ha	R=	0.90	1.00
	WS-06	0.123	ha	R=	0.87	1.00
	WS-07	0.039	ha	R=	0.76	0.95
	WS-08	0.027	ha	R=	0.20	0.25
	Total Controlled =	**0.485**	**ha**	**∑R=**	**0.71**	**0.89**
Uncontrolled	WS-09	0.029	ha	R=	0.20	0.25
	WS-10	0.020	ha	R=	0.20	0.25
	Total Uncontrolled =	**0.049**	**ha**	**∑R=**	**0.20**	**0.25**

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	214.24	121.09	12.43	6.09	18.52
15	142.89	171.45	143.12	12.43	4.88	17.31
20	119.95	143.92	157.79	12.43	4.09	16.52
25	103.85	124.60	168.26	12.43	3.54	15.97
30	91.87	110.23	176.04	12.43	3.13	15.56
35	82.58	99.08	181.97	12.43	2.82	15.25
40	75.15	90.16	186.56	12.43	2.56	14.99
45	69.05	82.85	190.13	12.43	2.36	14.79
50	63.95	76.74	192.92	12.43	2.18	14.61
55	59.62	71.54	195.06	12.43	2.03	14.46
60	55.89	67.07	196.69	12.43	1.91	14.34
65	52.65	63.17	197.88	12.43	1.80	14.23
70	49.79	59.74	198.70	12.43	1.70	14.13
75	47.26	56.70	199.21	12.43	1.61	14.04
80	44.99	53.98	199.45	12.43	1.54	13.97
85	42.95	51.54	199.45	12.43	1.47	13.90
90	41.11	49.33	199.24	12.43	1.40	13.83
95	39.43	47.32	198.85	12.43	1.35	13.78
100	37.90	45.48	198.29	12.43	1.29	13.72
105	36.50	43.79	197.58	12.43	1.25	13.68
110	35.20	42.24	196.73	12.43	1.20	13.63
115	34.01	40.80	195.76	12.43	1.16	13.59
120	32.89	39.47	194.68	12.43	1.12	13.55

*Average release rate taken as 50% of max. allowable controlled release rate for storage calculation

On-site stormwater detention

Storage required =	**199.45**	**m^3**	
Surface storage provided =	115.86	m^3	(See Dwg C601)
Underground storage provided =	90.76	m^3	(StormTech Chambers)
Total storage provided =	**206.62**	**m^3**	

LRL File No. 210691
Project: Proposed Development-Halo Car Wash
Location: 3555 Borrisokane Rd (Barrhaven, ON)
Date: July 7, 2023
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
Release Rate =	30.95	L/s

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 =	0.20	
I =	178.6	mm/hr
Tc =	10	min
Total Area =	0.534	ha
Release Rate =	52.99	L/s

Allowable Release Rate = 30.95 L/s
(5-yr pre-development level corresponding to EWS-01, see drawing C701)

Post-development Stormwater Management

					$\sum R_{2\&5}$	$\sum R_{100}$
	Total Site Area =	**0.534**	ha	**∑R=**	**0.67**	**0.83**
Controlled	WS-01A	0.045	ha	R=	0.29	0.36
	WS-01B	0.017	ha	R=	0.79	0.99
	WS-02	0.049	ha	R=	0.90	1.00
	WS-03	0.030	ha	R=	0.87	1.00
	WS-04	0.101	ha	R=	0.58	0.73
	WS-05	0.053	ha	R=	0.90	1.00
	WS-06	0.123	ha	R=	0.87	1.00
	WS-07	0.039	ha	R=	0.76	0.95
	WS-08	0.027	ha	R=	0.20	0.25
	Total Contolled =	**0.485**	**ha**	**∑R=**	**0.71**	**0.89**
Uncontrolled	WS-09	0.029	ha	R=	0.20	0.25
	WS-10	0.020	ha	R=	0.20	0.25
	Total Uncontolled =	**0.049**	**ha**	**∑R=**	**0.20**	**0.25**

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	100.01	52.55	12.43	2.84	15.27
15	83.56	80.20	61.00	12.43	2.28	14.71
20	70.25	67.43	66.00	12.43	1.92	14.35
25	60.90	58.45	69.03	12.43	1.66	14.09
30	53.93	51.76	70.80	12.43	1.47	13.90
35	48.52	46.57	71.70	12.43	1.32	13.75
40	44.18	42.41	71.96	12.43	1.21	13.64
45	40.63	39.00	71.74	12.43	1.11	13.54
50	37.65	36.14	71.14	12.43	1.03	13.46
55	35.12	33.71	70.24	12.43	0.96	13.39
60	32.94	31.62	69.09	12.43	0.90	13.33
65	31.04	29.80	67.74	12.43	0.85	13.28
70	29.37	28.19	66.21	12.43	0.80	13.23
75	27.89	26.77	64.53	12.43	0.76	13.19
80	26.56	25.50	62.72	12.43	0.73	13.15
85	25.37	24.35	60.80	12.43	0.69	13.12
90	24.29	23.31	58.77	12.43	0.66	13.09
95	23.31	22.37	56.66	12.43	0.64	13.07
100	22.41	21.51	54.47	12.43	0.61	13.04
105	21.58	20.72	52.21	12.43	0.59	13.02
110	20.82	19.99	49.88	12.43	0.57	13.00
115	20.12	19.31	47.49	12.43	0.55	12.98
120	19.47	18.69	45.05	12.43	0.53	12.96

*Average release rate taken as 50% of max. allowable controlled release rate for storage calculations

On-site stormwater detention

Storage required = 71.96 m^3
Underground Storage provided = 90.76 m^3 (StormTech Chambers)

LRL File No. 210691
Project: Proposed Development-Halo Car Wash
Location: 3555 Borrisokane Rd (Barrhaven, ON)
Date: July 7, 2023
Designed: M. Longtin
Checked: M. Basnet
Drawing Ref.: C701, C702

Stormwater Management Design Sheet

STORM - 2 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 (2-Yr)

$I_2 = 732.951 / (Td + 6.199)^{0.810}$ **A =** 732.951 **B =** 0.810 **C =** 6.199

C =	0.20	max of 0.5 as per City of Ottawa
I =	76.8	mm/hr
Tc =	10	min
Total Area =	0.534	ha
Release Rate =	22.82	L/s

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
Release Rate =	30.95	L/s

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 =	0.20	max of 0.5 as per City of Ottawa
I =	178.6	mm/hr
Tc =	10	min
Total Area =	0.534	ha
Release Rate =	52.99	L/s

Allowable Release Rate = 30.95 L/s
(5-yr pre-development level corresponding to EWS-01, see drawing C701)

Post-development Stormwater Management

					$\sum R_{2\&5}$	$\sum R_{100}$
	Total Site Area =	**0.534**	ha	**∑R=**	**0.67**	**0.83**
Controlled	WS-01A	0.045	ha	R=	0.29	0.36
	WS-01B	0.017	ha	R=	0.79	0.99
	WS-02	0.049	ha	R=	0.90	1.00
	WS-03	0.030	ha	R=	0.87	1.00
	WS-04	0.101	ha	R=	0.58	0.73
	WS-05	0.053	ha	R=	0.90	1.00
	WS-06	0.123	ha	R=	0.87	1.00
	WS-07	0.039	ha	R=	0.76	0.95
	WS-08	0.027	ha	R=	0.20	0.25
	Total Contolled =	**0.485**	**ha**	**∑R=**	**0.71**	**0.89**
Uncontrolled	WS-09	0.029	ha	R=	0.20	0.25
	WS-10	0.020	ha	R=	0.20	0.25
	Total Uncontolled =	**0.049**	**ha**	**∑R=**	**0.20**	**0.25**

LRL File No. 210691
Project: Proposed Development-Halo Car Wash
Location: 3555 Borrisokane Rd (Barrhaven, ON)
Date: July 7, 2023
Designed: M. Longtin
Checked: M. Basnet
Drawing Ref.: C701, C702

Stormwater Management Design Sheet

Post-development Stormwater Management (2-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	76.81	73.72	36.78	12.43	2.10	14.53
15	61.77	59.29	42.17	12.43	1.69	14.12
20	52.03	49.94	45.02	12.43	1.42	13.85
25	45.17	43.35	46.39	12.43	1.23	13.66
30	40.04	38.44	46.81	12.43	1.09	13.52
35	36.06	34.61	46.58	12.43	0.98	13.41
40	32.86	31.55	45.88	12.43	0.90	13.33
45	30.24	29.03	44.81	12.43	0.83	13.26
50	28.04	26.92	43.46	12.43	0.77	13.20
55	26.17	25.12	41.88	12.43	0.71	13.14
60	24.56	23.57	40.11	12.43	0.67	13.10
65	23.15	22.22	38.19	12.43	0.63	13.06
70	21.91	21.03	36.14	12.43	0.60	13.03
75	20.81	19.98	33.97	12.43	0.57	13.00
80	19.83	19.03	31.70	12.43	0.54	12.97
85	18.94	18.18	29.35	12.43	0.52	12.95
90	18.14	17.41	26.92	12.43	0.50	12.93
95	17.41	16.71	24.42	12.43	0.48	12.91
100	16.75	16.07	21.87	12.43	0.46	12.89
105	16.13	15.49	19.26	12.43	0.44	12.87
110	15.57	14.94	16.60	12.43	0.43	12.85
115	15.05	14.44	13.89	12.43	0.41	12.84
120	14.56	13.98	11.15	12.43	0.40	12.83

*Average release rate taken as 50% of max. allowable controlled release rate for storage calculation

On-site stormwater detention

Storage required = **46.81** **m^3**

Underground Storage provided = 90.76 m^3 (StormTech Chambers)

LRL Associates Ltd.

Storm Design Sheet

LRL File No.	210691
Project:	Proposed Development-Halo Car Wash
Location:	3555 Borrisokane Rd (Barrhaven, ON)
Date:	July 7, 2023
Designed:	M. Longtin
Checked:	M. Basnet
Drawing Reference:	C702, C401

Storm Design Parameters

Rational Method
Q = 2.78CIA
Q = Peak flow (L/s)
A = Drainage area (ha)
C = Runoff coefficient
I = Rainfall intensity (mm/hr)

Runoff Coefficient (C)

Grass	0.20
Gravel	0.80
Asphalt / rooftop	0.90

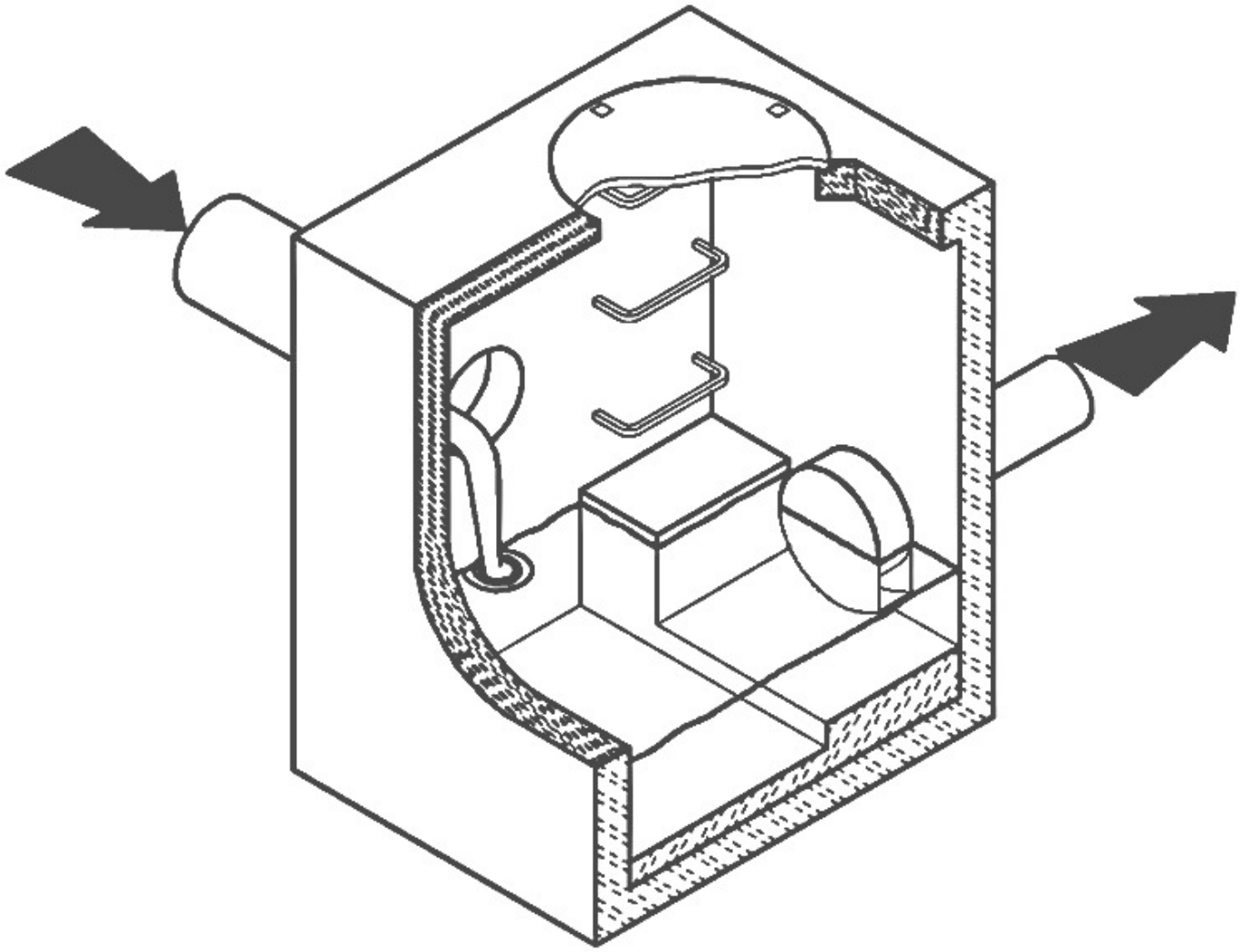
City of Ottawa IDF curve equation
(5 year event, intensity in mm/hr)
$I_5 = 998.071 / (Td + 6.053)^{0.814}$
Min. velocity = 0.80 m/s
Manning's "n" = 0.013

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-01A	CB01	CBMH02	0.040	0.000	0.006	0.04	0.04	10.00	104.19	3.73		250	PVC	0.45%	8.60	39.9	0.81	0.18	0.09
WS-01B	CBMH02	CBMH03	0.003	0.000	0.015	0.04	0.07	10.18	103.27	7.63		250	PVC	0.45%	22.9	39.9	0.81	0.47	0.19
WS-02	CB11	CBMH12	0.000	0.000	0.049	0.12	0.12	10.00	104.19	12.83		250	PVC	0.50%	8.4	42.0	0.86	0.16	0.31
	CBMH12	CBMH03					0.12	10.16	103.34	12.72		250	PVC	0.45%	10.4	39.9	0.81	0.21	0.32
WS-03	CBMH03	CBMH05	0.001	0.000	0.028	0.07	0.27	10.38	102.24	27.43		300	PVC	0.35%	16.7	57.2	0.81	0.34	0.48
WS-04	CB04	CBMH05	0.046	0.000	0.055	0.16	0.16	10.00	104.19	17.02		250	PVC	0.45%	14.9	39.9	0.81	0.31	0.43
WS-05	CBMH05	CBMH06	0.000	0.000	0.053	0.13	0.56	10.47	101.78	57.50		375	PVC	0.25%	21.7	87.7	0.79	0.46	0.66
WS-06	CBMH06	MH08	0.005	0.000	0.118	0.30	0.86	10.92	99.55	85.90		450	PVC	0.21%	21.8	130.7	0.82	0.44	0.66
WS-07	CBMH07	MH08	0.008	0.000	0.031	0.08	0.08	10.00	104.19	8.52		250	PVC	0.45%	10.0	39.9	0.81	0.21	0.21
	MH08	StormTech Chambers					0.94	11.13	98.58	93.13									
WS-08	CBMH09	MH10	0.027	0.000	0.000	0.02	0.02	10.00	104.19	1.58		250	PVC	0.50%	7.3	42.0	0.86	0.14	0.04
	MH10	StormTech Chambers					0.02												
	MH11 w/ ICD	OGS					0.96	11.13	98.58	94.63	24.86	250	PVC	1.00%	3.5	59.5	1.21	0.05	0.42
	OGS	Ex. STM					0.96	11.18	98.36	94.41	24.86	250	PVC	1.00%	9.5	59.5	1.21	0.13	0.42

Note
The Peak flow will be controlled by an ICD at the outlet of STM MH11

CSO/STORMWATER MANAGEMENT

HYDROVEX® VHV / SVHV
Vertical Vortex Flow Regulator



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APPLICATIONS

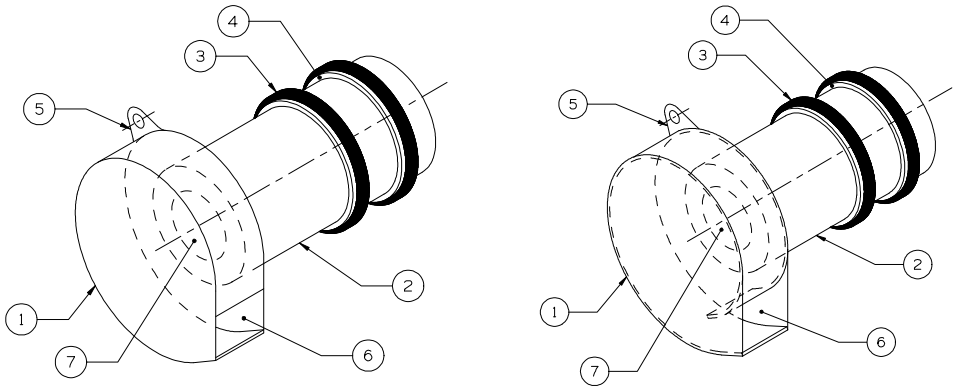
One of the major problems of urban wet weather flow management is the runoff generated after a heavy rainfall. During a storm, uncontrolled flows may overload the drainage system and cause flooding. Due to increased velocities, sewer pipe wear is increased dramatically and results in network deterioration. 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.

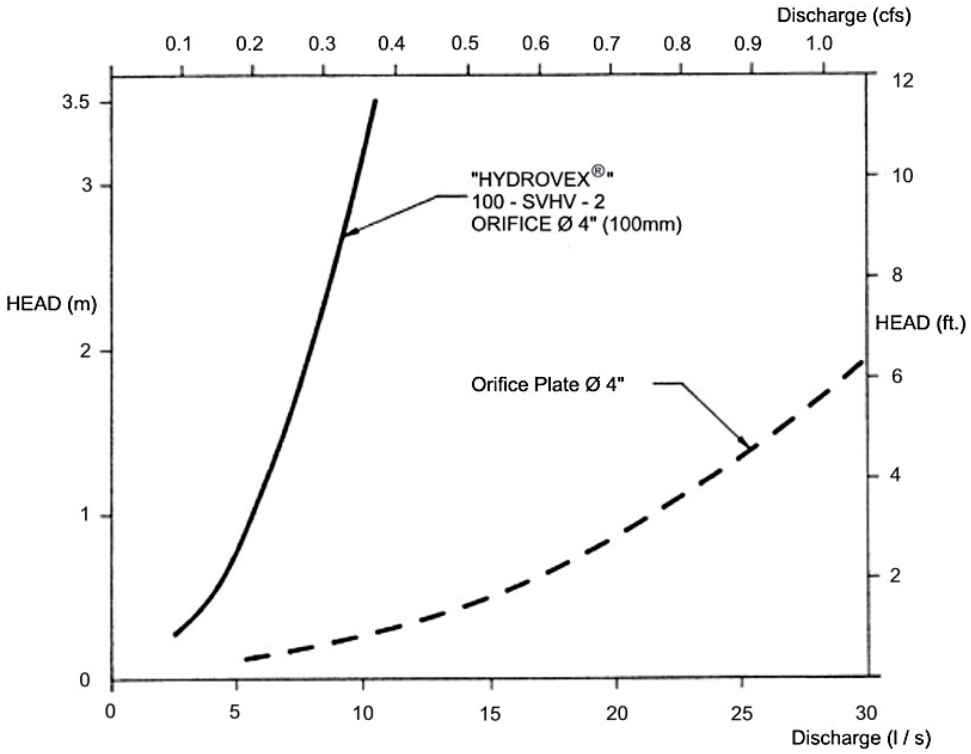


FIGURE 2: DISCHARGE CURVE SHOWING A HYDROVEX® FLOW REGULATOR VS AN ORIFICE PLATE

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:

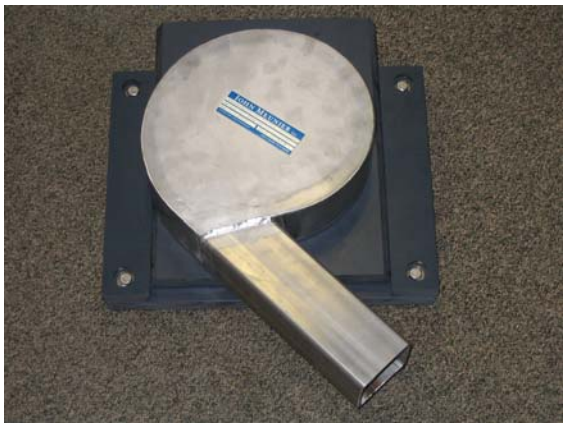
- ***project design flow rate***
- ***pressure head***
- ***chamber's outlet pipe diameter and type***

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

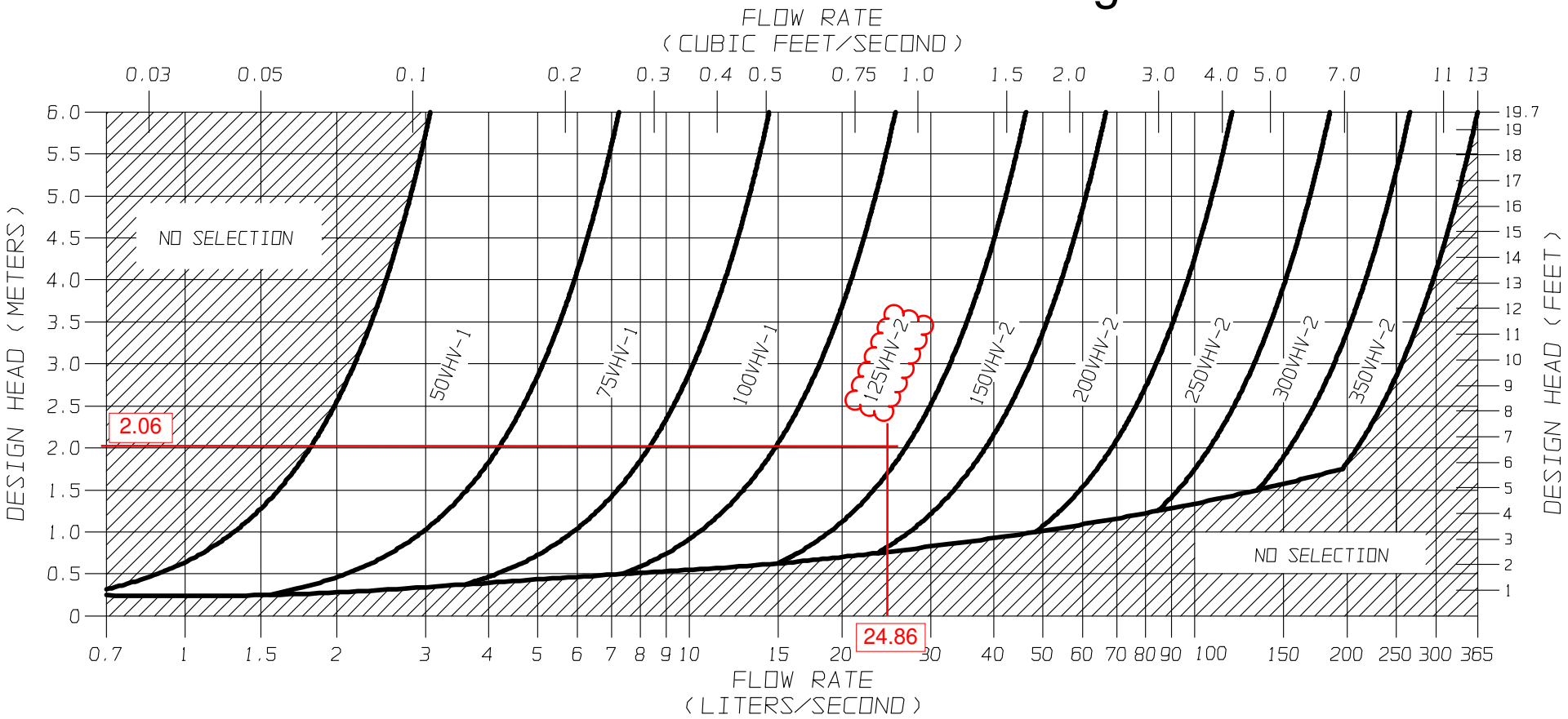


FIGURE 3 - VHV

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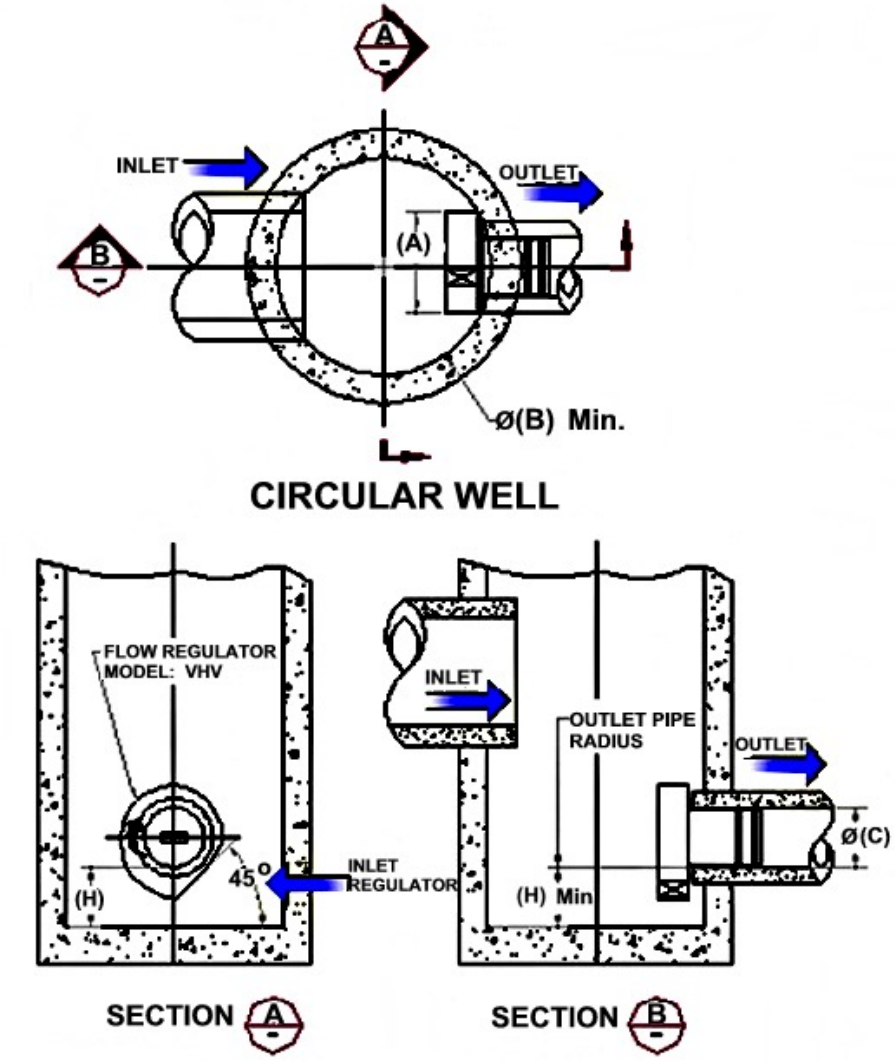
FLOW REGULATOR TYPICAL INSTALLATION IN CIRCULAR MANHOLE
FIGURE 4 (MODEL VHV)

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

ADS Treatment Train Sizing

Project Name:	Halo Car Wash - 3555 Borrisokane Road
Consulting Engineer:	LRL Engineering
Location:	Barrhaven, ON
Sizing Completed By:	Haider Nasrullah

Email: haider.nasrullah@adspipe.com

Summary of Results	
Isolator Row PLUS TSS Removal:	80.9%
FD-4HC TSS Removal:	53.0%
Combined TSS Removal:	**90.9%**
Total Volume Treated:	**90.0%**

Site Details	
Site Area (ha):	0.485
Rational C:	0.71
Particle Size Distribution:	ETV
Rainfall Station:	Ottawa, ONT

Notes: OGS results based on ETV PSD and results from ETV testing protocols.

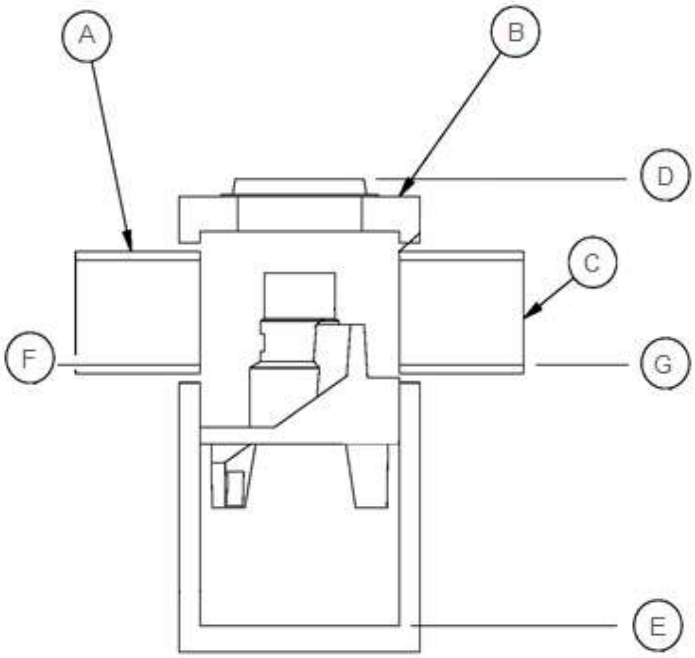
Individual OGS Results		
Model	**TSS Removal**	**Volume Treated**
FD-4HC	53.0%	>90%
FD-5HC	56.0%	>90%
FD-6HC	59.0%	>90%
FD-8HC	63.0%	>90%
FD-10HC	66.0%	>90%

Stormtech Details	
Chamber Model:	MC-7200
No. Chambers in Isolator Row PLUS:	4
Volume Treated by Isolator Row PLUS:	99.6%

Notes: Refer to Stormtech drawings for full IR+ configuration.

Isolator Row PLUS must include Flared End Ramp (FLAMP) for proper performance.

Overall System Capacities	
Total Sediment Storage Capacity:	2.18 m³
Oil Storage Capacity:	723 L
Max. OGS Pipe Diameter:	600 mm
Peak OGS Flow Capacity:	510 L/s
Peak Stormtech Inlet Flow Capacity:	311 L/s
Peak IR PLUS Water Quality Flow:	51.8 L/s



OGS Specifications	
Inlet Pipe Diameter (A):	450 mm
Unit Diameter (B):	1,200 mm
Outlet Pipe Diameter (C):	450 mm
Rim Elevation (D):	93.70 m
Bottom of Sump Elevation (E):	89.15 m
Inlet Pipe Elevation (F):	91.14 m
Outlet Pipe Elevation (G):	90.65 m

Notes:

Isolator Row PLUS removal efficiency based on verified ETV test report. For dimensions and configuration of Isolator Row PLUS, please see Stormtech drawing package.

Project Name: Halo Car Wash - 3555 Borrisokane Road
Consulting Engineer: LRL Engineering
Location: Barrhaven, ON

Net Annual Removal Efficiency Summary

Rainfall Intensity	Fraction of Rainfall	Removal Efficiency		Combined Removal Efficiency	Combined Weighted Removal Efficiency
		FD-4HC	IR PLUS(2)		
mm/hr	%	%	%	%	%
0.50	0.1%	68.1%	81.2%	94.0%	0.1%
1.00	14.1%	63.2%	81.2%	93.1%	13.1%
1.50	14.2%	60.2%	81.2%	92.5%	13.1%
2.00	14.1%	58.2%	81.2%	92.1%	13.0%
2.50	4.2%	56.6%	81.2%	91.8%	3.8%
3.00	1.5%	55.2%	81.2%	91.6%	1.4%
3.50	8.5%	54.1%	81.2%	91.4%	7.8%
4.00	5.4%	53.2%	81.2%	91.2%	5.0%
4.50	1.2%	52.3%	81.2%	91.0%	1.1%
5.00	5.5%	51.6%	81.2%	90.9%	5.0%
6.00	4.3%	50.3%	81.2%	90.6%	3.9%
7.00	4.5%	49.1%	81.2%	90.4%	4.1%
8.00	3.1%	48.2%	81.2%	90.3%	2.8%
9.00	2.3%	47.3%	81.2%	90.1%	2.1%
10.00	2.6%	46.6%	81.2%	90.0%	2.3%
20.00	9.2%	41.6%	81.2%	89.0%	8.2%
30.00	2.6%	38.7%	81.2%	88.5%	2.3%
40.00	1.2%	36.6%	81.2%	88.1%	1.0%
50.00	0.5%	0.0%	81.2%	81.2%	0.4%
100.00	0.7%	0.0%	44.0%	44.0%	0.3%
150.00	0.1%	0.0%	29.3%	29.3%	0.0%
200.00	0.0%	0.0%	22.0%	22.0%	0.0%
		Total Net Annual Removal Efficiency			**90.9%**
		Total Runoff Volume Treated			**90.0%**

Notes:

(1) Rainfall Data: 1960:2007, HLY03, Ottawa, ONT, 6105976 & 6105978.

(2) IR PLUS removal based on ETV PSD and ETV protocols.

(3) Rainfall adjusted to 5 min peak intensity based on hourly average.

(4) Combined removal efficiencies calculated based on NCDENR Stormwater BMP Manual, Section 3.9.4, where Total Removal Efficiency = 1st BMP Efficiency + 2nd BMP Efficiency - (1st BMP Efficiency x 2nd BMP Efficiency)

PROJECT INFORMATION	
ENGINEERED PRODUCT MANAGER:	HAIDER NASRULLAH 647-850-9417 HAIDER.NASRULLAH@ADSPIPE.COM
ADS SALES REP:	RYAN MARTIN 705-207-2059 RYAN.MARTIN@ADSPIPE.COM
PROJECT NO:	S359205
ONTARIO SITE COORDINATOR:	RYAN RUBENSTEIN 519-710-3687 RYAN.RUBENSTEIN@ADS-PIPE.COM

Advanced Drainage Systems, Inc.

SiteAssist™
FOR STORMTECH
INSTALLATION INSTRUCTIONS
VISIT OUR APP

HALO CAR WASH

BARRHAVEN, ON

MC-3500 STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH MC-3500.
2. CHAMBERS SHALL BE ARCH-SHAPED AND SHALL BE MANUFACTURED FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE COPOLYMERS.
3. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 45x76 DESIGNATION SS.
4. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORTS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
5. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
6. CHAMBERS SHALL BE DESIGNED, TESTED AND ALLOWABLE LOAD CONFIGURATIONS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS". LOAD CONFIGURATIONS SHALL INCLUDE: 1) INSTANTANEOUS (<1 MIN) AASHTO DESIGN TRUCK LIVE LOAD ON MINIMUM COVER 2) MAXIMUM PERMANENT (75-YR) COVER LOAD AND 3) ALLOWABLE COVER WITH PARKED (1-WEEK) AASHTO DESIGN TRUCK.
7. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 450 LBS/FT/%. THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.
8. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. UPON REQUEST BY THE SITE DESIGN ENGINEER OR OWNER, THE CHAMBER MANUFACTURER SHALL SUBMIT A STRUCTURAL EVALUATION FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE AS FOLLOWS:
   - THE STRUCTURAL EVALUATION SHALL BE SEALED BY A REGISTERED PROFESSIONAL ENGINEER.
   - THE STRUCTURAL EVALUATION SHALL DEMONSTRATE THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY SECTIONS 3 AND 12.12 OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR THERMOPLASTIC PIPE.
   - THE TEST DERIVED CREEP MODULUS AS SPECIFIED IN ASTM F2418 SHALL BE USED FOR PERMANENT DEAD LOAD DESIGN EXCEPT THAT IT SHALL BE THE 75-YEAR MODULUS USED FOR DESIGN.
9. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF MC-3500 CHAMBER SYSTEM

1. STORMTECH MC-3500 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH MC-3500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR AN EXCAVATOR SITUATED OVER THE CHAMBERS. STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - STONESHOOTER LOCATED OFF THE CHAMBER BED.
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM - 6" (150 mm) SPACING BETWEEN THE CHAMBER ROWS.
7. INLET AND OUTLET MANIFOLDS MUST BE INSERTED A MINIMUM OF 12" (300 mm) INTO CHAMBER END CAPS.
8. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE MEETING THE AASHTO M43 DESIGNATION OF #3 OR #4.
9. STONE MUST BE PLACED ON THE TOP CENTER OF THE CHAMBER TO ANCHOR THE CHAMBERS IN PLACE AND PRESERVE ROW SPACING.
10. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIALS BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
11. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

1. STORMTECH MC-3500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
2. THE USE OF EQUIPMENT OVER MC-3500 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADER, DUMP TRUCK, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. FULL 36" (900 mm) OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY USING THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

CONTACT STORMTECH AT 1-888-892-2694 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

PROPOSED LAYOUT

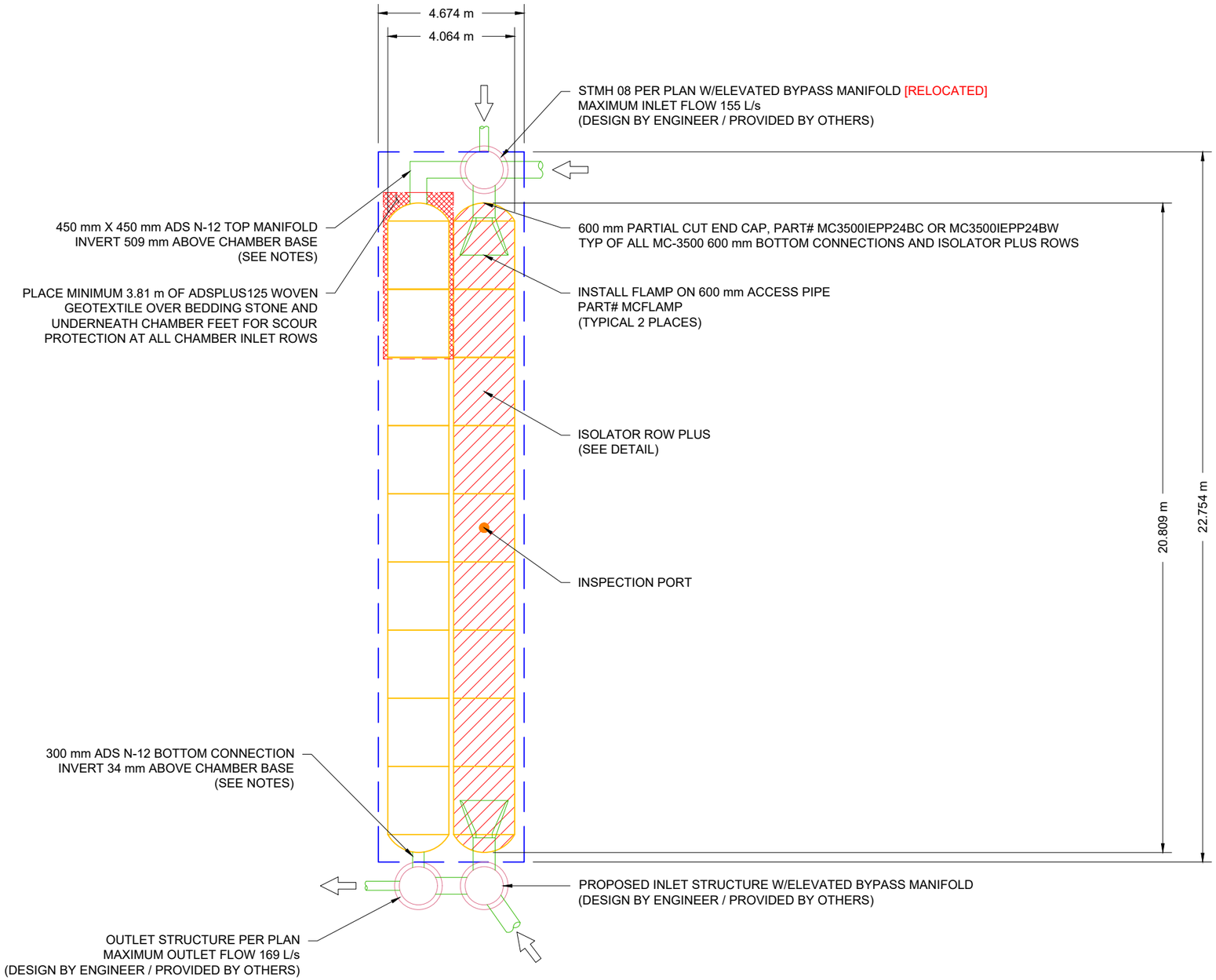
18	STORMTECH MC-3500 CHAMBERS
4	STORMTECH MC-3500 END CAPS
305	STONE ABOVE (mm)
229	STONE BELOW (mm)
40	% STONE VOID
93.1	**INSTALLED SYSTEM VOLUME (m³) ABOVE ELEVATION 91.202 (PERIMETER STONE INCLUDED)**
106.3	SYSTEM AREA (m²)
54.8	SYSTEM PERIMETER (m)

PROPOSED ELEVATIONS

94.749	MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):
92.921	MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):
92.768	MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):
92.768	MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):
92.768	MINIMUM ALLOWABLE GRADE (TOP OF RIGID PAVEMENT):
92.616	TOP OF STONE:
92.311	TOP OF MC-3500 CHAMBER:
91.677	450 mm TOP MANIFOLD INVERT:
91.220	600 mm ISOLATOR ROW PLUS INVERT:
91.202	300 mm BOTTOM CONNECTION INVERT:
91.168	BOTTOM OF MC-3500 CHAMBER:
90.939	BOTTOM OF STONE:

NOTES

- MANIFOLD SIZE TO BE DETERMINED BY SITE DESIGN ENGINEER. SEE TECHNICAL NOTE 6.32 FOR MANIFOLD SIZING GUIDANCE.
- DUE TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONSTRAINTS, IT MAY BE NECESSARY TO CUT AND COUPLE ADDITIONAL PIPE TO STANDARD MANIFOLD COMPONENTS IN THE FIELD.
- THE SITE DESIGN ENGINEER MUST REVIEW ELEVATIONS AND IF NECESSARY ADJUST GRADING TO ENSURE THE CHAMBER COVER REQUIREMENTS ARE MET.
- THIS CHAMBER SYSTEM WAS DESIGNED WITHOUT SITE-SPECIFIC INFORMATION ON SOIL CONDITIONS OR BEARING CAPACITY. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR DETERMINING THE SUITABILITY OF THE SOIL AND PROVIDING THE BEARING CAPACITY OF THE INSITU SOILS. THE BASE STONE DEPTH MAY BE INCREASED OR DECREASED ONCE THIS INFORMATION IS PROVIDED.



HALO CAR WASH

BARRHAVEN, ON

DATE: 06/09/2023 DRAWN: JF

PROJECT #: S359205 CHECKED: XXX

DATE	DRWN	CHKD	DESCRIPTION
6/29/23	RCT	RCT	REVISED PER NEW PLAN

StormTech® Chamber System

888-892-2694 | WWW.STORMTECH.COM

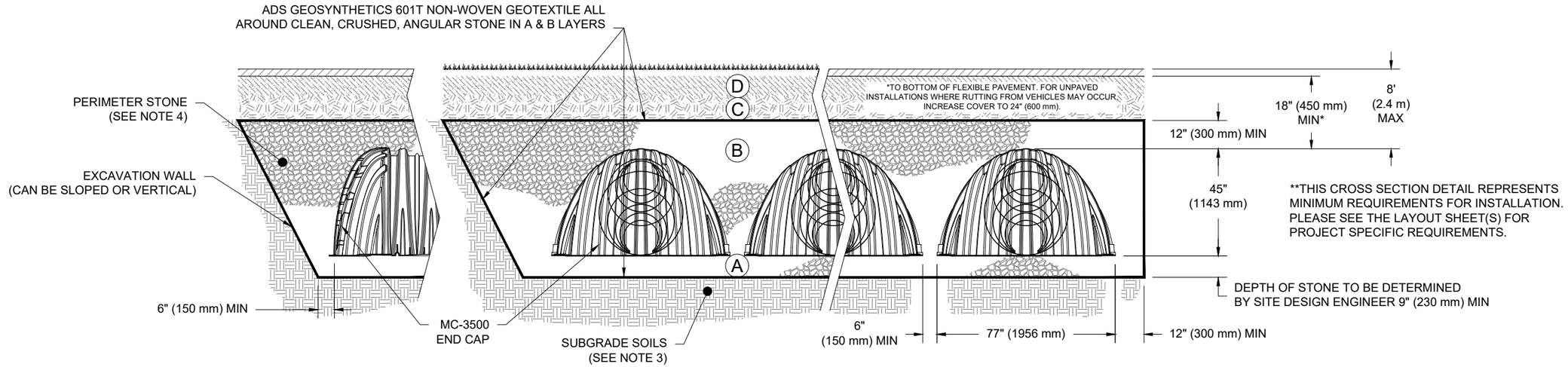
4640 TRUEMAN BLVD
HILLIARD, OH 43026

SCALE = 1 : 150

ACCEPTABLE FILL MATERIALS: STORMTECH MC-3500 CHAMBER SYSTEMS

MATERIAL LOCATION		DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 24" (600 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 24" (600 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS.
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 4	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 4	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE.[2,3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9" (230 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.



NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 45x76 DESIGNATION SS.
2. MC-3500 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT AS DEFINED IN SECTION 6.2.8 OF ASTM F2418 SHALL BE GREATER THAN OR EQUAL TO 500 LBS/FT/%. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

HALO CAR WASH
BARRHAVEN, ON
DATE: 06/09/2023 DRAWN: JF
PROJECT #: S359205 CHECKED: XXX

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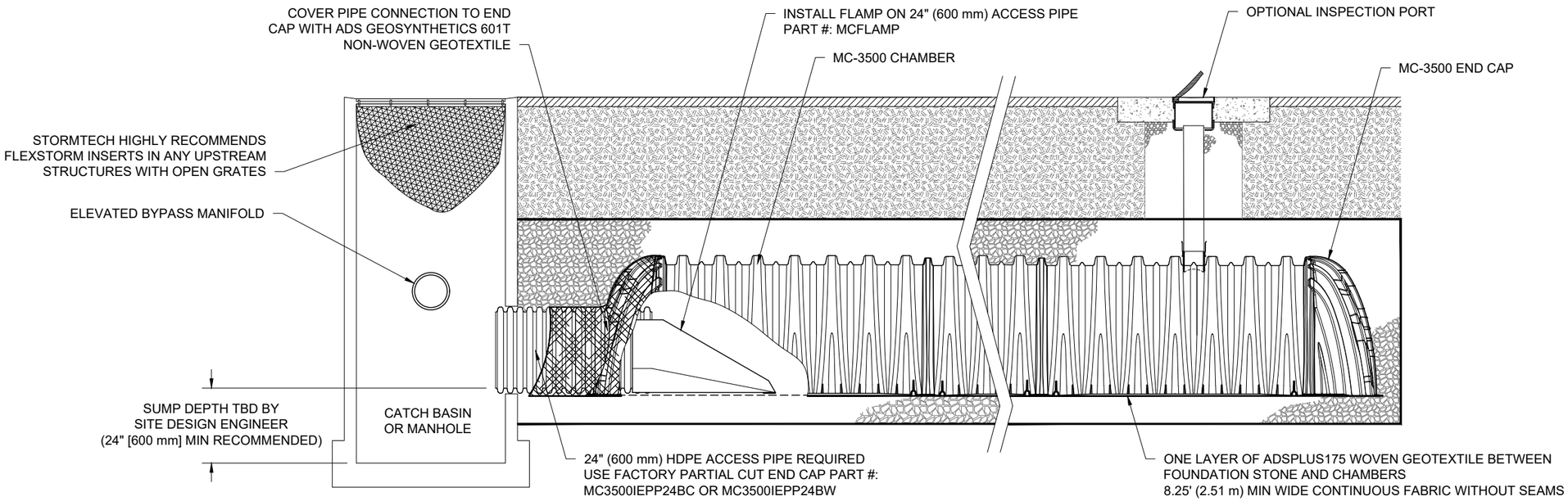
ADS
4640 TRUEMAN BLVD
HILLIARD, OH 43026



MC-3500 ISOLATOR ROW PLUS DETAIL
NTS

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW PLUS FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW PLUS FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR PLUS ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW PLUS THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

STEP 2) CLEAN OUT ISOLATOR ROW PLUS USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

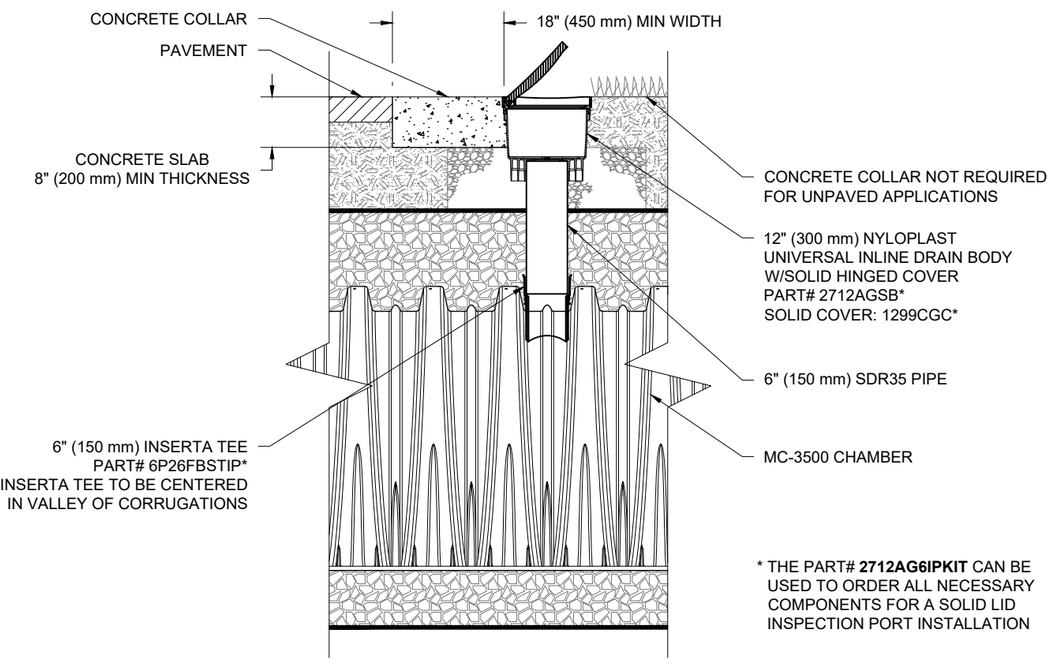
STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.

2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.



* THE PART# **2712AG6IPKIT** CAN BE USED TO ORDER ALL NECESSARY COMPONENTS FOR A SOLID LID INSPECTION PORT INSTALLATION

MC-3500 6" (150 mm) INSPECTION PORT DETAIL
NTS

HALO CAR WASH
BARRHAVEN, ON
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PROJECT #: S359205 CHECKED: XXX

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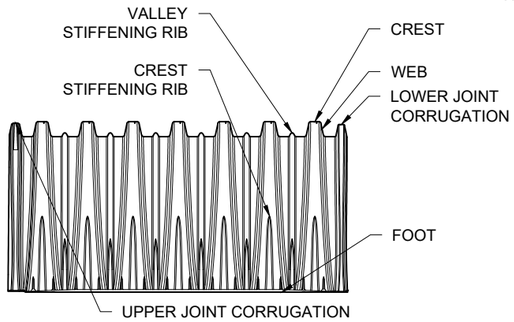
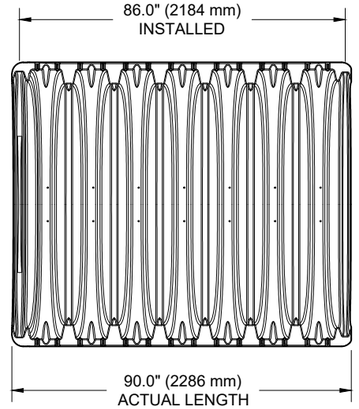
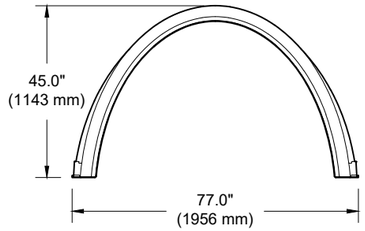
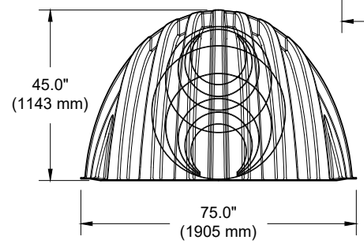
MC-3500 TECHNICAL SPECIFICATION

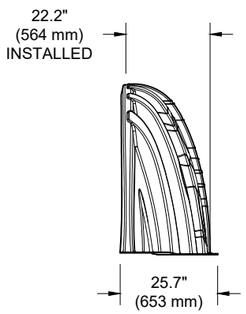
NTS











NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	77.0" X 45.0" X 86.0"	(1956 mm X 1143 mm X 2184 mm)
CHAMBER STORAGE	109.9 CUBIC FEET	(3.11 m³)
MINIMUM INSTALLED STORAGE*	175.0 CUBIC FEET	(4.96 m³)
WEIGHT	134 lbs.	(60.8 kg)

NOMINAL END CAP SPECIFICATIONS

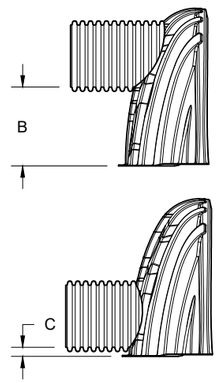
SIZE (W X H X INSTALLED LENGTH)	75.0" X 45.0" X 22.2"	(1905 mm X 1143 mm X 564 mm)
END CAP STORAGE	14.9 CUBIC FEET	(0.42 m³)
MINIMUM INSTALLED STORAGE*	45.1 CUBIC FEET	(1.28 m³)
WEIGHT	49 lbs.	(22.2 kg)

*ASSUMES 12" (305 mm) STONE ABOVE, 9" (229 mm) STONE FOUNDATION, 6" (152 mm) STONE BETWEEN CHAMBERS, 6" (152 mm) STONE PERIMETER IN FRONT OF END CAPS AND 40% STONE POROSITY.

PARTIAL CUT HOLES AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
PARTIAL CUT HOLES AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"
END CAPS WITH A PREFABRICATED WELDED STUB END WITH "W"
END CAPS WITH A WELDED CROWN PLATE END WITH "C"

PART #	STUB	B	C
MC3500IEPP06T	6" (150 mm)	33.21" (844 mm)	---
MC3500IEPP06B		---	0.66" (17 mm)
MC3500IEPP08T	8" (200 mm)	31.16" (791 mm)	---
MC3500IEPP08B		---	0.81" (21 mm)
MC3500IEPP10T	10" (250 mm)	29.04" (738 mm)	---
MC3500IEPP10B		---	0.93" (24 mm)
MC3500IEPP12T	12" (300 mm)	26.36" (670 mm)	---
MC3500IEPP12B		---	1.35" (34 mm)
MC3500IEPP15T	15" (375 mm)	23.39" (594 mm)	---
MC3500IEPP15B		---	1.50" (38 mm)
MC3500IEPP18TC	18" (450 mm)	20.03" (509 mm)	---
MC3500IEPP18TW			
MC3500IEPP18BC		---	1.77" (45 mm)
MC3500IEPP18BW			
MC3500IEPP24TC	24" (600 mm)	14.48" (368 mm)	---
MC3500IEPP24TW			
MC3500IEPP24BC		---	2.06" (52 mm)
MC3500IEPP24BW			
MC3500IEPP30BC	30" (750 mm)	---	2.75" (70 mm)

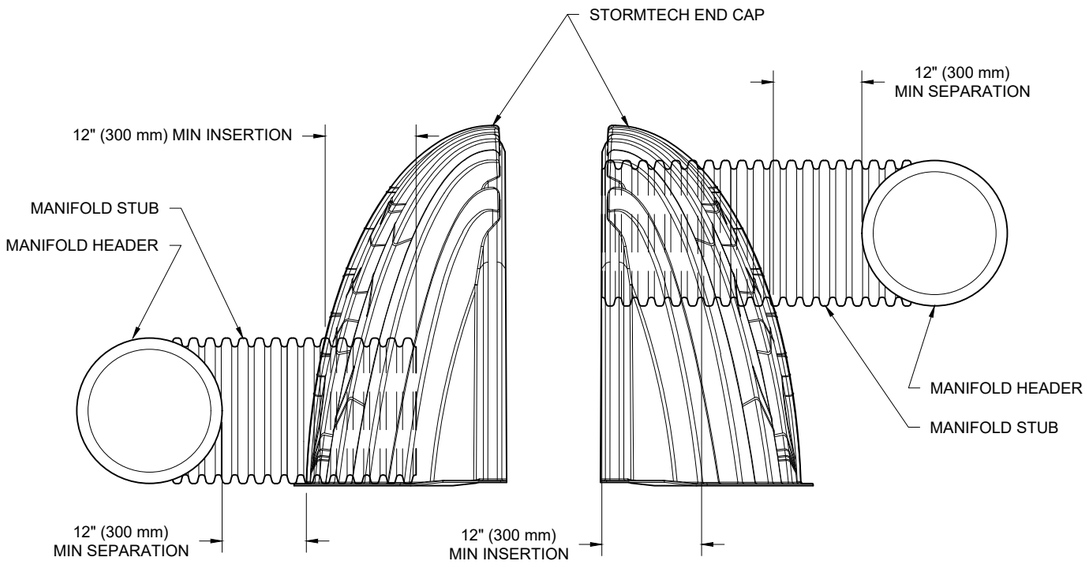
NOTE: ALL DIMENSIONS ARE NOMINAL



CUSTOM PARTIAL CUT INVERTS ARE AVAILABLE UPON REQUEST. INVENTORIED MANIFOLDS INCLUDE 12-24" (300-600 mm) SIZE ON SIZE AND 15-48" (375-1200 mm) ECCENTRIC MANIFOLDS. CUSTOM INVERT LOCATIONS ON THE MC-3500 END CAP CUT IN THE FIELD ARE NOT RECOMMENDED FOR PIPE SIZES GREATER THAN 10" (250 mm). THE INVERT LOCATION IN COLUMN 'B' ARE THE HIGHEST POSSIBLE FOR THE PIPE SIZE.

MC-SERIES END CAP INSERTION DETAIL

NTS



NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL FOR A PROPER FIT IN END CAP OPENING.

HALO CAR WASH
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ADS
4640 TRUEMAN BLVD
HILLIARD, OH 43026

PROP STM CB07
(1200mmØ)
T/G = 93.15
SE INV = 91.32

PROP STM 14.9m - 250mmØ PVC DR-3

PROP STM CBMH06
(1200mmØ)
T/G = 93.05
SW INV = 91.36
NE INV = 91.39

PROP SAN MH01
T/G = 93.12
SE INV = 91.12
SW INV = 90.98
NE INV = 90.95

PROP STM 10.0m - 250mmØ PVC DR-35 @ 0.45%

PROP STM 21.7m - 375mmØ
PVC DR-35 @ 0.25%

PROP STM MH08
(1200mmØ)
T/G = 93.37
NW INV = 91.28
SE INV = 91.25
NE INV = 91.32

PROP STM 21.8m - 450mmØ PVC DR-35 @ 0.20%

INV. = 91.69
(OBV TO OBV)

PROP STM 13.5m - 450mmØ PVC DR-35 @ 0.20%

PROP. 15.2m - 150mmØ PVC
ROOF DRAIN LEAD @ 2.0%
INV. AT MAIN = 91.65
INV. AT BLDG = 91.95

PROP SAN 19.4m - 150mmØ
PVC DR-35 @ 1.00%

PROP STM 2.1m - 250mmØ PVC DR-35 @ 0.94%

PROP STM DIVERSION MH
T/G = 93.70
DIVERSION WEIR ELEV = 91.16
S INV = 90.87
SW INV = 90.87
NE INV = 91.14

PROP STM CBMH10
C/W HYDROVEX 125 VHV-2
OR EQUIVALENT
(Q=24.86L/s, H=2.04m)
(1200mmØ)
T/G = 93.70
SW INV = 91.16
NW INV = 91.22
SE INV = 91.28

INV. = 91.80

PROP. 11.0m - 100mmØ
PVC DR-35 @ 1.00%

PROP STM 2.0m - 150mmØ PVC DR-35 @ 8.42%

PROP STM 2.8m - 250mmØ PVC DR-35 @ 2.00%

PROP RETURN MH
T/G = 93.70
SW INV = 90.65
NE INV = 90.81
E INV = 90.68

PROP SAN MH05
T/G = 93.36
SE INV = 91.39
NW INV = 91.39
NE INV = 91.49

30.0m

PROP STM 11.8m - 250mmØ PVC DR-35 @ 0.44%

EXIST CULVERT INV = 90.33
INV. = 90.60
c/w RODENT GRATE & RIP-RAP AT
OUTLET AS PER OPSD 810.010

PROP STM 2.0m - 200mmØ PVC DR-35 @ 8.47%

PROP STM JELLYFISH TREATMENT UNIT
T/G = 93.74
W INV = 90.85
N INV = 90.70

INV. = 91.76

PROP STM 3.5m - 150mmØ PVC DR-35 @ 2.00%

PROP STM CBMH09
(1200mmØ)
T/G = 93.15
NW INV = 91.36
N INV = 91.66

PROP STM 16.1m - 450mmØ PVC DR-35 @ 0.50%

DIRECTION OF TRAVEL

NEW
G.F.A = 533m²

TOP OF

Project: Halo Car Wash

Chamber Model -	MC-7200	
Units -	**Metric**	
Number of Chambers -	8	
Number of End Caps -	4	
Voids in the stone (porosity) -	40	%
Base of Stone Elevation -	90.93	m
Amount of Stone Above Chambers -	305	mm
Amount of Stone Below Chambers -	229	mm

78 sq.meters Min. Area - 57.13 sq.meters

☑ Include Perimeter Stone in Calculations

☐ Click for Stage Area Data

☐ Click to Invert Stage Area Data

Click Here for Imperial

StormTech MC-7200 Cumulative Storage Volumes

Height of System (mm)	Incremental Single Chamber (cubic meters)	Incremental Single End Cap (cubic meters)	Incremental Chambers (cubic meters)	Incremental End Cap (cubic meters)	Incremental Stone (cubic meters)	Incremental Ch, EC and Stone (cubic meters)	Cumulative System (cubic meters)	Elevation (meters)
2057	0.00	0.00	0.00	0.00	0.792	0.79	90.76	92.99
2032	0.00	0.00	0.00	0.00	0.792	0.79	89.96	92.97
2007	0.00	0.00	0.00	0.00	0.792	0.79	89.17	92.94
1981	0.00	0.00	0.00	0.00	0.792	0.79	88.38	92.91
1956	0.00	0.00	0.00	0.00	0.792	0.79	87.59	92.89
1930	0.00	0.00	0.00	0.00	0.792	0.79	86.79	92.86
1905	0.00	0.00	0.00	0.00	0.792	0.79	86.00	92.84
1880	0.00	0.00	0.00	0.00	0.792	0.79	85.21	92.81
1854	0.00	0.00	0.00	0.00	0.792	0.79	84.42	92.79
1829	0.00	0.00	0.00	0.00	0.792	0.79	83.63	92.76
1803	0.00	0.00	0.00	0.00	0.792	0.79	82.83	92.74
1778	0.00	0.00	0.00	0.00	0.792	0.79	82.04	92.71
1753	0.00	0.00	0.01	0.00	0.786	0.80	81.25	92.69
1727	0.01	0.00	0.04	0.00	0.773	0.82	80.45	92.66
1702	0.01	0.00	0.06	0.01	0.765	0.83	79.63	92.63
1676	0.01	0.00	0.08	0.01	0.757	0.85	78.80	92.61
1651	0.01	0.00	0.10	0.01	0.747	0.86	77.95	92.58
1626	0.02	0.00	0.17	0.01	0.720	0.90	77.09	92.56
1600	0.03	0.00	0.25	0.01	0.687	0.95	76.19	92.53
1575	0.04	0.00	0.30	0.02	0.665	0.98	75.24	92.51
1549	0.04	0.01	0.34	0.02	0.648	1.01	74.26	92.48
1524	0.05	0.01	0.37	0.02	0.632	1.03	73.25	92.46
1499	0.05	0.01	0.41	0.03	0.618	1.05	72.22	92.43
1473	0.05	0.01	0.43	0.03	0.606	1.07	71.17	92.41
1448	0.06	0.01	0.46	0.03	0.594	1.09	70.09	92.38
1422	0.06	0.01	0.49	0.04	0.583	1.11	69.00	92.36
1397	0.06	0.01	0.51	0.04	0.572	1.12	67.90	92.33
1372	0.07	0.01	0.53	0.04	0.562	1.14	66.78	92.30
1346	0.07	0.01	0.55	0.05	0.553	1.15	65.64	92.28
1321	0.07	0.01	0.57	0.05	0.544	1.16	64.49	92.25
1295	0.07	0.01	0.59	0.05	0.535	1.18	63.32	92.23
1270	0.08	0.01	0.61	0.06	0.527	1.19	62.15	92.20
1245	0.08	0.01	0.62	0.06	0.519	1.20	60.96	92.18
1219	0.08	0.02	0.64	0.06	0.512	1.21	59.76	92.15
1194	0.08	0.02	0.66	0.06	0.504	1.22	58.54	92.13
1168	0.08	0.02	0.67	0.07	0.498	1.23	57.32	92.10
1143	0.09	0.02	0.68	0.07	0.491	1.24	56.09	92.08
1118	0.09	0.02	0.70	0.07	0.484	1.25	54.84	92.05
1092	0.09	0.02	0.71	0.07	0.479	1.26	53.59	92.03
1067	0.09	0.02	0.72	0.08	0.472	1.27	52.33	92.00
1041	0.09	0.02	0.74	0.08	0.466	1.28	51.05	91.97
1016	0.09	0.02	0.75	0.08	0.461	1.29	49.77	91.95
991	0.09	0.02	0.76	0.08	0.455	1.30	48.48	91.92
965	0.10	0.02	0.77	0.09	0.450	1.31	47.19	91.90
940	0.10	0.02	0.78	0.09	0.445	1.31	45.88	91.87
914	0.10	0.02	0.79	0.09	0.440	1.32	44.57	91.85
889	0.10	0.02	0.80	0.09	0.435	1.33	43.25	91.82
864	0.10	0.02	0.81	0.09	0.431	1.33	41.92	91.80
838	0.10	0.02	0.82	0.10	0.427	1.34	40.59	91.77
813	0.10	0.02	0.83	0.10	0.423	1.35	39.25	91.75
787	0.10	0.03	0.83	0.10	0.418	1.35	37.90	91.72
762	0.11	0.03	0.84	0.10	0.414	1.36	36.55	91.70
737	0.11	0.03	0.85	0.10	0.411	1.36	35.19	91.67
711	0.11	0.03	0.86	0.10	0.408	1.37	33.83	91.64
686	0.11	0.03	0.86	0.11	0.404	1.37	32.46	91.62
660	0.11	0.03	0.87	0.11	0.401	1.38	31.08	91.59
635	0.11	0.03	0.88	0.11	0.398	1.38	29.70	91.57
610	0.11	0.03	0.88	0.11	0.394	1.39	28.32	91.54
584	0.11	0.03	0.89	0.11	0.393	1.39	26.93	91.52
559	0.11	0.03	0.89	0.11	0.389	1.40	25.54	91.49
533	0.11	0.03	0.90	0.11	0.386	1.40	24.14	91.47
508	0.11	0.03	0.90	0.12	0.384	1.40	22.74	91.44
483	0.11	0.03	0.91	0.12	0.381	1.41	21.34	91.42
457	0.11	0.03	0.91	0.12	0.379	1.41	19.93	91.39
432	0.11	0.03	0.92	0.12	0.377	1.41	18.52	91.36
406	0.12	0.03	0.92	0.12	0.375	1.42	17.11	91.34
381	0.12	0.03	0.93	0.12	0.374	1.42	15.69	91.31
356	0.12	0.03	0.93	0.12	0.372	1.42	14.27	91.29
330	0.12	0.03	0.93	0.12	0.370	1.43	12.85	91.26
305	0.12	0.03	0.94	0.12	0.368	1.43	11.42	91.24
279	0.12	0.03	0.94	0.12	0.367	1.43	9.99	91.21
254	0.12	0.03	0.94	0.13	0.364	1.43	8.56	91.19
229	0.00	0.00	0.00	0.00	0.792	0.79	7.13	91.16
203	0.00	0.00	0.00	0.00	0.792	0.79	6.34	91.14
178	0.00	0.00	0.00	0.00	0.792	0.79	5.54	91.11
152	0.00	0.00	0.00	0.00	0.792	0.79	4.75	91.09
127	0.00	0.00	0.00	0.00	0.792	0.79	3.96	91.06
102	0.00	0.00	0.00	0.00	0.792	0.79	3.17	91.03
76	0.00	0.00	0.00	0.00	0.792	0.79	2.38	91.01
51	0.00	0.00	0.00	0.00	0.792	0.79	1.58	90.98
25	0.00	0.00	0.00	0.00	0.792	0.79	0.79	90.96

StormTech® Isolator® Row Plus

The StormTech Isolator Row Plus is an enhancement to our proven water quality treatment system. This updated system is both a NJCAT and ETV verified water quality treatment device that can be incorporated into any system layout.

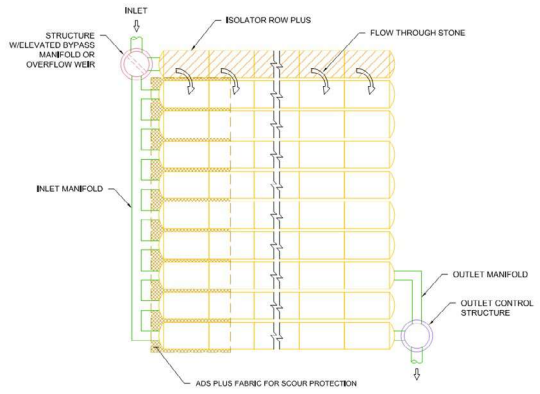
Features

- Isolator Row Plus is now ETV verified. As a Manufactured Treatment Device it achieves over 81% TSS removal per the ISO 14034:2016 ETV standard and the Canadian Environmental Technology Verification Process.
- A patented Flamp™ (Flared End Ramp) provides a smooth transition from pipe invert to fabric bottom. The FLAMP is attached to the inlet pipe inside the chamber end cap and improves chamber function over time by distributing sediment and debris that would otherwise collect at the inlet. It also serves to improve the fluid and solid flow back into the inlet pipe during maintenance and cleaning.
- Proprietary ADS Plus fabric maintains durability and sediment removal while allowing for higher water quality flow rates. A single layer of ADS Plus fabric is placed between the angular base stone and the Isolator Row Plus chambers.

Technology Descriptions

The Isolator Row Plus is designed to capture the "first flush" runoff and offers the versatility to be sized on a volume or a flow basis. Considered an LID (low impact development) technology, the Isolator Row Plus can be part of the treatment train design for water quality. An upstream manhole not only provides access to the Isolator Row Plus but includes a high/low concept such that stormwater flow rates or volumes that exceed the capacity of the Isolator Row Plus bypass through a manifold to the other chambers. This creates a differential between the Isolator Row Plus row of chambers and the manifold to the rest of the system, thus allowing for settlement time in the Isolator Row Plus. Stormwater is then either infiltrated into the soils below or passed at a controlled rate through an outlet manifold and outlet control structure.

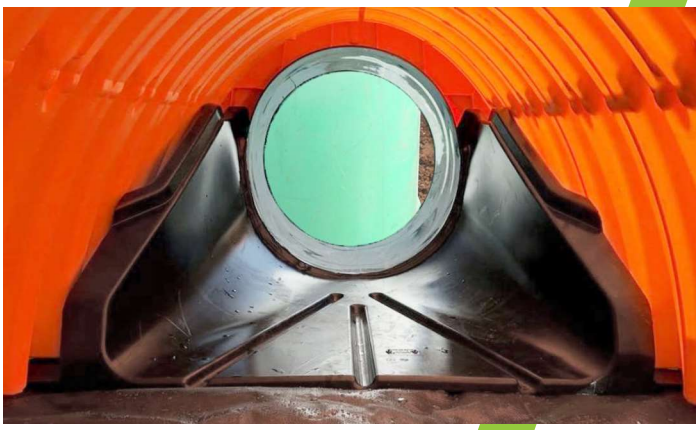
Schematic of the StormTech Isolator Row PLUS System



Summary of Verified Claims[1]

Maximum Treatment Flow Rate (MTFR) (L/s/m²)	2.8
Effective Filtration Treatment Area (m²)	5.06
Test Sediment Size (microns)	1-1000
Mean Particle Concentration (mg/L)	200
TSS Removal Efficiency	81%

[1] Verification of StormTech SC-740 Isolator Row PLUS test results in accordance with the ISO 14034:2016 ETV standard. The full Verification Statement for the StormTech SC-740 Isolator Row PLUS can be downloaded from the VerifiGlobal website

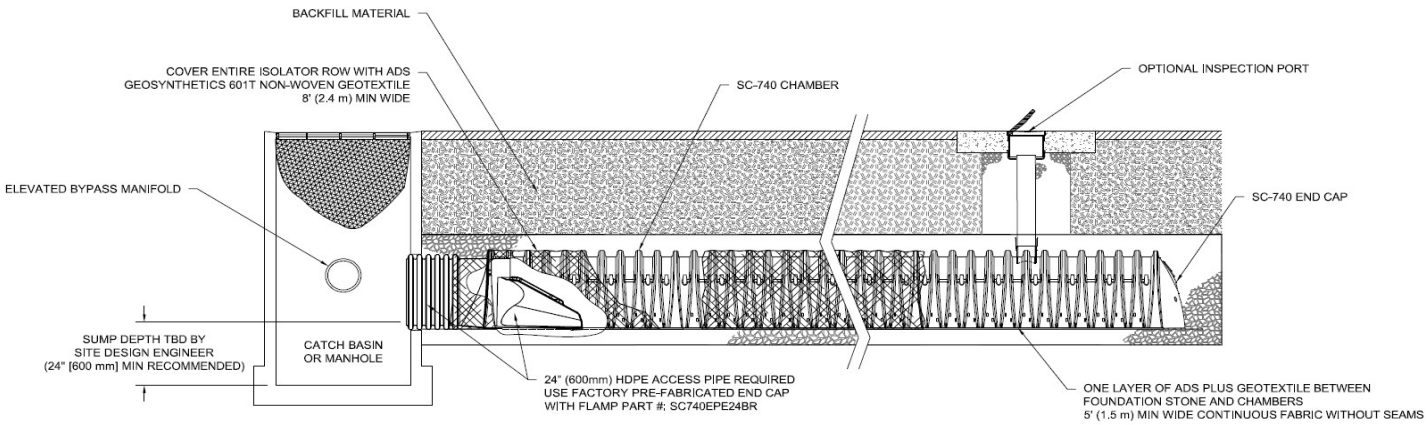


ADS StormTech™

VerifiGlobal

ads-pipecanada.ca
519-699-0222

StormTech Isolator Row Plus (not to scale)
Note: Non-woven fabric is only required over the chambers for the SC-310 and SC-740 chamber models.



Maintenance

The Isolator Row Plus was designed to reduce the cost of periodic maintenance. By "isolating" sediment to just one row of the StormTech system, costs are dramatically reduced by eliminating the need to clean out each row of the entire storage bed. If inspection indicates the potential need for maintenance, access is provided via a manhole(s) located on the end(s) of the row for cleanout. Maintenance is accomplished with the JetVac process. The JetVac® process utilizes a high-pressure water nozzle to propel itself down the Isolator Row Plus while scouring and suspending sediment. As the nozzle is retrieved, the captured pollutants are flushed back into the manhole for vacuuming. Most sewer and pipe maintenance companies have vacuum/JetVac combination vehicles. Selection of an appropriate JetVac nozzle will improve maintenance efficiency.

	Chamber Storage	Chamber Footprint	Treatment Rate
SC-160LP	0.42 m^3 (15.0 cf)	1.06 m^2 (11.45 sf)	3.11 L/s (0.11 cfs)
SC-310	0.88 m^3 (31.0 cf)	1.64 m^2 (17.7 sf)	4.53 L/s (0.16 cfs)
SC-740	2.12 m^3 (74.9 cf)	2.58 m^2 (27.8 sf)	7.36 L/s (0.26 cfs)
DC-780	2.22 m^3 (78.4 cf)	2.58 m^2 (27.8 sf)	7.36 L/s (0.26 cfs)
MC-3500	4.96 m^3 (175.0 cf)	3.99 m^2 (42.9 sf)	11.32 L/s (0.40 cfs)
MC-4500	4.60 m^3 (162.6 cf)	2.80 m^2 (30.1 sf)	7.93 L/s (0.28 cfs)

Installation

Installation of the stormwater treatment unit(s) shall be preformed per manufacture's installation instructions. Such instructions can be obtained by calling Advanced Drainage systems at 888-367-7473 or by logging on to www.ads-pipe.com or www.stormtech.com.

ADS StormTech™

ads-pipecanada.ca
519-699-0222

Verification Statement

StormTech Isolator® Row PLUS
Registration number: (V-2020-10-01)
Date of issue: (2020-October-27)

Technology type	Stormwater Filtration Device
Application	Stormwater filtration technology to remove sediments, nutrients, heavy metals, and organic contaminants from stormwater runoff
Company	StormTech, LLC.
Address	520 Cromwell Avenue, Rocky Hill, CT 06067 USA **Phone** +1-888-892-2694
Website	www.stormtech.com
E-mail	info@stormtech.com

Verified Performance Claims

The StormTech Isolator® Row PLUS technology was tested at the Mid-Atlantic Storm Water Research Center (MASWRC), under the supervision of Boggs Environmental Consultants, Inc. The performance test results for two overlapping StormTech Isolator® Row PLUS chambers (commercial unit model SC-740) were verified by Good Harbour Laboratories Inc. (GHL), following the requirements of ISO 14034:2016 and the VerifiGlobal Performance Verification Protocol. Based on the laboratory testing conducted, the verified performance claims are as follows:

Total Suspended Solids (TSS) Removal Efficiency - The StormTech Isolator® Row PLUS achieved 82% ± 1% removal efficiency of suspended sediment concentration (SCC) at a 95% confidence level.

Average Loading Rate - Based on the reported flow rate data and the effective sedimentation and filtration treatment area of the test unit, the average loading rate of the test unit was 4.15 ± 0.03 GPM/ft^2 at a 95% confidence level.

Maximum Treatment Flow Rate (MTFR) - Although the MTFR varies among the StormTech Isolator® Row PLUS model sizes and the number of chambers, the design surface loading rate remains the same (4.13 gpm/ ft^2 of treatment surface area). The test unit consisted of two overlapping StormTech SC-740 chambers with a nominal MTFR of 225 GPM (0.501 CFS) and an effective filtration treatment area (EFTA) of approximately 54.5 ft^2.

Detention Time and Volume - The StormTech Isolator Row PLUS detention time and wet volume varies with model size. The unit tested had a wet volume of approximately 65.1 ft^3 and a detention time of 2.2 minutes.

Maximum Sediment Storage Depth and Volume - The sediment storage volume and depth vary according to the StormTech Isolator® Row PLUS model sizes and system configuration. For the two overlapping StormTech SC-740 chambers tested, the maximum sediment storage volume is 2.3 ft^3 at a sediment depth of 0.5 inches.

Effective Sedimentation/Filtration Treatment Areas - The Effective Sedimentation Area (ESA) and the Effective Filtration Treatment Area (EFTA) increase as the size of the system increases. For the two overlapping StormTech SC-740 chambers tested, the ESA and the ratio of ESA/EFTA were 54.5 ft^2 and 1.0, respectively.

Sediment Mass Load Capacity - The sediment mass load capacity varies according to the StormTech Isolator® Row PLUS model sizes and system configuration. For the two overlapping StormTech SC-740 chambers tested, the mass loading capture was 158.4 lbs ± 0.8 lbs (2.91 ±0.01 lbs/ ft^2) following a total sediment loading of 195.2 lbs.

Technology Application

The StormTech "Isolator® Row PLUS" is a stormwater treatment technology designed for use under parking lots, roadways and heavy earth loads while providing a superior and durable structural system. The technology comprises a row of chambers covered in a non-woven geotextile fabric with a single layer of proprietary woven fabric at the bottom that serves as a filter strip, providing surface area for infiltration and runoff reduction with enhanced suspended solids and pollutant removal. The following features make the Isolator® Row PLUS effective as a water quality solution:

- Enhanced infiltration Surface Area
- Runoff Volume Reduction
- Peak Flow Reduction
- Sediment/Pollutant Removal
- Internal Water Storage (IWS)
- Water Temperature Cooling (Thermal Buffer).

Technology Description

The Isolator® Row PLUS (shown in Figures 1 and 2) is the first row of StormTech chambers that is surrounded with filter fabric and connected to a closely located manhole for easy access. The Isolator® Row PLUS provides for settling and filtration of sediment as stormwater rises in the chamber and ultimately passes through the filter fabric. The open-bottom chambers allow stormwater to flow out of the chambers, while sediment is captured in the Isolator® Row PLUS.

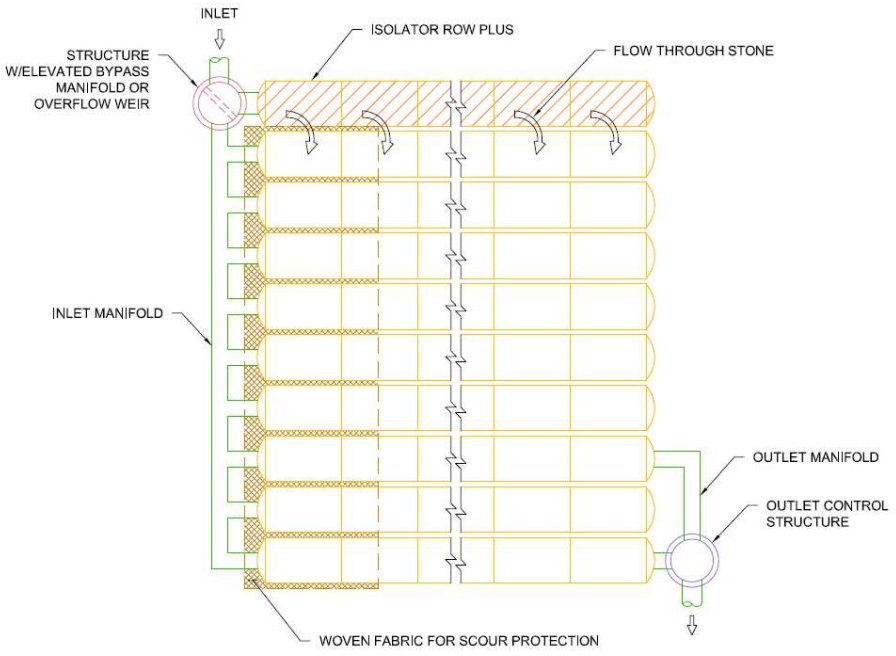


Figure 1: Schematic of the StormTech Isolator® Row PLUS System

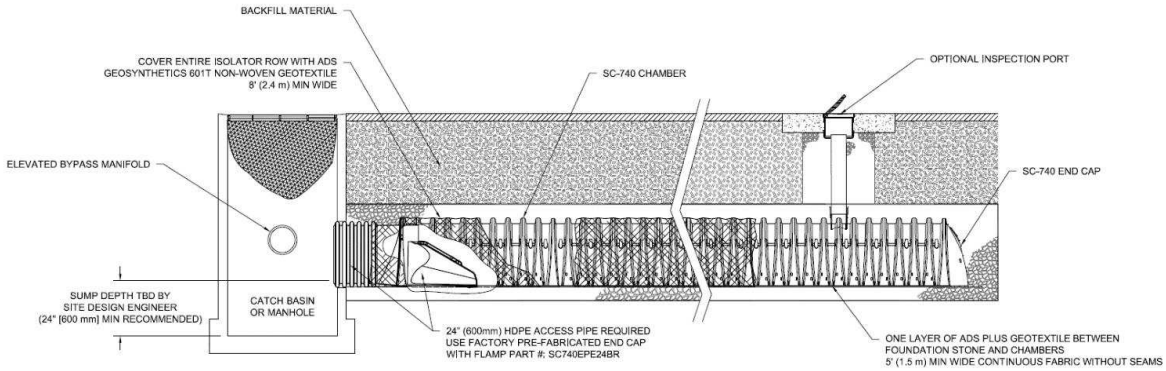


Figure 2: Isolator® Row PLUS Detail

A single layer of proprietary Advanced Drainage Systems (ADS) PLUS fabric is placed between the angular base stone and the Isolator Row PLUS chamber. The geotextile provides the means for stormwater filtration and provides a durable surface for maintenance operations. A 6 oz. non-woven fabric is placed over the chambers.

The Isolator® Row PLUS is designed to capture the “first flush” and offers the versatility to be sized on a volume basis or a flow-rate basis. An upstream manhole not only provides access to the Isolator® Row PLUS but includes a high low/concept such that stormwater flow rates or volumes that exceed the capacity of the Isolator® Row PLUS bypass through a manifold to the other chambers. This is achieved with either a high-flow weir or an elevated manifold. This creates a differential between the Isolator® Row PLUS and the manifold, thus allowing for settlement time in the Isolator® Row PLUS. After Stormwater flows through the Isolator® Row PLUS and into the rest of the StormTech chamber system it is either infiltrated into the soils below or passed at a controlled rate through an outlet manifold and outlet control structure.

StormTech developed and owns the Isolator® Row PLUS technology and has filed a number of patent applications relating to the Isolator® Row PLUS system.[1]

Description of Test Procedure for the StormTech Isolator® Row PLUS

In January 2020, two overlapping StormTech SC-740 Isolator® Row PLUS commercial size chambers were installed at the Mid-Atlantic Storm Water Research Center (MASWRC, a subsidiary of BaySaver), in Mount Airy, Maryland, to evaluate the performance of the Isolator® Row PLUS system for Total Suspended Solid (TSS) removal (Figure 3) All testing and data collection procedures were supervised by Boggs Environmental Consultants, Inc. (BEC), who was hired by ADS for third party oversight, and were in accordance with the *New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device (January 2013)*.

Prior to the start of testing, a Quality Assurance Project Plan (QAPP), revision dated January 09, 2020, was submitted and approved by the New Jersey Corporation for Advanced Technology (NJCAT), c/o Center for Environmental Systems, Stevens Institute of Technology, Castle Point on Hudson, Hoboken, NJ 07030.

[1] (U.S. Provisional Application No. 62/753,050, filed October 30, 2018; U.S. Non-Provisional Application No. 16/670,628, filed October 31, 2019; International Application No. PCT/US2019/059283, filed October 31, 2019; U.S. Application No. 16/938,482, filed July 24, 2020; U.S. Application No. 16/938,657, filed July 24, 2020; PCT International Application No. PCT/US2020/043543, filed July 24, 2020; PCT International Application No. PCT/US2020/043557, filed July 24, 2020.

Figure 3: StormTech "Isolator® Row PLUS" Test Set-up at MASWRC

Verification Results

The verification process for the StormTech Isolator® Row PLUS technology was conducted by GHL in accordance with the VerifiGlobal Verification Plan for the StormTech "Isolator® Row PLUS" Technology – 2020-09-09. The technology performance claims verified by GHL are summarized at the front of this Verification Statement and in Table 6 on Page 8 under the heading "Verification Summary".

Particle size distribution analysis was performed by ECS Mid-Atlantic, LLC of Frederick, MD in accordance with ASTM D422-63(2007). ECS is accredited by the American Association of State Highways and Transportation Officials (AASHTO).

ASTM D422-63(2007) is a sieve and hydrometer method where the larger particles, > 75 microns, are measured using a standard sieve stack while the smaller particles are measured based on their settling time using a hydrometer.

The PSD meets the requirements of NJDEP, which is generally accepted as representative of the type of particle sizes an OGS would be designed to treat. Actual PSD is site and rainfall event specific, so it was necessary to choose a standard PSD to make testing and comparison manageable.

Table 1 shows the NJDEP PSD specification. Table 2 and Figure 4 show the incoming material PSD as determined by ECS Mid-Atlantic and confirmed by the verifier.

Table 1: NJDEP PSD Specification

Particle Size (µm)	NJDEP Minimum Specification
1000	98
500	93
250	88
150	73
100	58
75	48
50	43
20	33
8	18
5	8
2	3
d_{50}	< 75 µm

Table 2 – Particle Size Distribution (PSD) of Test Sediment

Mesh (mm)	US Sieve Size	Sample ID		
		PSD A	PSD B	PSD C
		Percent Finer		
9.525	0.375	100.0	100.0	100.0
4.750	#4	100.0	100.0	100.0
4.000	#5	100.0	100.0	100.0
2.360	#8	100.0	100.0	100.0
2.000	#10	100.0	100.0	100.0
1.180	#16	100.0	100.0	100.0
1.000	#18	100.0	100.0	100.0
0.500	#35	100.0	100.0	100.0
0.425	#40	93.3	93.0	93.6
0.250	#60	90.3	89.8	90.2
0.150	#100	79.3	78.1	78.1
0.125	#120	73.6	71.7	71.7
0.106	#140	68.4	65.2	64.8
0.090	#170	60.2	58.3	57.5
0.075	#200	52.0	50.9	50.3
0.053	#270	48.0	48.3	47.8
0.045	Hydrometer	46.6	46.7	46.7
0.032		42.8	42.9	41.0
0.021		37.1	37.2	35.3
0.0125		25.7	25.7	25.8
0.0090		20.1	20.1	19.2
0.0064		16.3	16.4	14.5
0.0032		8.8	8.7	7.8
0.0014		3.8	3.7	3.8

The suspended sediment concentration analysis was completed by Fredericktowne Labs Inc., Meyersville, MD. Fredericktown Labs is accredited by the Maryland Department of Environment as Maryland Certified Water Quality Laboratory. The analysis procedure was ASTM D3977-97, Suspended Sediment Concentration. The sampling procedure and submission of samples to the test lab were overseen by the independent observer, Boggs Environmental Consultants, Inc.

All test data and calculations were detailed in the report “NJCAT TECHNOLOGY VERIFICATION Isolator® Row PLUS StormTech, LLC”, July 2020, which was submitted to and verified by the New Jersey Corporation for Advanced Technology (NJCAT).

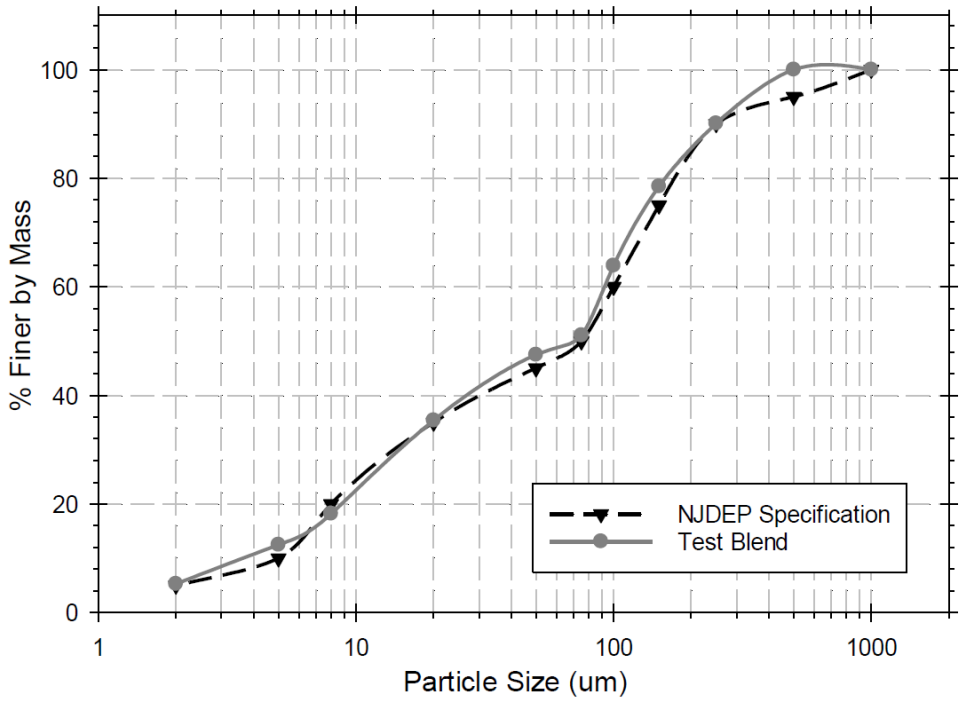


Figure 4– Particle Size Distribution (PSD)

The data in Table 3 (Flow Rate and Temperature) and Table 4 (Removal Efficiency) form the basis for the verified technology performance claim, specifically, flow rate, sediment captured and removal efficiency.

Table 3: Flow Rate and Temperature Summary

Run	Max Flow (gpm)	Min Flow (gpm)	Average Flow (gpm)	Flow COV	Flow Compliance (COV< 0.1)	Maximum Temperature (Fahrenheit)	NJDEP Temperature Compliance (< 80 F)
1	232.8	223.9	226.3	0.0078	Y	48.2	Y
2	228.9	218.6	220.8	0.0104	Y	51.5	Y
3	229.4	220.0	227.2	0.0094	Y	44.7	Y
4	230.2	218.7	223.2	0.0138	Y	40.5	Y
5	228.7	216.9	222.2	0.0103	Y	44.7	Y
6	227.6	217.0	224.2	0.0115	Y	46.7	Y
7	229.7	221.9	226.4	0.0092	Y	44.6	Y
8	230.3	222.2	226.8	0.0089	Y	43.5	Y
9	233.2	218.4	225.6	0.0136	Y	45.5	Y
10	232.2	219.7	228.4	0.0126	Y	44.7	Y
11	226.9	219.2	224.1	0.0088	Y	52.4	Y
12	232.2	222.1	226.9	0.0107	Y	48.5	Y
13	234.7	221.2	226.1	0.0109	Y	48.5	Y
14	231.9	223.4	228.7	0.0103	Y	45.6	Y
15	236.8	224.1	231.4	0.0131	Y	52.2	Y
16	232.5	221.3	229.0	0.0137	Y	47.8	Y

Table 4: Removal Efficiency Results

Run	Average Influent TSS (mg/L)	Influent Water Volume (gal)	Adjusted Average Effluent TSS (mg/L)	Effluent Water Volume (gal)	Adjusted Average Drain Down TSS (mg/L)	Drain Down Water Volume (gal)	Single Run Removal Efficiency (%)	Mass of Captured Sediment (g)	Cumulative Removal Efficiency (%)
1	203	7166	46	6881	34	285	77.8	4282	77.8
2	199	6993	32	6639	27	354	84.0	4415	80.8
3	207	7197	37	6793	27	403	82.6	4654	81.4
4	217	7068	33	6635	29	433	84.9	4923	82.3
5	215	7037	39	6593	29	444	82.2	4705	82.3
6	207	7097	40	6643	31	454	81.2	4504	82.1
7	198	7169	37	6693	30	476	81.6	4386	82.0
8	201	7184	37	6716	32	468	81.6	4473	82.0
9	205	7147	38	6675	30	472	81.8	4539	82.0
10	203	7235	38	6759	31	476	81.4	4523	81.9
11	208	7096	38	6624	30	472	81.8	4567	81.9
12	209	7185	41	6709	30	476	80.7	4584	81.8
13	198	7162	41	6680	32	482	79.7	4277	81.6
14	200	7242	43	6757	34	485	78.8	4318	81.4
15	196	7329	41	6842	32	487	79.5	4320	81.3
16	202	7254	44	6769	31	485	78.9	4384	81.2
Avg.	**204.2**	**7160**	**39**	**6713**	**31**	**447**	**81.2**	**4491**	**N/A**
Cumulative Mass Removed (g)							**71854**		
Cumulative Mass Removed (lb)							**158.4**		
Total Mass Loaded (lb)							**195.2**		
Cumulative Removal Efficiency (%)							**81.2**		

Quality Assurance

Performance verification of the StormTech Isolator® Row PLUS technology was performed in accordance with the requirements of ISO 14034:2016 and the VerifiGlobal Performance Verification Protocol. This included reviewing all data sheets and calculated values, as well as overall management of the test system, quality control and data integrity.

Additional information on quality control measures taken can be found in section 5 of the QAPP for StormTech Isolator Row New Jersey Department of Environmental Protection Testing, Rev. 1/9/2020.

Specific QA/QC measures reviewed by the verifier are summarized in Table 5 below.

Table 5. Validation of QA/QC Procedures

QC Parameter	Acceptance Criteria
Independence of observer	Confirmed in letter from Boggs Environmental Consultants, Inc. to NJCAT
Consistency of procedure	Daily logs confirm proper procedure
Existence of QAPP	Confirmed. “QAPP For StormTech Isolator Row New Jersey Department of Environmental Protection Testing”, Rev. 1/9/2020*)*
Use of appropriate sample analysis method – ASTM D3799	Confirmed by method reference on lab reports from Fredericktowne Labs Inc.
Test method appropriate for the technology	Used industry stakeholder approved protocol: *New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids*

	Removal by a Filtration Manufactured Treatment Device (January 2013)
Test parameters stayed within required limits	Confirmed in report "NJCAT TECHNOLOGY VERIFICATION Isolator® Row PLUS StormTech, LLC", July 2020
Third party verified data	All testing was observed and reviewed by Boggs Environmental Consultants, Inc.

Variance

Performance claims regarding structural load limitations were not verified as they are outside the scope of the performance testing that was conducted in accordance with the 'Quality Assurance Project Plan (QAPP) for StormTech Isolator Row, New Jersey Department of Environmental Protection Testing', revision dated January 09, 2020.

Verification Summary

The StormTech "Isolator® Row PLUS" is a stormwater treatment technology designed for use under parking lots, roadways and heavy earth loads while providing a superior and durable structural system. The technology comprises a row of chambers wrapped in woven geotextile fabric with two layers at the bottom that serve as a filter strip, providing surface area for infiltration and runoff reduction with enhanced suspended solids and pollutant removal.

The StormTech Isolator® Row PLUS technology was tested at the Mid-Atlantic Storm Water Research Center (MASWRC), under the supervision of Boggs Environmental Consultants, Inc. The performance test results for two overlapping StormTech Isolator® Row PLUS chambers (commercial unit model SC-740) were verified by Good Harbour Laboratories Inc. (GHL), following the requirements of ISO 14034:2016 and the VerifiGlobal Performance Verification Protocol. Table 6 summarizes the verification results in relation to the technology performance parameters that were identified in the Verification Plan to determine the efficacy of the StormTech Isolator® Row PLUS technology.

Table 6 - Summary of Verification Results Against Performance Parameters

Parameters	Verified Claims	Accuracy
Total Suspended Solids (TSS) Removal Efficiency	Based on the laboratory testing conducted, the StormTech Isolator® Row PLUS achieved an average 82% removal efficiency of SSC	± 1% (95% confidence level)
Average Loading Rate	Based on the laboratory testing parameters, the StormTech Isolator® Row PLUS maintained a loading rate of 4.15 GPM/sf	±0.03 GPM/sf (95% confidence level)
Maximum Treatment Flow Rate (MTFR)	Although the MTFR varies among the StormTech Isolator® Row PLUS model sizes and the number of chambers, the design surface loading rate remains the same (4.13 GPM/ft^2 of treatment surface area). The test unit consisted of two overlapping StormTech SC-740 chambers with a nominal MTFR of 225 GPM (0.501 CFS) and an effective filtration treatment area (EFTA) of approximately 54.5 ft^2.	± 1.4 GPM (95% confidence level)
Detention Time and Volume	Detention time and wet volume varies with model size. The unit tested had a wet volume of approximately 65.1 ft^3 (based on	N/A

	physical measurement) and a detention time of 2.2 minutes.	
Maximum Sediment Storage Depth and Volume	The sediment storage volume and depth vary according to the StormTech Isolator® Row PLUS model sizes and system configuration. For the two overlapping StormTech SC-740 chambers tested, the maximum sediment storage volume is 2.3 ft^3 at a sediment depth of 0.5 inches.	N/A
Effective Sedimentation/ Filtration Treatment Area	The effective sedimentation and filtration treatment area increases as the size of the chamber increases. Under the tested conditions using 2 overlapping chambers, the treatment area was 54.5 ft^2	The sedimentation /filtration area was determined from the actual physical dimensions of the test unit*
Sediment Mass Load Capacity	The sediment mass load capacity varies according to the StormTech Isolator® Row PLUS model sizes and system configuration. For the two overlapping StormTech SC-740 chambers tested, the mass loading capture was 158.4 lbs (2.91 lbs/ ft^2) following a total sediment loading of 195.2 lbs	± 0.8 lbs (±0.01 lbs/ft^2) (95% confidence level)

*Note: These numbers are determined based on physical measurement or a dimensional drawing, which is standard practice. Highly accurate measurements are not practical.

In conclusion, the StormTech Isolator® Row PLUS is a viable technology that can be used to remove contaminants from stormwater runoff via filtration. This technology has proven effective at removing suspended sediment from stormwater through in-lab testing using an industry recognized laboratory protocol.

By extension of sediment removal, this technology should also remove particle bound nutrients, heavy metals, and a wide variety of organic contaminants. Performance is a function of pollutant properties, hydraulic retention time, filter media, pre-treatment, and flow rate, such that proper design of the system is critical to achieving the desired results.

What is ISO 14034?

The purpose of environmental technology verification is to provide a credible and impartial account of the performance of environmental technologies. Environmental technology verification is based on a number of principles to ensure that verifications are performed and reported accurately, clearly, unambiguously and objectively. The International Organization for Standardization (ISO) standard for environmental technology verification (ETV) is ISO 14034, which was published in November 2016.

Benefits of ETV

ETV contributes to protection and conservation of the environment by promoting and facilitating market uptake of innovative environmental technologies, especially those that perform better than relevant alternatives. ETV is particularly applicable to those environmental technologies whose innovative features or performance cannot be fully assessed using existing standards. Through the provision of objective evidence, ETV provides an independent and impartial confirmation of the performance of an environmental technology based on reliable test data. ETV aims to strengthen the credibility of new, innovative technologies by supporting informed decision-making among interested parties.

For more information on the StormTech "Isolator® Row PLUS" technology, contact:	For more information on VerifiGlobal, contact:
StormTech, LLC. 520 Cromwell Avenue, Rocky Hill, CT 06067 USA t: +1-888-892-2694 e: info@stormtech.com w: www.stormtech.com	VerifiGlobal c/o ETA-Danmark A/S Göteborg Plads 1, DK-2150 Nordhaven t +45 7224 5900 e: info@verifiglobal.com w: www. verifiglobal.com
Signed for StormTech: *Original signed by:* *Greg Spires* Greg Spires, P.E. General Manager	Signed for VerifiGlobal: *Original signed by:* *Thomas Bruun* Thomas Bruun, Managing Director *Original signed by:* *John Neate* John Neate, Managing Director

APPENDIX E

Civil Engineering Drawings

HALO CAR WASH
3555 BORRISOKANE RD
BARRHAVEN, ON

REVISION 11

KEY PLAN (N.T.S.)

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DEMOLITION PLAN	C102
GRADING AND DRAINAGE PLAN	C301
SERVICING PLAN	C401
STORMWATER MANAGEMENT PLAN	C601
PRE-DEVELOPMENT WATERSHED PLAN	C701
POST-DEVELOPMENT WATERSHED PLAN	C702
SANITARY DRAINAGE AREA PLAN	C703
CONSTRUCTION DETAIL PLAN	C901
CONSTRUCTION DETAIL PLAN	C902
CONSTRUCTION DETAIL PLAN	C903
CONSTRUCTION DETAIL PLAN	C904

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

HALO CAR WASH
3555 BORRISOKANE RD, BARRHAVEN, ON
REV.11 - RE-ISSUED FOR APPROVAL - JULY 07, 2023
LRL PROJECT no: 210691

LICENSED PROFESSIONAL ENGINEER
M. BASNET
100501998
2023/07/07
PROVINCE OF ONTARIO

NOT AUTHENTIC UNLESS SIGNED AND DATED

D07-12-22-0085

#18788

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).
20. CONCRETE RAMP C/W TACTILE WALKING SURFACE INDICATORS COMPONENT AS PER OPSD 310.039. TACTILE WALKING SURFACE INDICATORS TO BE INSTALLED AT ALL RAMPS. MATERIAL TO BE POLYMER COMPOSITE, COLOR TO BE COORDINATED WITH HALO.

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.

SUBJECT FOR APPROVAL

No.	REVISIONS	BY	DATE
11	RE-ISSUED FOR APPROVAL	M.L.	07 JULY 2023
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09	RE-ISSUED FOR APPROVAL	M.L.	09 MAY 2023
08	ISSUED FOR COMMITTEE OF ADJUSTMENT	M.L.	08 MAY 2023
07	RE-ISSUED FOR APPROVAL	P.P.	31 MAR 2023
06	RE-ISSUED FOR APPROVAL	P.P.	31 MAR 2023
05	RE-ISSUED FOR APPROVAL	P.P.	22 FEB 2023
04	RE-ISSUED FOR APPROVAL	P.P.	17 NOV 2022
03	REVISED FLOOR AREA FOR MV. APPLICATION	P.P.	13 JULY 2022
02	REVISED FLOOR AREA FOR MV. APPLICATION	P.P.	23 JUNE 2022
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
3555 BORRISOKANE RD
BARRHAVEN, ON

DRAWING TITLE
GENERAL NOTES

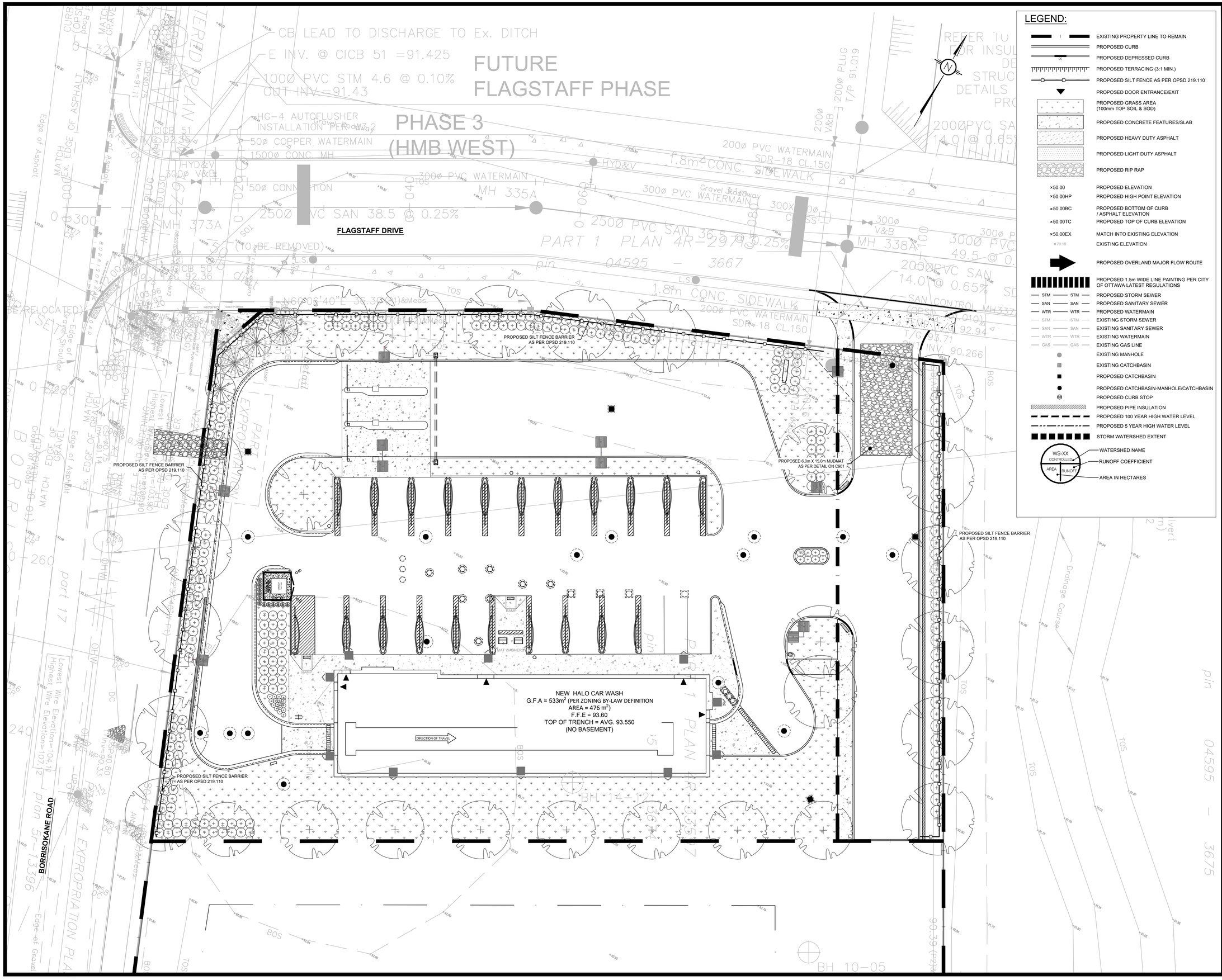
PROJECT NO.
210691

DATE
JANUARY 2022

C001

D07-12-22-0085

#18788



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 DOOR ENTRANCE/EXIT
- PROPOSED GRASS AREA (100mm TOP SOIL & SOD)
- PROPOSED CONCRETE FEATURES/SLAB
- PROPOSED HEAVY DUTY ASPHALT
- PROPOSED LIGHT DUTY ASPHALT
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- EXISTING MANHOLE
- EXISTING CATCHBASIN
- PROPOSED CATCHBASIN
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- PROPOSED 5 YEAR HIGH WATER LEVEL
- STORM WATERSHED EXTENT
- WS-XX CONTROLLED AREA RUNOFF — WATERSHED NAME, RUNOFF COEFFICIENT, AREA IN HECTARES

USE AND INTERPRETATION OF DRAWINGS

GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION ARE PART OF THE CONTRACT DOCUMENTS AND DESCRIBE USE AND INTENT OF THE DRAWING. THE CONTRACT DOCUMENTS INCLUDE NOT ONLY THE DRAWINGS, BUT ALSO THE OWNER-CONTRACTOR AGREEMENTS, CONDITIONS OF THE CONTRACT, THE SPECIFICATIONS, ADDENDA, AND MODIFICATIONS ISSUED AFTER EXECUTION OF THE CONTRACT. THESE CONTRACT DOCUMENTS ARE COMPLEMENTARY, AND WHAT IS REQUIRED BY ANY ONE SHALL BE BINDING AS IF REQUIRED BY ALL. WORK NOT COMPLETELY DELINEATED HEREON SHALL BE CONSTRUCTED OF THE SAME MATERIALS AND DETAILED SIMILARLY AS WORK SHOWN MORE COMPLETELY ELSEWHERE IN THE CONTRACT DOCUMENTS.

BY USE OF THE DRAWINGS FOR CONSTRUCTION OF THE PROJECT, THE OWNER CONFIRMS THAT HE HAS REVIEWED AND APPROVED THE DRAWINGS. THE CONTRACTOR CONFIRMS THAT HE HAS VISITED THE SITE, FAMILIARIZED HIMSELF WITH THE LOCAL CONDITIONS, VERIFIED FIELD DIMENSIONS AND CORRELATED HIS OBSERVATIONS WITH THE REQUIREMENTS OF THE CONTRACT DOCUMENTS.

AS INSTRUMENTS OF SERVICE, ALL DRAWINGS, SPECIFICATIONS, CADD FILES OR OTHER ELECTRONIC MEDIA AND COPIED THERE OF FURNISHED BY THE ENGINEER ARE HIS PROPERTY. THEY ARE TO BE USED ONLY FOR THIS PROJECT AND ARE NOT TO BE USED ON ANY OTHER PROJECT, INCLUDING REPEATS OF THE PROJECT. CHANGES TO THE DRAWINGS MAY ONLY BE MADE BY THE ENGINEER.

UNLESS THE REVISION TITLE IS "ISSUED FOR CONSTRUCTION", THESE DRAWINGS SHALL BE CONSIDERED PRELIMINARY AND SHALL NOT BE USED AS A CONSTRUCTION DOCUMENT.

THESE DRAWINGS ILLUSTRATES THE WORK TO BE DONE. THE ENGINEER IS NOT RESPONSIBLE FOR THE MEANS, METHODS, TECHNIQUES, SEQUENCES, AND PROCEDURES USED TO DO THE WORK, OR THE SAFETY ASPECTS OF CONSTRUCTION, AND NOTHING ON THESE DRAWINGS EXPRESSED OR IMPLIED CHANGES THIS CONDITION. CONTRACTOR SHALL DETERMINE ALL CONDITIONS AT THE SITE AND SHALL BE RESPONSIBLE FOR KNOWING HOW THEY AFFECT THE WORK. SUBMITTAL OF A BID TO PERFORM THIS WORK IS ACKNOWLEDGEMENT OF THE RESPONSIBILITIES, AND THAT THEY HAVE BEEN FULLY CONSIDERED IN PLANNING OF THE WORK, AND THE BID PRICE. NO CLAIMS FOR EXTRA CHARGES DUE TO THESE CONDITIONS WILL BE FORTHCOMING.

UNAUTHORIZED CHANGES:

IN THE EVENT THE CLIENT, THE CLIENT'S CONTRACTORS OR SUBCONTRACTORS, OR ANYONE FOR WHOM THE CLIENT IS LEGALLY LIABLE MAKES OR PERMITS TO BE MADE ANY CHANGES TO ANY REPORTS, PLANS, SPECIFICATIONS OR OTHER CONSTRUCTION DOCUMENTS PREPARED BY LRL ASSOCIATES LTD. (LRL) WITHOUT OBTAINING LRL'S PRIOR WRITTEN CONSENT, THE CLIENT SHALL ASSUME FULL RESPONSIBILITY FOR THE RESULTS OF SUCH CHANGES, THEREFORE THE CLIENT AGREES TO WAIVE ANY CLAIM AGAINST LRL TO RELEASE LRL FROM ANY LIABILITY ARISING DIRECTLY OR INDIRECTLY FROM SUCH UNAUTHORIZED CHANGES.

IN ADDITION, THE CLIENT AGREES, TO THE FULLEST EXTENT PERMITTED BY LAW, TO INDEMNIFY AND HOLD HARMLESS LRL FROM ANY DAMAGES, LIABILITIES OR COST, INCLUDING REASONABLE ATTORNEY'S FEES AND COST OF DEFENSE, ARISING FROM SUCH CHANGES.

IN ADDITION, THE CLIENT AGREES TO INCLUDE IN ANY CONTRACTS FOR CONSTRUCTION APPROPRIATE LANGUAGE THAT PROHIBITS THE CONTRACTOR OR ANY SUBCONTRACTORS OF ANY TIER FROM MAKING ANY CHANGES OR MODIFICATIONS TO LRL'S CONSTRUCTION DOCUMENTS WITHOUT THE PRIOR WRITTEN APPROVAL OF LRL AND THAT FURTHER REQUIRES THE CONTRACTOR TO INDEMNIFY BOTH LRL AND THE CLIENT FROM ANY LIABILITY OR COST ARISING FROM SUCH CHANGES MADE WITHOUT SUCH PROPER AUTHORIZATION.

GENERAL NOTES:

EXISTING SERVICES AND UTILITIES SHOWN ON THESE DRAWINGS ARE TAKEN FROM THE BEST AVAILABLE RECORDS, BUT MAY NOT BE COMPLETE OR TO DATE. CONTRACTOR SHALL VERIFY IN FIELD FOR LOCATION AND ELEVATION OF PIPES AND CHECK WITH THE UTILITY COMPANIES BEFORE DIGGING OR PERFORMING WORK.

CONTRACTOR IS ADVISED TO COLLECT INFORMATION ON SOIL CONDITIONS BEFORE START OF CONSTRUCTION.

THE ENGINEER WAIVES ANY AND ALL RESPONSIBILITY AND LIABILITY FOR PROBLEMS WHICH ARISE FROM FAILURE TO FOLLOW THESE PLANS, SPECIFICATIONS AND THE DESIGN INTENT THEY CONVEY, OR FOR PROBLEMS WHICH ARISE FROM OTHERS' FAILURE TO OBTAIN AND/OR FOLLOW THE ENGINEER'S GUIDANCE WITH RESPECT TO ANY ERRORS, OMISSIONS, INCONSISTENCIES AMBIGUITIES OR CONFLICTS WHICH ARE ALLEGED.

CONTRACTOR TO VERIFY ALL DIMENSIONS AND NOTIFY THE ENGINEER OF ANY DISCREPANCIES BEFORE WORK COMMENCES. DO NOT SCALE DRAWINGS.

5m 2 0 5m

SCALE: 1:200

SUBJECT FOR APPROVAL

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LICENSED PROFESSIONAL ENGINEER
M. BASNET
100501996
2023/07/07
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
3555 BORRISOKANE RD
BARRHAVEN, ON

DRAWING TITLE
EROSION AND SEDIMENT CONTROL PLAN

PROJECT NO.
210691

DATE
JANUARY 2022

C101

D07-12-22-0085

#18788

KEY PLAN
N.T.S.

DETAILS OF DEVELOPMENT

DATA		REQUIRED	PROVIDED
ZONING		IL (304) - LIGHT INDUSTRIAL URBAN EXC. 304	
SETBACKS	FY	7.5m	18.9m
	RY	7.5m	27.8m
	INT.SY	7.5m	7.5m
	EXT.SY	7.5m	39.9m
LOT AREA (sqm)		2000 sqm	5342 sqm
LOT WIDTH (m)		NO MIN	85.0m
BUILDING COVERAGE		65 % (MAX)	9.6 %
BUILDING HEIGHT		18 m (MAX)	8.0 m
GROSS FLOOR AREA		533sqm (476sqm PER ZBL DEF)	
MAX FLOOR SPACE INDEX		2	
No. of UNITS		1	
MIN WIDTH OF LANDSCAPED AREA		ABUTTING A STREET : 3.0m ALL OTHER CASES : NO MIN.	
LOADING SPACES		N/A	N/A
PARKING:		N/A	3 + 1 HC
No. OF STOREYS			1
No. OF BICYCLE SPACE		1 PER 1500sqm	

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TOPOGRAPHIC INFORMATION

TOPOGRAPHIC INFORMATION PROVIDED BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD. PART OF LOT 11, CONCESSION 3 (RIDEAU FRONT), GEOGRAPHIC TOWNSHIP OF NEPEAN, CITY OF OTTAWA
DATED JANUARY 21st 2022

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.

Bearings are grid, derived from Can-Net 2016 Real Time Network GPS observations referenced to Specified Control Points 01919761338 and 01919871649, MTM Zone 9 (76°30' West Longitude) NAD-83 (original).

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5m 2 0 5m
SCALE: 1:200

SUBJECT FOR APPROVAL

No.	REVISIONS	BY	DATE
11	RE-ISSUED FOR APPROVAL	M.L.	07 JULY 2023
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01	ISSUED FOR APPROVAL	M.L.	22 APR 2022

LICENSED PROFESSIONAL ENGINEER — M. BASNET 100501996 — 2023/07/07 — 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
3555 BORRISOKANE RD
BARRHAVEN, ON

DRAWING TITLE
SITE DEVELOPMENT PLAN

PROJECT NO. 210691
DATE JANUARY 2022
C201
D07-12-22-0085
#18788

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.

REFER TO LATEST GEOTECHNICAL REPORT PREPARED BY LRL ENGINEERING LTD.

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BENCHMARK
SPIKE IN UTILITY POLE
ELEV. = 92.96

FLAGSTAFF DRIVE

FUTURE FLAGSTAFF PHASE 3 (HMB WEST)

ASPHALT REINSTATEMENT SHALL MATCH EXISTING GRANULAR AND ASPHALT THICKNESS. CONTRACTOR TO COMPLETE ROAD CUT AS PER CITY OF OTTAWA DETAIL R10. TIE INTO EXISTING ASPHALT AS PER CITY STD R25 AND CITY ROAD CUT BY-LAW.

PROP RIP-RAP AT EMERGENCY SPILL-POINT TO PREVENT EROSION

PROP RETAINING WALL c/w GUARD RAIL WHERE HEIGHT EXCEEDS 0.6m

GRADES AT THE CAR WASH ENTRANCE AND EXIT SHALL BE READ IN CONJUNCTION WITH PLAN A106 FROM MCROBIE ARCHITECT

NEW HALO CAR WASH
G.F.A = 533m² (PER ZONING BY-LAW DEFINITION AREA = 476 m²)
F.F.E = 93.60
TOP OF TRENCH = AVG. 93.550
(NO BASEMENT)

DIRECTION OF TRAVEL

TRENCH DRAIN GUTTER GRATE TO BE INSTALLED ON AN ANGLE MATCHING THE SLOPE OF PROPOSED EXTERIOR RAMP

TRENCH DRAIN GUTTER GRATE TO BE INSTALLED ON AN ANGLE MATCHING THE SLOPE OF PROPOSED EXTERIOR RAMP

PROP STM CB04 T/G = 92.90
PROP STM CB07 T/G = 93.15
PROP STM MH06 C/W ELEVATED BYPASS MANIFOLD T/G = 93.37
PROP STM CBMH06 T/G = 93.05
PROP STM CBMH05 T/G = 93.05
PROP STM CBMH03 T/G = 93.05
PROP STM CBMH02 T/G = 93.05
PROP STM CBMH12 T/G = 93.20
PROP STM CB11 T/G = 93.22
PROP SAN MH04 T/G = 93.58
PROP SAN MH02 T/G = 93.23
PROP STM MH10 T/G = 93.83
PROP STM MH11 T/G = 93.84
PROP STM CBMH09 T/G = 93.15
PROP STM CB01 T/G = 92.60
SLAB = 93.33

BORRISOKANE ROAD

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LICENSED PROFESSIONAL ENGINEER M BASNET 100501986 2023/07/07 PROVINCE OF ONTARIO

NOT AUTHENTIC UNLESS SIGNED AND DATED

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

PROJECT
HALO CAR WASH
3555 BORRISOKANE RD
BARRHAVEN, ON

DRAWING TITLE
GRADING AND DRAINAGE PLAN

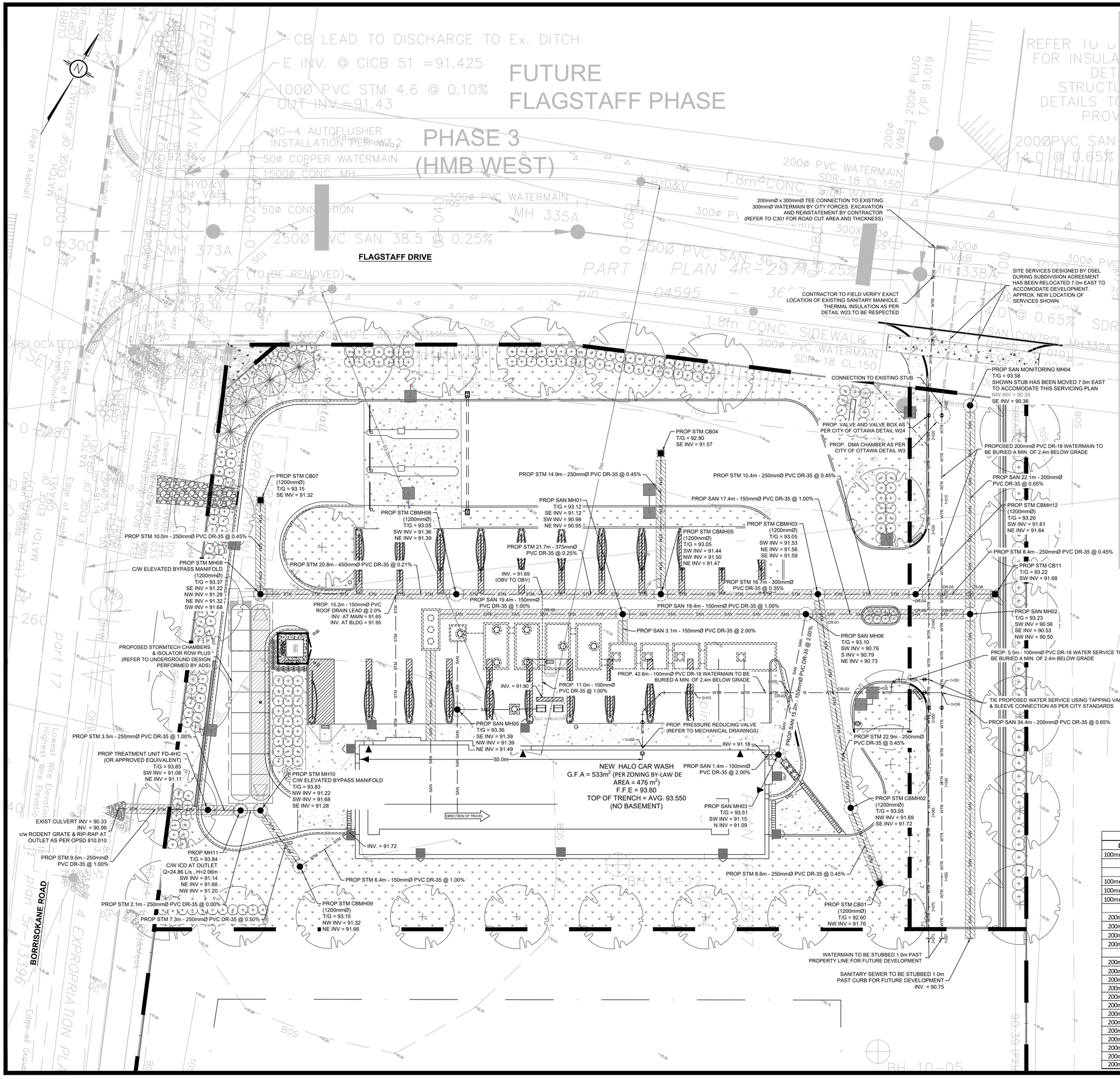
PROJECT NO.
210691

DATE
JANUARY 2022

C301

D07-12-22-0085

#18788



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- STORM WATERSHED EXTENT

WS-XX
CONTROLLED AREA | RUNOFF

- WATERSHED NAME
- RUNOFF COEFFICIENT
- AREA IN HECTARES

NOTE:

CLAY DYKES ARE TO BE INSTALLED DOWNSTREAM FROM EACH OF THE MANHOLES/CATCH BASINS. THESE DYKES SHOULD EXTEND FROM THE BASE OF THE SERVICE TRENCH TO THE SUBGRADE LEVEL,HAVING MIN. WIDTH OF 1.0m. REFER TO GEOTECHNICAL REPORT FOR FURTHER DETAILS.

Crossing Table

Crossing #	WM	STM	SAN	Depth Separation (m)
CR-01	N/A	91.74 (inv.)	90.87 (obv.)	0.87
CR-02	91.63 (inv.)	N/A	91.11 (obv.)	0.52
CR-03	90.92 (obv.)	91.77 (inv.)	N/A	0.85
CR-04	91.04 (obv.)	91.79 (inv.)	N/A	0.75
CR-05	91.03 (obv.)	91.79 (inv.)	N/A	0.76
CR-06	91.27 (inv.)	N/A	90.75 (obv.)	0.52
CR-07	91.28 (inv.)	N/A	90.74 (obv.)	0.54
CR-08	N/A	91.81 (inv.)	90.64 (obv.)	1.17
CR-09	N/A	91.87 (inv.)	91.22 (obv.)	0.65

WM crossing above sewer per City STD W25.2
WM crossing below sewer per City STD W25

Watermain Table

Description	Chainage	Finish Grade	Obvert of Watermain	Cover (m)
100mm Water Service	0+000	93.41	91.01	2.40
45° Bend	0+004	93.34	90.94	2.40
45° Bend	0+007	93.27	90.87	2.40
100mm Water Service	0+010	93.32	90.92	2.40
100mm Water Service	0+020	93.25	91.63	1.62
100mm Water Service	0+030	93.37	90.97	2.40
Tee	0+036	93.05	90.65	2.40
200mm Watermain	1+000	93.56	91.16	2.40
200mm Watermain	1+010	93.35	90.95	2.40
200mm Watermain	1+020	93.17	90.77	2.40
200mm Watermain	1+030	93.05	90.65	2.40
Tee	1+031	93.04	90.64	2.40
200mm Watermain	1+040	93.02	90.62	2.40
200mm Watermain	1+050	93.15	90.75	2.40
200mm Watermain	1+057	92.75	90.35	2.40
200mm Watermain	2+000	94.02	91.62	2.40
200mm Watermain	2+010	93.60	91.20	2.40
200mm Watermain	2+020	93.50	91.10	2.40
200mm Watermain	2+030	93.30	90.90	2.40
200mm Watermain	2+040	93.15	91.47	1.68
200mm Watermain	2+046	93.10	90.70	2.40
200mm Watermain	2+050	93.05	90.65	2.40
200mm Watermain	2+060	93.10	90.70	2.40
200mm Watermain	2+070	93.25	90.85	2.40
200mm Watermain	2+073	92.75	90.35	2.40

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5m 2 0 5m
SCALE: 1:200

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LICENSED PROFESSIONAL ENGINEER
M. BASNET
100501986
2023/07/07
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
3555 BORRISOKANE RD
BARRHAVEN, ON

DRAWING TITLE
SERVICING PLAN

PROJECT NO.
210691

DATE
JANUARY 2022

C401

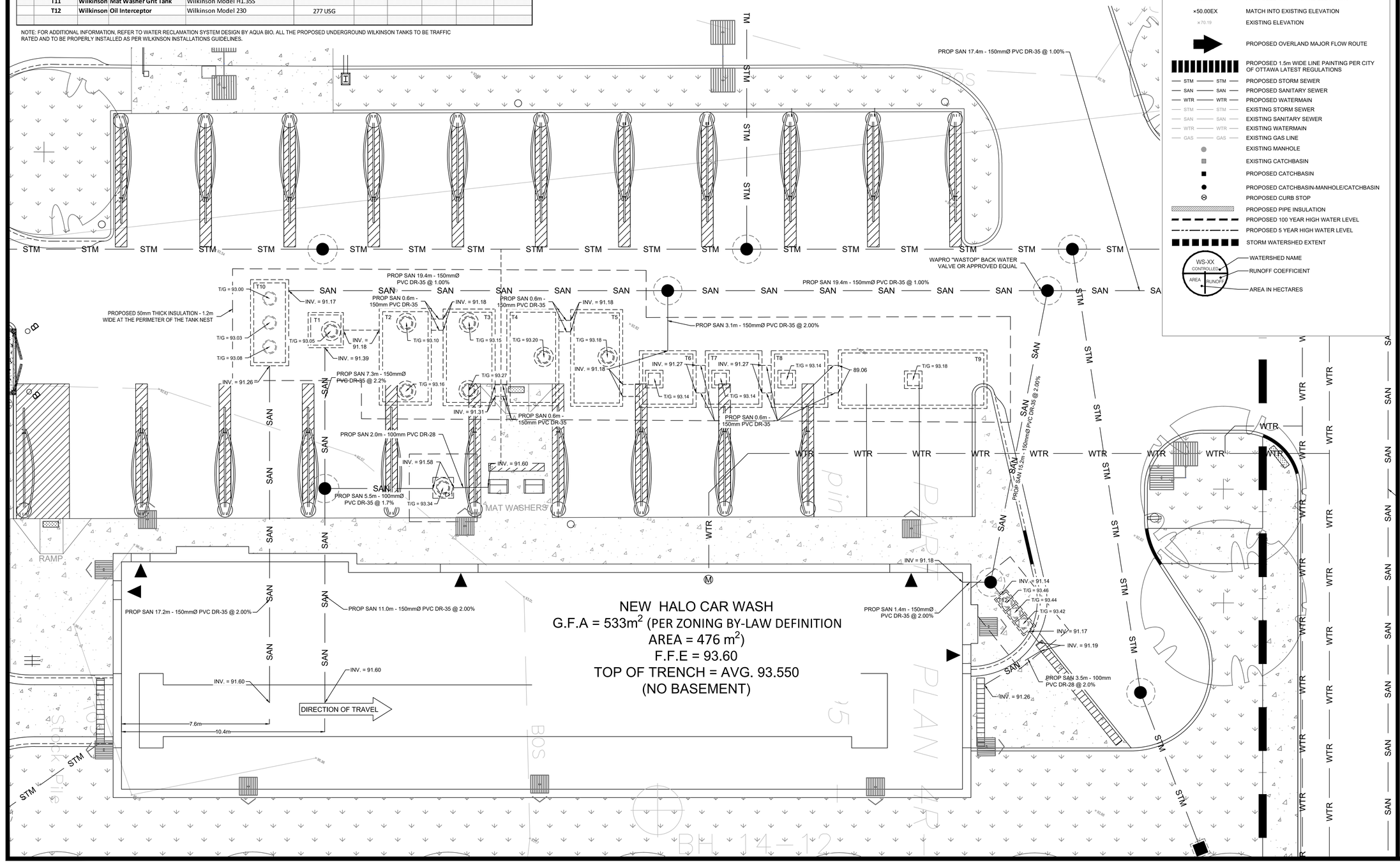
D07-12-22-0085

#18788

List of Underground TankS

Water Reclamation Tanks										
For Validation										
	T1	**Wilkinson**	**Sand Tank**	Wilkinson Model H4H	1056 USG					
	T2	**Wilkinson**	**Settling Tank**	Wilkinson Model H22.2H	5811 USG					
	T3	**Wilkinson**	**Settling Tank**	Wilkinson Model H22.2H	5811 USG					
	T4	**Wilkinson**	**Settling Tank**	Wilkinson Model H22.2H	5811 USG					
	T5	**Wilkinson**	**Settling Tank**	Wilkinson Model H22.2H	5811 USG					
	T6	**Wilkinson**	**Aeration Tank**	Wilkinson Model 2.5M						
	T7	**Wilkinson**	**Clean Water Tank**	Wilkinson Model 2.5M						
	T8	**Wilkinson**	**Clarifier Tank**	Wilkinson Model 2.5M						
	T9	**Wilkinson**	**Biological Tank**	Wilkinson Model H50.1S	5811 USG					
Sediment Trap and other tanks on site										
	T10	**Wilkinson**	**Oil Grit Seperator**	Wilkinson Model 1075	1600USG					
	T11	**Wilkinson**	**Mat Washer Grit Tank**	Wilkinson Model H1.35S						
	T12	**Wilkinson**	**Oil Interceptor**	Wilkinson Model 230	277 USG					

NOTE: FOR ADDITIONAL INFORMATION, REFER TO WATER RECLAMATION SYSTEM DESIGN BY AQUA BIO. ALL THE PROPOSED UNDERGROUND WILKINSON TANKS TO BE TRAFFIC RATED AND TO BE PROPERLY INSTALLED AS PER WILKINSON INSTALLATIONS GUIDELINES.



LEGEND:

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- EXISTING MANHOLE
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5m 2 0 5m
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LICENSED PROFESSIONAL ENGINEER — M BASNET 100501996 — 2023/07/07 — 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
3555 BORRISOKANE RD
BARRHAVEN, ON

DRAWING TITLE
CAR WASH WASTEWATER TREATMENT & RECLAMATION SYSTEM

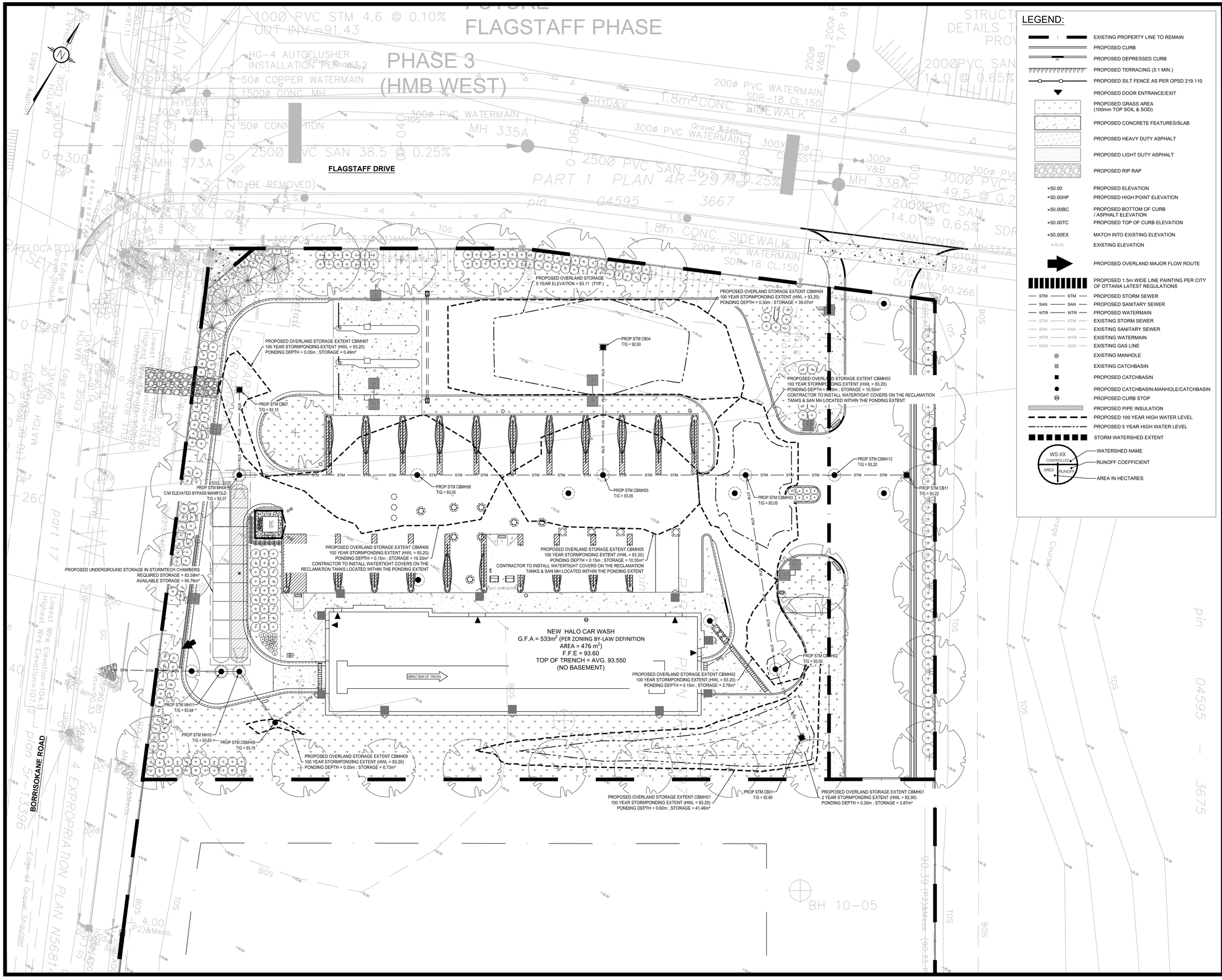
PROJECT NO.
210691

DATE
JANUARY 2022

C402

D07-12-22-0085

#18788



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LICENSED PROFESSIONAL ENGINEER
M BASNET
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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
3555 BORRISOKANE RD
BARRHAVEN, ON

DRAWING TITLE
STORMWATER MANAGEMENT PLAN

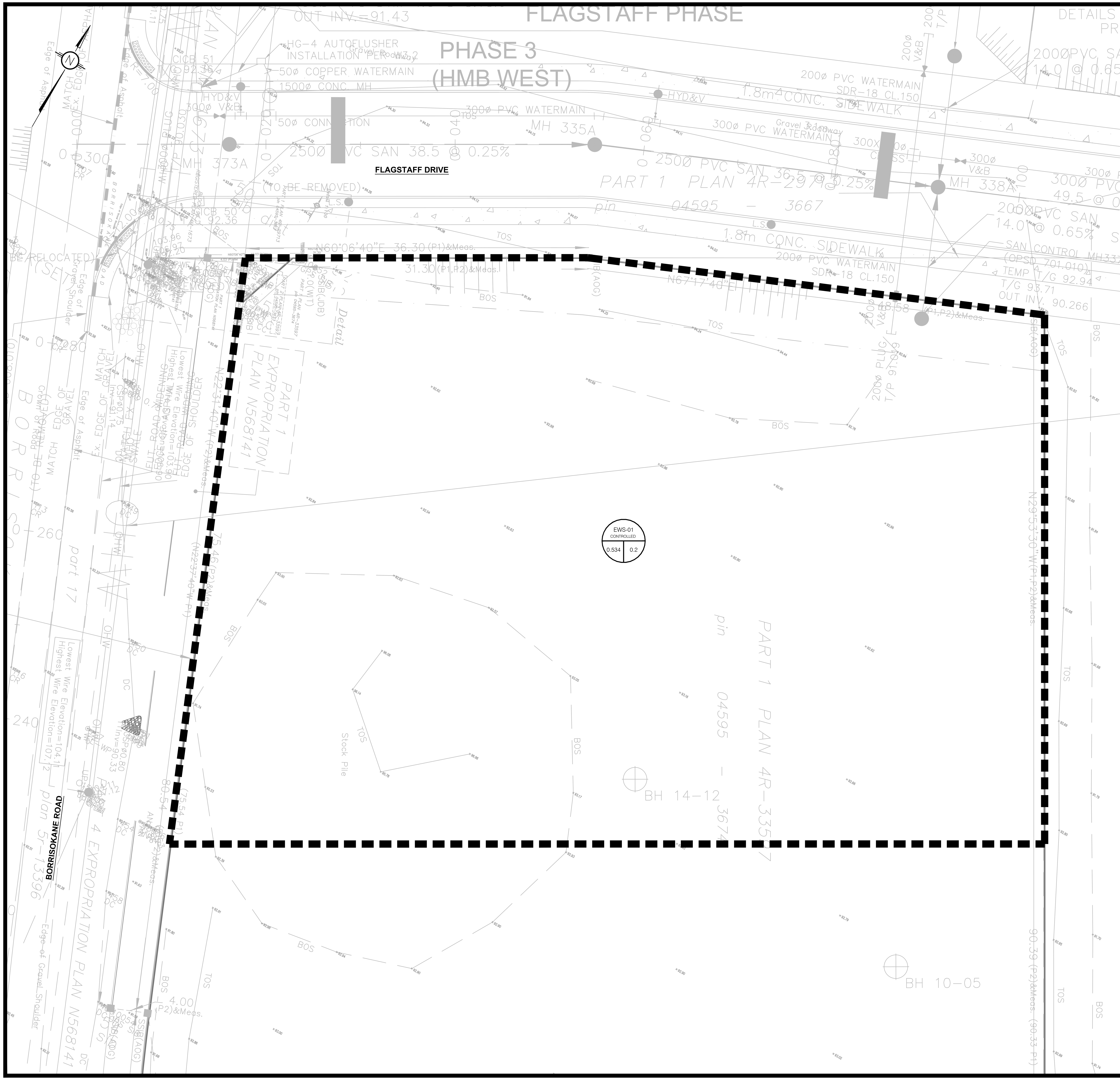
PROJECT NO.
210691

DATE
JANUARY 2022

C601

D07-12-22-0085

#18788



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5m 2 0 5m

SCALE: 1:200

SUBJECT FOR APPROVAL

No.	REVISIONS	BY	DATE
11	RE-ISSUED FOR APPROVAL	M.L.	07 JULY 2023
10	RE-ISSUED FOR APPROVAL	M.L.	23 MAY 2023
09	RE-ISSUED FOR APPROVAL	M.L.	09 MAY 2023
08	ISSUED FOR COMMITTEE OF ADJUSTMENT	M.L.	08 MAY 2023
07	RE-ISSUED FOR APPROVAL	P.P.	31 MAR 2023
06	RE-ISSUED FOR APPROVAL	P.P.	31 MAR 2023
05	RE-ISSUED FOR APPROVAL	P.P.	22 FEB 2023
04	RE-ISSUED FOR APPROVAL	P.P.	17 NOV 2022
03	REVISED FLOOR AREA FOR MV. APPLICATION	P.P.	13 JULY 2022
02	REVISED FLOOR AREA FOR MV. APPLICATION	P.P.	23 JUNE 2022
01	ISSUED FOR APPROVAL	M.L.	22 APR 2022

LICENSED PROFESSIONAL ENGINEER
M. BASNET
100501996
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
3555 BORRISOKANE RD
BARRHAVEN, ON

DRAWING TITLE
PRE-DEVELOPMENT WATERSHED PLAN

PROJECT NO.
210691

DATE
JANUARY 2022

C701

D07-12-22-0085

#18788

FLAGSTAFF PHASE

PHASE 3
(HMB WEST)

FLAGSTAFF DRIVE

BORRISOKANE ROAD

NEW HALO CAR WASH
G.F.A = 533m² (PER ZONING BY-LAW DEFINITION
AREA = 476 m²)
F.F.E = 93.60
TOP OF TRENCH = AVG. 93.550
(NO BASEMENT)

DIRECTION OF TRAVEL

WS-07 CONTROLLED 0.039 | 0.76
WS-04 CONTROLLED 0.101 | 0.58
WS-06 CONTROLLED 0.123 | 0.87
WS-05 CONTROLLED 0.053 | 0.90
WS-03 CONTROLLED 0.030 | 0.87
WS-02 CONTROLLED 0.049 | 0.90
WS-01B CONTROLLED 0.017 | 0.79
WS-01A CONTROLLED 0.045 | 0.29
WS-08 CONTROLLED 0.027 | 0.20
WS-09 UN-CONTROLLED 0.027 | 0.20
WS-10 UN-CONTROLLED 0.020 | 0.53

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 DOOR ENTRANCE/EXIT
- PROPOSED GRASS AREA (100mm TOP SOIL & SOD)
- 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
- ×50.00BC PROPOSED BOTTOM OF CURB / ASPHALT ELEVATION
- ×50.00TC PROPOSED TOP OF CURB ELEVATION
- ×50.00EX MATCH INTO EXISTING ELEVATION
- ×70.19 EXISTING ELEVATION
- PROPOSED OVERLAND MAJOR FLOW ROUTE
- PROPOSED 1.5m WIDE LINE PAINTING PER CITY OF OTTAWA LATEST REGULATIONS
- 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
- PROPOSED CATCHBASIN-MANHOLE/CATCHBASIN
- 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

USE AND INTERPRETATION OF DRAWINGS

GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION ARE PART OF THE CONTRACT DOCUMENTS AND DESCRIBE USE AND INTENT OF THE DRAWING. THE CONTRACT DOCUMENTS INCLUDE NOT ONLY THE DRAWINGS, BUT ALSO THE OWNER-CONTRACTOR AGREEMENTS, CONDITIONS OF THE CONTRACT, THE SPECIFICATIONS, ADDENDA, AND MODIFICATIONS ISSUED AFTER EXECUTION OF THE CONTRACT. THESE CONTRACT DOCUMENTS ARE COMPLEMENTARY, AND WHAT IS REQUIRED BY ANY ONE SHALL BE BINDING AS IF REQUIRED BY ALL. WORK NOT COMPLETELY DELINEATED HEREON SHALL BE CONSTRUCTED OF THE SAME MATERIALS AND DETAILED SIMILARLY AS WORK SHOWN MORE COMPLETELY ELSEWHERE IN THE CONTRACT DOCUMENTS.

BY USE OF THE DRAWINGS FOR CONSTRUCTION OF THE PROJECT, THE OWNER CONFIRMS THAT HE HAS REVIEWED AND APPROVED THE DRAWINGS. THE CONTRACTOR CONFIRMS THAT HE HAS VISITED THE SITE, FAMILIARIZED HIMSELF WITH THE LOCAL CONDITIONS, VERIFIED FIELD DIMENSIONS AND CORRELATED HIS OBSERVATIONS WITH THE REQUIREMENTS OF THE CONTRACT DOCUMENTS.

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IN ADDITION, THE CLIENT AGREES, TO THE FULLEST EXTENT PERMITTED BY LAW, TO INDEMNIFY AND HOLD HARMLESS LRL FROM ANY DAMAGES, LIABILITIES OR COST, INCLUDING REASONABLE ATTORNEY'S FEES AND COST OF DEFENSE, ARISING FROM SUCH CHANGES.

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5m 2 0 5m
GRAPHIC SCALE

SUBJECT FOR APPROVAL

No.	REVISIONS	BY	DATE
11	RE-ISSUED FOR APPROVAL	M.L.	07 JULY 2023
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LICENSED PROFESSIONAL ENGINEER
M. BASNET
100501998
2023/07/07
PROVINCE OF ONTARIO

NOT AUTHENTIC UNLESS SIGNED AND DATED

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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
3555 BORRISOKANE RD
BARRHAVEN, ON

DRAWING TITLE
POST-DEVELOPMENT
WATERSHED PLAN

PROJECT NO.
210691
DATE
JANUARY 2022

C702

D07-12-22-0085

#18788

FLAGSTAFF PHASE

PHASE 3
(HMB WEST)

FLAGSTAFF DRIVE

NEW HALO CAR WASH
G.F.A = 533m² (PER ZONING BY-LAW DEFINITION
AREA = 476 m²)
F.F.E = 93.60
TOP OF TRENCH = AVG. 93.550
(NO BASEMENT)

DIRECTION OF TRAVEL

SA-01
0.534HA

BORRISOKANE ROAD

LEGEND:

- EXISTING PROPERTY LINE TO REMAIN
- PROPOSED CURB
- PROPOSED DEPRESSED CURB
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WS-XX
CONTROLLED AREA — RUNOFF

- WATERSHED NAME
- RUNOFF COEFFICIENT
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5m 2 0 5m
GRAPHIC SCALE

SUBJECT FOR APPROVAL

No.	REVISIONS	BY	DATE
11	RE-ISSUED FOR APPROVAL	M.L.	07 JULY 2023
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LICENSED PROFESSIONAL ENGINEER
M. BASNET
100501996
2023/07/07
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
3555 BORRISOKANE RD
BARRHAVEN, ON

DRAWING TITLE
SANITARY DRAINAGE AREA

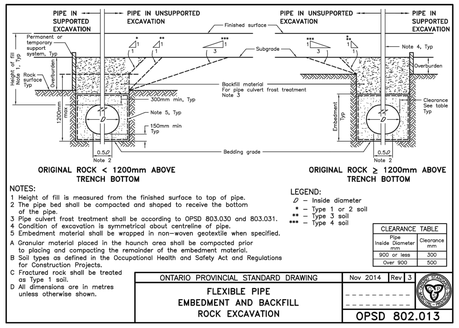
PROJECT NO.
210691

DATE
JANUARY 2022

C703

D07-12-22-0085

#18788

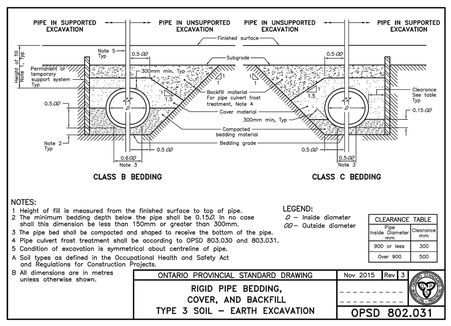


NOTES:
1 Height of fill is measured from the finished surface to top of pipe.
2 The pipe bed shall be compacted and shaped to receive the bottom of the pipe.
3 Pipe culvert frost treatment shall be according to OPSD 803.030 and 803.031.
4 Condition of excavation is symmetrical about centreline of pipe.
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	

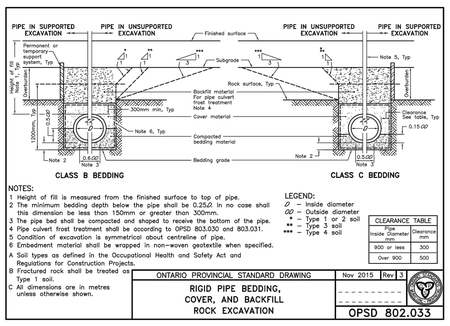


NOTES:
1 Height of fill is measured from the finished surface to top of pipe.
2 The minimum bedding depth below the pipe shall be 0.15$\varnothing$ in no case shall this dimension be less than 150mm or greater than 300mm.
3 The pipe bed shall be compacted and shaped to receive the bottom of the pipe.
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
OD – 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	

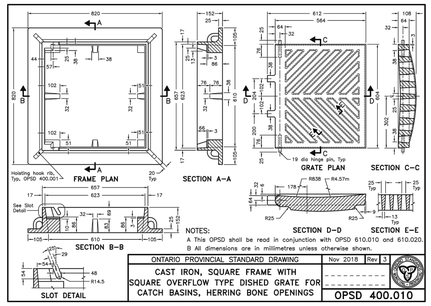


NOTES:
1 Height of fill is measured from the finished surface to top of pipe.
2 The minimum bedding depth below the pipe shall be 0.25$\varnothing$ in no case shall this dimension be less than 150mm or greater than 300mm.
3 The pipe bed shall be compacted and shaped to receive the bottom of the pipe.
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.
6 Embedment material shall be wrapped in non-woven geotextile when specified.
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.

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

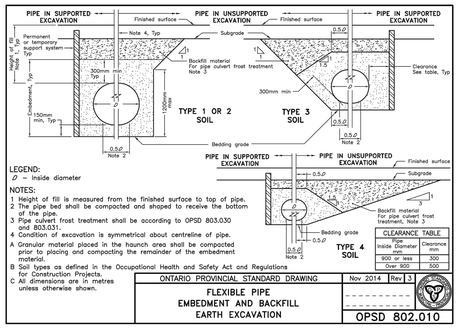
CLEARANCE TABLE	
Pipe Inside Diameter mm	Clearance mm
900 or less	300
Over 900	500

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 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:
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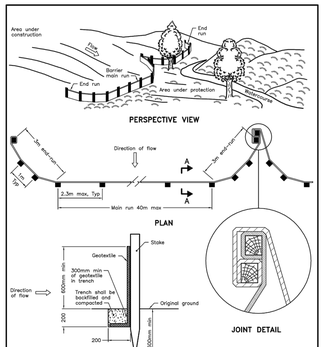
B Soil types as defined in the Occupational Health and Safety Act and Regulations for Construction Projects.
C All dimensions are in metres unless otherwise shown.

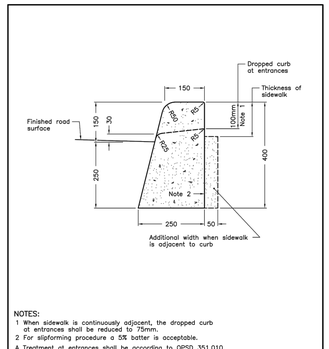
CLEARANCE TABLE	
Pipe Inside Diameter mm	Clearance mm
900 or less	300
Over 900	500

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



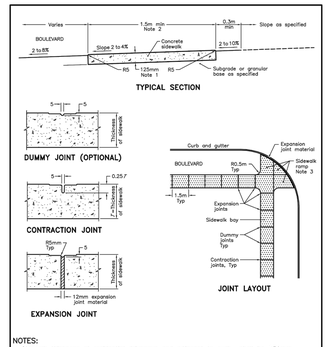
NOTE:
A All dimensions are in millimetres unless otherwise shown.

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



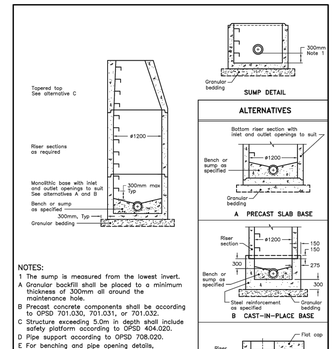
NOTES:
1 When sidewalk is continuously adjacent, the dropped curb at entrances shall be reduced to 75mm.
2 For slipforming procedure a 5% batter is acceptable.
A Treatment at entrances shall be according to OPSD 351.010.
B Outlet treatment shall be according to the OPSD 610 Series.
C The transition from 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	



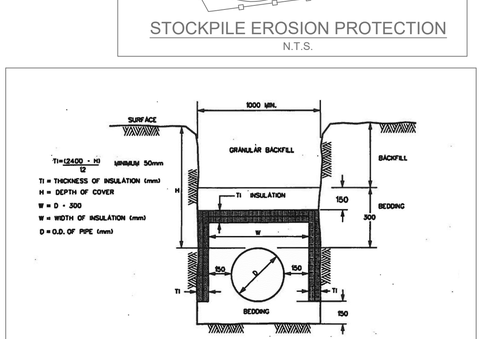
NOTES:
1 Sidewalk thickness at residential driveways and adjacent to curb shall be 150mm. At commercial and industrial driveways, the thickness shall be 200mm.
2 Sidewalk width shall be wider when specified.
3 This OPSD shall be read in conjunction with OPSD 310.030, 310.031, 310.032, 310.033 and 310.039.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

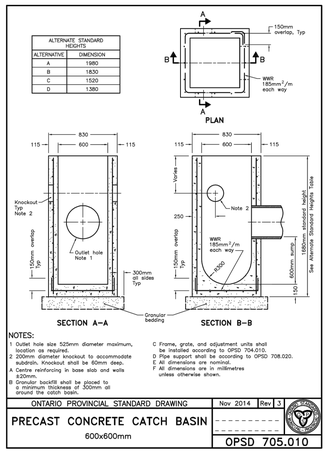
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev 5
PRECAST CONCRETE MAINTENANCE HOLE 1200mm DIAMETER		
	OPSD 701.010	



STOCKPILE EROSION PROTECTION
N.T.S.

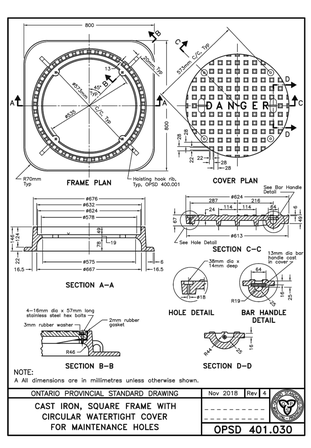
NOTES:
-FOR STORM INSULATION USE AN X VALUE OF 2000 IN THE ABOVE "TI" EQUATION.
-FOR SANITARY INSULATION USE AN X VALUE OF 2500 IN THE ABOVE "TI" EQUATION.
-FOR WATERMAIN INSULATION USE AN X VALUE OF 2400 IN THE ABOVE "TI" EQUATION.
-INCREMENTS OF INSULATION THICKNESS SHALL BE ADJUSTABLE TO 25mm.
-STAGGER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

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



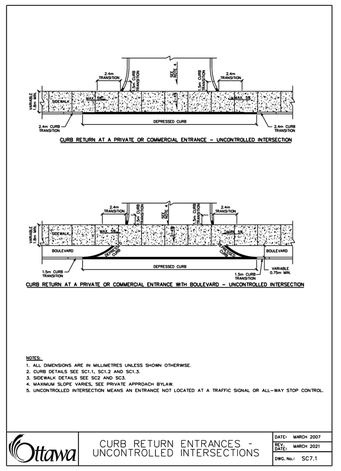
NOTES:
1 Outlet hole size 525mm diameter maximum, location as required.
2 200mm diameter knockout to accommodate subdrain. Knockout shall be 60mm deep.
A Concrete reinforcing in base slab and walls 520mm².
B Granular backfill shall be placed to a minimum thickness of 300mm all around the catch basin.
C Frame, grate, and adjustment units shall be installed according to OPSD 704.010.
D Benching and inverts 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	



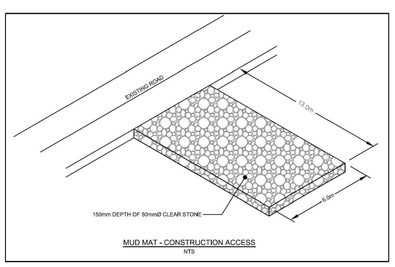
NOTE:
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2018	Rev 4
CAST IRON, SQUARE FRAME WITH CIRCULAR WATERTIGHT COVER FOR MAINTENANCE HOLES		
	OPSD 401.030	

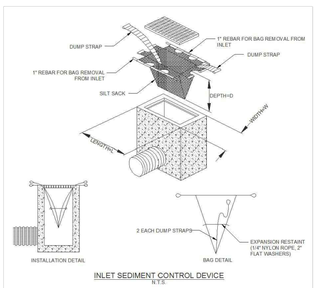


NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.
2. FOR DETAILS SEE SC1.1, SC1.2 AND SC1.3.
3. SIDEWALK DETAILS SEE SC2 AND SC3.
4. MAXIMUM SLOPE VARIES, SEE PRIVATE APPROACH BYLAW.
5. UNCONTROLLED INTERSECTION MEANS AN ENTRANCE NOT LOCATED AT A TRAFFIC SIGNAL OR ALL–WAY STOP CONTROL.

Ottawa | CURB RETURN ENTRANCES – UNCONTROLLED INTERSECTIONS | DATE: MARCH 2007 | REV. DATE: MARCH 2021 | DWG. No.: SC7.1



MUD MAT – CONSTRUCTION ACCESS
NTS



INLET SEDIMENT CONTROL DEVICE
N.T.S.

USE AND INTERPRETATION OF DRAWINGS

GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION ARE PART OF THE CONTRACT DOCUMENTS AND DESCRIBE USE AND INTENT OF THE DRAWINGS. THE CONTRACT DOCUMENTS INCLUDE NOT ONLY THE DRAWINGS, BUT ALSO THE OWNER-CONTRACTOR AGREEMENTS, CONDITIONS OF THE CONTRACT, THE SPECIFICATIONS, ADDENDA, AND MODIFICATIONS ISSUED AFTER EXECUTION OF THE CONTRACT. THESE CONTRACT DOCUMENTS ARE COMPLEMENTARY, AND WHAT IS REQUIRED BY ANY ONE SHALL BE BINDING AS IF REQUIRED BY ALL. WORK NOT COMPLETELY DELINEATED HEREON SHALL BE CONSTRUCTED OF THE SAME MATERIALS AND FINISH SIMILARLY AS WORK SHOWN MORE COMPLETELY ELSEWHERE IN THE CONTRACT DOCUMENTS.

BY USE OF THE DRAWINGS FOR CONSTRUCTION OF THE PROJECT, THE OWNER CONFIRMS THAT HE HAS REVIEWED AND APPROVED THE DRAWINGS. THE CONTRACTOR CONFIRMS THAT HE HAS VISITED THE SITE, FAMILIARIZED HIMSELF WITH THE LOCAL CONDITIONS, VERIFIED FIELD DIMENSIONS AND CORRELATED HIS OBSERVATIONS WITH THE REQUIREMENTS OF THE CONTRACT DOCUMENTS.

AS INSTRUMENTS OF SERVICE, ALL DRAWINGS, SPECIFICATIONS, CADD FILES OR OTHER ELECTRONIC MEDIA AND COPIED THERE OF FURNISHED BY THE ENGINEER ARE HIS PROPERTY. THEY ARE TO BE USED ONLY FOR THIS PROJECT AND ARE NOT TO BE USED ON ANY OTHER PROJECT, INCLUDING REPEATS OF THE PROJECT. CHANGES TO THE DRAWINGS MAY ONLY BE MADE BY THE ENGINEER.

UNLESS THE REVISION TITLE IS "ISSUED FOR CONSTRUCTION", THESE DRAWINGS SHALL BE CONSIDERED PRELIMINARY AND SHALL NOT BE USED AS A CONSTRUCTION DOCUMENT.

THESE DRAWINGS ILLUSTRATES THE WORK TO BE DONE. THE ENGINEER IS NOT RESPONSIBLE FOR THE MEANS, METHODS, TECHNIQUES, SEQUENCES, AND PROCEDURES USED TO DO THE WORK, OR THE SAFETY ASPECTS OF CONSTRUCTION, AND NOTHING ON THESE DRAWINGS EXPRESSED OR IMPLIED CHANGES THIS CONDITION. CONTRACTOR SHALL DETERMINE ALL CONDITIONS AT THE SITE AND SHALL BE RESPONSIBLE FOR KNOWING HOW THEY AFFECT THE WORK. SUBMITTAL OF A BID TO PERFORM THIS WORK IS ACKNOWLEDGEMENT OF THE RESPONSIBILITIES, AND THAT THEY HAVE BEEN FULLY CONSIDERED IN PLANNING OF THE WORK, AND THE BID PRICE. NO CLAIMS FOR EXTRA CHANGES DUE TO THESE CONDITIONS WILL BE FORTHCOMING.

UNAUTHORIZED CHANGES:

IN THE EVENT THE CLIENT, THE CLIENT'S CONTRACTORS OR SUBCONTRACTORS, OR ANYONE FOR WHOM THE CLIENT IS LEGALLY LIABLE MAKES OR PERMITS TO BE MADE ANY CHANGES TO ANY REPORTS, PLANS, SPECIFICATIONS OR OTHER CONSTRUCTION DOCUMENTS PREPARED BY LRL ASSOCIATES LTD. (LRL) WITHOUT OBTAINING LRL'S PRIOR WRITTEN CONSENT, THE CLIENT SHALL ASSUME FULL RESPONSIBILITY FOR THE RESULTS OF SUCH CHANGES, THEREFORE THE CLIENT AGREES TO WAIVE ANY CLAIM AGAINST LRL AND TO RELEASE LRL FROM ANY LIABILITY ARISING DIRECTLY OR INDIRECTLY FROM SUCH UNAUTHORIZED CHANGES.

IN ADDITION, THE CLIENT AGREES, TO THE FULLEST EXTENT PERMITTED BY LAW, TO INDEMNIFY AND HOLD HARMLESS LRL FROM ANY DAMAGES, LIABILITIES OR COST, INCLUDING REASONABLE ATTORNEY'S FEES AND COST OF DEFENSE, ARISING FROM SUCH CHANGES.

IN ADDITION, THE CLIENT AGREES TO INCLUDE IN ANY CONTRACTS FOR CONSTRUCTION APPROPRIATE LANGUAGE THAT PROHIBITS THE CONTRACTOR OR ANY SUBCONTRACTORS OF ANY TIER FROM MAKING ANY CHANGES OR MODIFICATIONS TO LRL'S CONSTRUCTION DOCUMENTS WITHOUT THE PRIOR WRITTEN APPROVAL OF LRL AND THAT FURTHER REQUIRES THE CONTRACTOR TO INDEMNIFY BOTH LRL AND THE CLIENT FROM ANY LIABILITY OR COST ARISING FROM SUCH CHANGES MADE WITHOUT SUCH PROPER AUTHORIZATION.

GENERAL NOTES:

EXISTING SERVICES AND UTILITIES SHOWN ON THESE DRAWINGS ARE TAKEN FROM THE BEST AVAILABLE RECORDS, BUT MAY NOT BE COMPLETE OR TO DATE. CONTRACTOR SHALL VERIFY IN FIELD FOR LOCATION AND ELEVATION OF PIPES AND CHECK WITH THE UTILITY COMPANIES BEFORE DIGGING OR PERFORMING WORK.

CONTRACTOR IS ADVISED TO COLLECT INFORMATION ON SOIL CONDITIONS BEFORE START OF CONSTRUCTION.

THE ENGINEER WAIVES ANY AND ALL RESPONSIBILITY AND LIABILITY FOR PROBLEMS WHICH ARISE FROM FAILURE TO FOLLOW THESE PLANS, SPECIFICATIONS AND THE DESIGN INTENT THEY CONVEY, OR FOR PROBLEMS WHICH ARISE FROM OTHERS' FAILURE TO OBTAIN AND/OR FOLLOW THE ENGINEER'S GUIDANCE WITH RESPECT TO ANY ERRORS, OMISSIONS, INCONSISTENCIES AMBIGUITIES OR CONFLICTS WHICH ARE ALLEGED.

CONTRACTOR TO VERIFY ALL DIMENSIONS AND NOTIFY THE ENGINEER OF ANY DISCREPANCIES BEFORE WORK COMMENCES. DO NOT SCALE DRAWINGS.

SUBJECT FOR APPROVAL

No.	REVISIONS	BY	DATE
11	RE-ISSUED FOR APPROVAL	M.L.	07 JULY 2023
10	RE-ISSUED FOR APPROVAL	M.L.	23 MAY 2023
09	RE-ISSUED FOR APPROVAL	M.L.	09 MAY 2023
08	ISSUED FOR COMMITTEE OF ADJUSTMENT	M.L.	08 MAY 2023
07	RE-ISSUED FOR APPROVAL	P.P.	31 MAR 2023
06	RE-ISSUED FOR APPROVAL	P.P.	31 MAR 2023
05	RE-ISSUED FOR APPROVAL	P.P.	22 FEB 2023
04	RE-ISSUED FOR APPROVAL	P.P.	17 NOV 2022
03	REVISED FLOOR AREA FOR MV. APPLICATION	P.P.	13 JULY 2022
02	REVISED FLOOR AREA FOR MV. APPLICATION	P.P.	23 JUNE 2022
01	ISSUED FOR APPROVAL	M.L.	22 APR 2022

LICENSED PROFESSIONAL ENGINEER
M. BASNET
100501598
2023/07/07
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
3555 BORRISOKANE RD
BARRHAVEN, ON

DRAWING TITLE
CONSTRUCTION DETAIL PLAN

PROJECT NO.
210691

DATE
JANUARY 2022

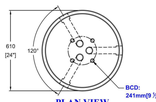
C901

D07-12-22-0085

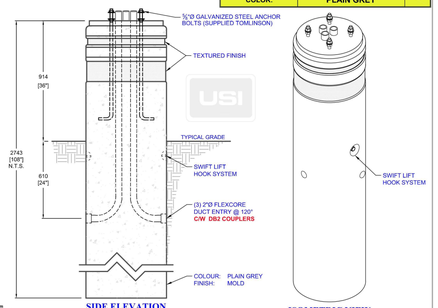
#18788

USI JOB# U1139-A

POLE BASE INFORMATION		✓
QUANTITY:		
B.C.D.:	241mm [9 ½"]	
ANCHOR BOLTS:	⅝"Ø (BY TOMLINSON)	
PVC DUCTS:	(3) 2" FLEXCORE	
	N/A	
FINISH:	MOLD	
COLOR:	PLAIN GREY	



PLAN VIEW



SIDE ELEVATION ISOMETRIC VIEW

NOTE:
ALL DIMENSIONS DEFAULT TO MILLIMETRES

CUSTOM PIECE

CUSTOMER: R. W. Tomlinson Limited

PROJECT NAME:

APPROVED BY:

CONSTRUCTION DETAILS:
- **COLOUR: PLAIN GREY**
- **FINISH: MOLD**

CUSTOM DETAILS:
- BOLT CIRCLE DIAMETER = 241mm[9.5"]
- ANCHOR BOLTS = ⅝" Ø ANCHOR BOLTS (SUPPLIED BY TOMLINSON)

PRODUCT CODE: **P-56(9)**
DECORATIVE PARKING LOT POLE BASE

DIMENSIONS: **2.74m(H) X 610mmØ**

TOTAL WEIGHT: **2,000 kg / 4,400 lbs**

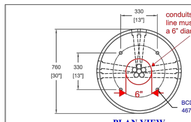
REVISION DATE: **DECEMBER 14, 2022** REV. # 4

UTILITY STRUCTURES INC.
61 BONSARD AVE | OTTAWA, ON | K2E 6V2
T: 613.225.5388 F: 613.225.1661 TF: 800.267.6466
www.utilitystructures.com

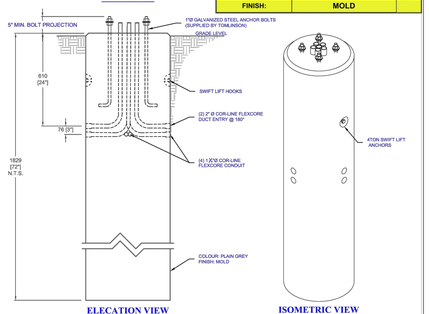
- **CSA 23.4-05**
- **45 MPa (6525psi) AT 28 DAYS**
- **STRIPPING STRENGTH: MIN. 20 MPa(2900psi)**
- **5-8% AIR ENTRAINED**
- **EXPOSURE CLASS: C-1**
- **REINFORCING: STEEL TO CSA CAN A23.1**

USI JOB# U1139-B

POLE BASE INFORMATION		✓
QUANTITY:		
B.C.D.:	467mm [18 ⅜"]	
ANCHOR BOLTS:	1"Ø (BY TOMLINSON)	
PVC DUCTS:	(6) 1 ¼" CORE-LINE	
	N/A	
COLOUR:	PLAIN GREY	
FINISH:	MOLD	



PLAN VIEW



ELECATION VIEW ISOMETRIC VIEW

CUSTOM PIECE

CUSTOMER: Tomlinson

PROJECT NAME:

APPROVED BY:

CUSTOM DETAILS:
- BOLT CIRCLE DIAMETER = 467 mm[18 ⅜"]
- ANCHOR BOLTS SIZE = 1"Ø ANCHOR BOLTS (SUPPLIED BY TOMLINSON)

CONSTRUCTION DETAILS:
- **COLOUR: PLAIN GREY**
- **FINISH: MOLD**

PRODUCT CODE: **P50-30G(6)**
30" DIAMETER POLE BASE

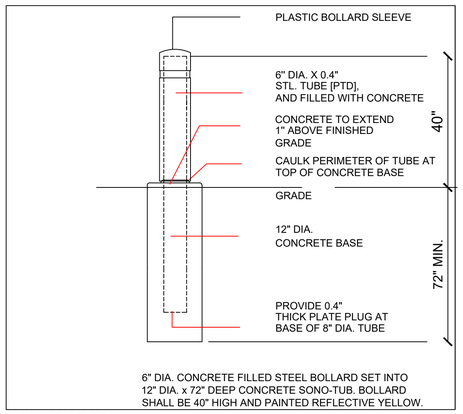
DIMENSIONS: **1,829m(H) X 760mmØ**

TOTAL WEIGHT: **1,936 kg / 4,260 lbs**

REVISION DATE: **DECEMBER 22, 2022** REV. #4

UTILITY STRUCTURES INC.
61 BONSARD AVE | OTTAWA, ON | K2E 6V2
T: 613.225.5388 F: 613.225.1661 TF: 800.267.6466
www.utilitystructures.com

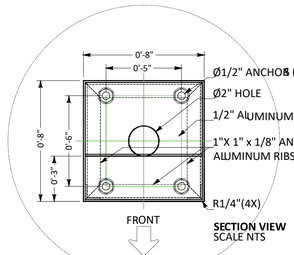
- **CSA 23.4-05**
- **45 MPa (6525psi) AT 28 DAYS**
- **STRIPPING STRENGTH: MIN. 20 MPa(2900psi)**
- **5-8% AIR ENTRAINED**
- **EXPOSURE CLASS: C-1**
- **REINFORCING: STEEL TO CSA CAN A23.1**



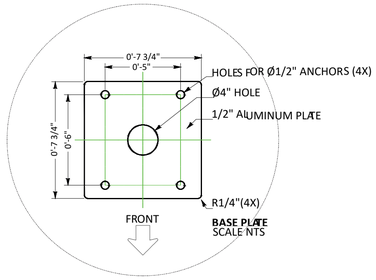
6" DIA. CONCRETE FILLED STEEL BOLLARD SET INTO 12" DIA. x 72" DEEP CONCRETE SONO-TUB. BOLLARD SHALL BE 40" HIGH AND PAINTED REFLECTIVE YELLOW.

BOLLARD DETAIL

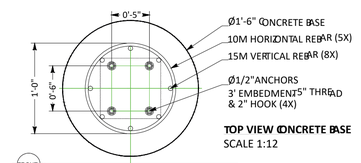
N.T.S.



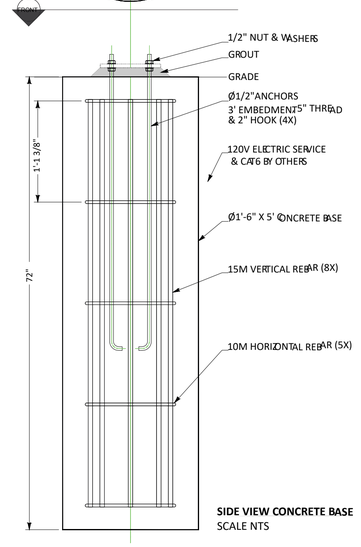
SECTION VIEW
SCALE NTS



BASE PLATE
SCALE NTS



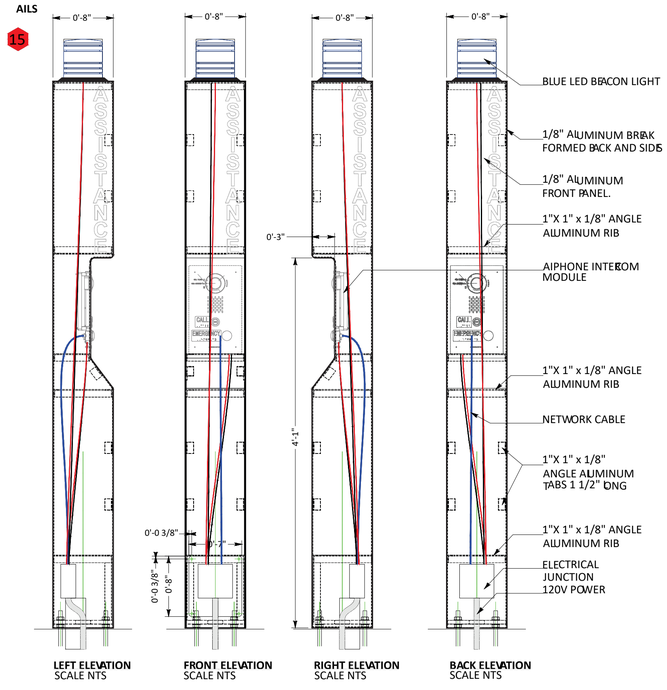
TOP VIEW CONCRETE BASE
SCALE 1:12



SIDE VIEW CONCRETE BASE
SCALE NTS

ASSISTANCE INTERCOM STATIONS

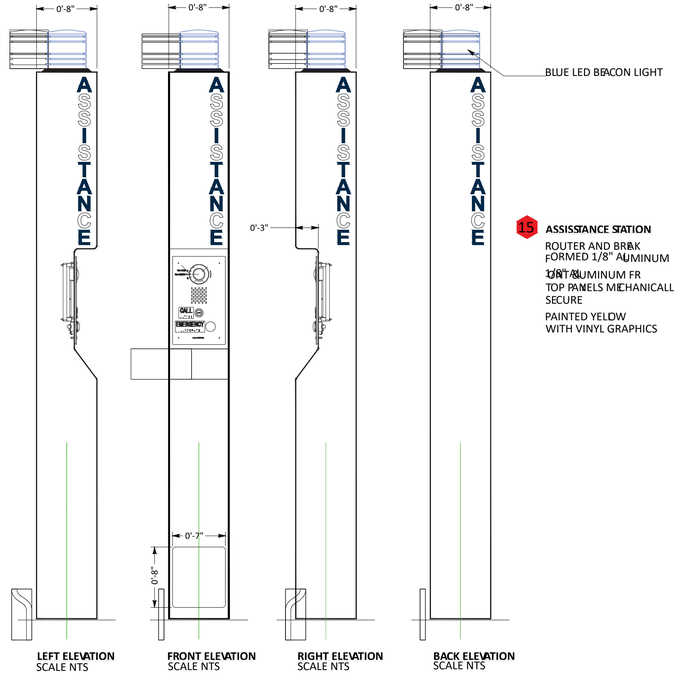
N.T.S.



LEFT ELEVATION SCALE NTS
FRONT ELEVATION SCALE NTS
RIGHT ELEVATION SCALE NTS
BACK ELEVATION SCALE NTS

ASSISTANCE INTERCOM STATIONS

N.T.S.



15 **ASSISTANCE STATION**

ROUTER AND BRAK FORMED 1/8" ALUMINUM
1/8" ALUMINUM FR
TOP PANELS MECHANICALL SECURE

PAINTED YELOW WITH VINYL GRAPHICS

LEFT ELEVATION SCALE NTS
FRONT ELEVATION SCALE NTS
RIGHT ELEVATION SCALE NTS
BACK ELEVATION SCALE NTS

ASSISTANCE INTERCOM STATIONS

N.T.S.

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

USE AND INTERPRETATION OF DRAWINGS

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UNAUTHORIZED CHANGES:

IN THE EVENT THE CLIENT, THE CLIENT'S CONTRACTORS OR SUBCONTRACTORS, OR ANYONE FOR WHOM THE CLIENT IS LEGALLY LIABLE MAKES OR PERMITS TO BE MADE ANY CHANGES TO ANY REPORTS, PLANS, SPECIFICATIONS OR OTHER CONSTRUCTION DOCUMENTS PREPARED BY LRL ASSOCIATES LTD. (LRL) WITHOUT OBTAINING LRL'S PRIOR WRITTEN CONSENT, THE CLIENT SHALL ASSUME FULL RESPONSIBILITY FOR THE RESULTS OF SUCH CHANGES, THEREFORE THE CLIENT AGREES TO WAIVE ANY CLAIM AGAINST LRL AND TO RELEASE LRL FROM ANY LIABILITY ARISING DIRECTLY OR INDIRECTLY FROM SUCH UNAUTHORIZED CHANGES.

IN ADDITION, THE CLIENT AGREES, TO THE FULLEST EXTENT PERMITTED BY LAW, TO INDEMNIFY AND HOLD HARMLESS LRL FROM ANY DAMAGES, LIABILITIES OR COST, INCLUDING REASONABLE ATTORNEY'S FEES AND COST OF DEFENSE, ARISING FROM SUCH CHANGES.

IN ADDITION, THE CLIENT AGREES TO INCLUDE IN ANY CONTRACTS FOR CONSTRUCTION APPROPRIATE LANGUAGE THAT PROHIBITS THE CONTRACTOR OR ANY SUBCONTRACTORS OF ANY TIER FROM MAKING ANY CHANGES OR MODIFICATIONS TO LRL'S CONSTRUCTION DOCUMENTS WITHOUT THE PRIOR WRITTEN APPROVAL OF LRL AND THAT FURTHER REQUIRES THE CONTRACTOR TO INDEMNIFY BOTH LRL AND THE CLIENT FROM ANY LIABILITY OR COST ARISING FROM SUCH CHANGES MADE WITHOUT SUCH PROPER AUTHORIZATION.

GENERAL NOTES:

EXISTING SERVICES AND UTILITIES SHOWN ON THESE DRAWINGS ARE TAKEN FROM THE BEST AVAILABLE RECORDS, BUT MAY NOT BE COMPLETE OR TO DATE. CONTRACTOR SHALL VERIFY IN FIELD FOR LOCATION AND ELEVATION OF PIPES AND CHECK WITH THE UTILITY COMPANIES BEFORE DIGGING OR PERFORMING WORK.

CONTRACTOR IS ADVISED TO COLLECT INFORMATION ON SOIL CONDITIONS BEFORE START OF CONSTRUCTION.

THE ENGINEER WAIVES ANY AND ALL RESPONSIBILITY AND LIABILITY FOR PROBLEMS WHICH ARISE FROM FAILURE TO FOLLOW THESE PLANS, SPECIFICATIONS AND THE DESIGN INTENT THEY CONVEY, OR FOR PROBLEMS WHICH ARISE FROM OTHERS' FAILURE TO OBTAIN AND/OR FOLLOW THE ENGINEER'S GUIDANCE WITH RESPECT TO ANY ERRORS, OMISSIONS, INCONSISTENCIES AMBIGUITIES OR CONFLICTS WHICH ARE ALLEGED.

CONTRACTOR TO VERIFY ALL DIMENSIONS AND NOTIFY THE ENGINEER OF ANY DISCREPANCIES BEFORE WORK COMMENCES. DO NOT SCALE DRAWINGS.

SUBJECT FOR APPROVAL

No.	REVISIONS	BY	DATE
11	RE-ISSUED FOR APPROVAL	M.L.	07 JULY 2023
10	RE-ISSUED FOR APPROVAL	M.L.	23 MAY 2023
09	RE-ISSUED FOR APPROVAL	M.L.	09 MAY 2023
08	ISSUED FOR COMMITTEE OF ADJUSTMENT	M.L.	08 MAY 2023
07	RE-ISSUED FOR APPROVAL	P.P.	31 MAR 2023
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02	REVISED FLOOR AREA FOR MV. APPLICATION	P.P.	23 JUNE 2022
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
3555 BORRISOKANE RD
BARRHAVEN, ON

DRAWING TITLE

CONSTRUCTION DETAIL PLAN

PROJECT NO. 210691

DATE JANUARY 2022

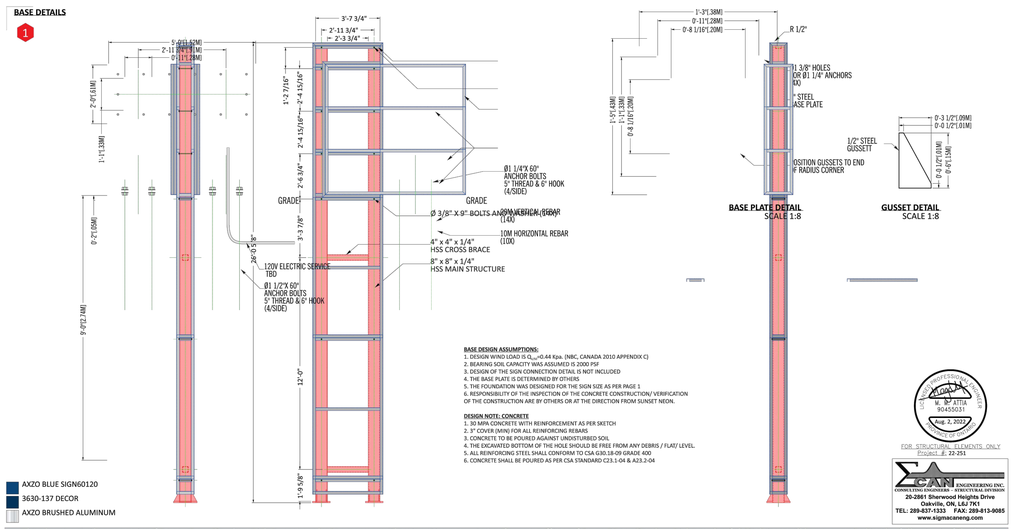
C902

D07-12-22-0085

#18788

BASE DETAILS

1



BASE DESIGN ASSUMPTIONS:
1. DESIGN WIND LOAD IS $Q_{1/50}$=0.44 Kpa. (NBC, CANADA 2010 APPENDIX C)
2. BEARING SOIL CAPACITY WAS ASSUMED IS 2000 PSF
3. DESIGN OF THE SIGN CONNECTION DETAIL IS NOT INCLUDED
4. THE BASE PLATE IS DETERMINED BY OTHERS
5. THE FOUNDATION WAS DESIGNED FOR THE SIGN SIZE AS PER PAGE 1
6. RESPONSIBILITY OF THE INSPECTION OF THE CONCRETE CONSTRUCTION/ VERIFICATION OF THE CONSTRUCTION ARE BY OTHERS OR AT THE DIRECTION FROM SUNSET NEON.

DESIGN NOTE: CONCRETE
1. 30 MPA CONCRETE WITH REINFORCEMENT AS PER SKETCH
2. 3" COVER (MIN.) FOR ALL REINFORCING REBARS
3. CONCRETE TO BE POURED AGAINST UNDISTURBED SOIL
4. THE ENGRAVED BOTTOM OF THE HOLE SHOULD BE FREE FROM ANY DEBRIS / FLAT/ LEVEL.
5. ALL REINFORCING STEEL SHALL CONFORM TO CSA G30.18-09 GRADE 400
6. CONCRETE SHALL BE POURED AS PER CSA STANDARD C23.1-04 & A23.2-04

AXZO BLUE SIGN60120
3630-137 DECOR
AXZO BRUSHED ALUMINUM

Customer: **Halo Car Wash**

Date: 22/07/11
Scale: as shown
Designer: vn
Account Mngr: Dan Bovair
File: 2022\A-Z\H\Halo Car Wash\London ON 250 Southdale Rd E\ London 250 Southdale Rd E PYLON R2.cdr
120 Volts

Revision: R2
22/07/20:VN, ADDRESS NUMBER CHANGE
22/07/27:VN, REVISE DRAWING

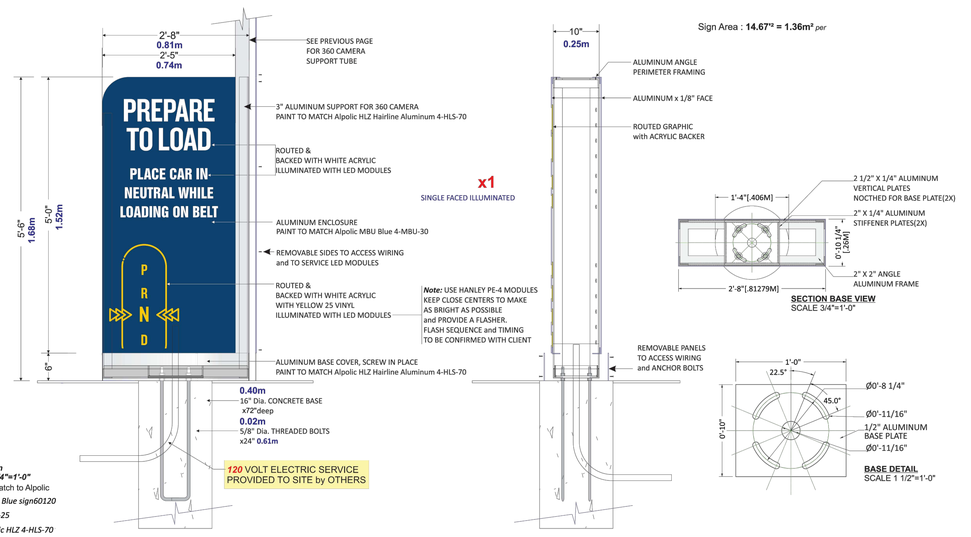
Page: 4 of 5

- [x] Permit Required
- [x] Conceptual artwork
- [ ] Production artwork
- [ ] Site check completed
- [ ] Indoor
- [x] Outdoor

Production Approval:
Signature:
Date:

JONES neon displays
1140 Blair Road, Burlington, ON L7M 1K9
e: info@jonesneonsigns.com
t: 905.335.6664 | f: 905.335.2712

9



Elevation
Scale: 3/4"=1'-0"
Colour Match to Alpolic
- *AXZO Blue sign60120*
- *3630-25*
- *Alpolic HLZ 4-HLS-70*

SECTION BASE VIEW
SCALE 3/4"=1'-0"

BASE DETAIL
SCALE 1 1/2"=1'-0"

Customer: **Halo Car Wash**

Date: Feb 8/2022
Scale: as shown
Designer: bl
Account Mngr: Dan Bovair
File: 2022\A-Z\H\Halo Car Wash\Stittsville ON 6111 Hazeldean Road\ Stittsville 6111 Hazeldean RoadR7.cdr
120 Volts

Revision: R7
22/02/17: VN, SIGNS ADDED
22/05/10:VN, VACUUM BOOTH FONT CHANGE
22/05/12:VN, VACUUM BOOTH QNTY CHANGE

Page: 14 of 23

- [x] Permit Required
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- [x] Outdoor

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Signature:
Date:

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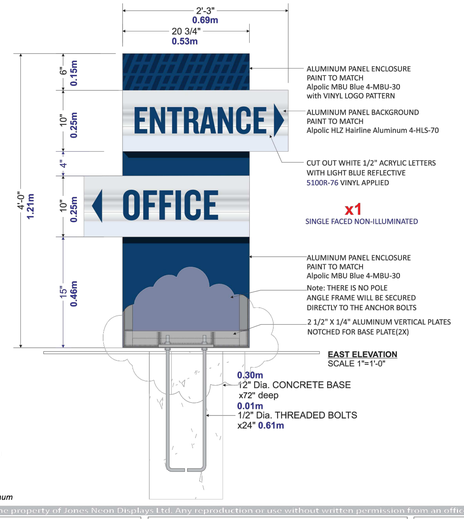
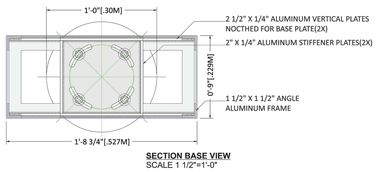
10

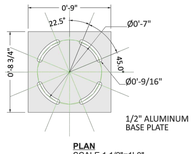


EAST ELEVATION
SCALE 1"=1'-0"

EAST ELEVATION
SCALE 1"=1'-0"



SECTION BASE VIEW
SCALE 1 1/2"=1'-0"



PLAN
SCALE 1 1/2"=1'-0"

Colour Match to Alpolic
- *AXZO Blue sign60120*
- *3630-137 decor*
- *3630-97 TEXT*
- *AXZO Brushed Aluminum*

Customer: **Halo Car Wash**

Date: Feb 8/2022
Scale: as shown
Designer: bl
Account Mngr: Dan Bovair
File: 2022\A-Z\H\Halo Car Wash\Stittsville ON 6111 Hazeldean Road\ Stittsville 6111 Hazeldean RoadR7.cdr
120 Volts

Revision: R7
22/02/17: VN, SIGNS ADDED
22/05/10:VN, VACUUM BOOTH FONT CHANGE
22/05/12:VN, VACUUM BOOTH QNTY CHANGE

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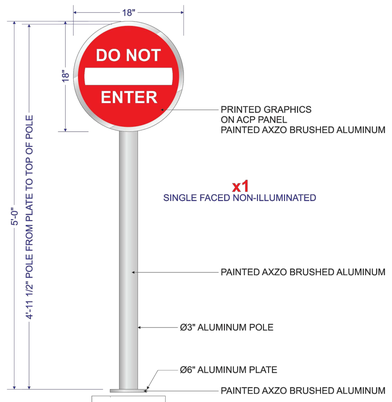
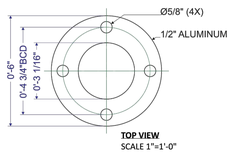
11



ELEVATION
SCALE 1"=1'-0"

PLATE DETAIL



TOP VIEW
SCALE 1"=1'-0"

Red
WHITE
AXZO BRUSHED ALUMINUM

Customer: **Halo Car Wash**

Date: Feb 8/2022
Scale: as shown
Designer: bl
Account Mngr: Dan Bovair
File: 2022\A-Z\H\Halo Car Wash\Stittsville ON 6111 Hazeldean Road\ Stittsville 6111 Hazeldean RoadR7.cdr
120 Volts

Revision: R7
22/02/17: VN, SIGNS ADDED
22/05/10:VN, VACUUM BOOTH FONT CHANGE
22/05/12:VN, VACUUM BOOTH QNTY CHANGE

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Production Approval:
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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
3555 BORRISOKANE RD
BARRHAVEN, ON

DRAWING TITLE

CONSTRUCTION DETAIL PLAN

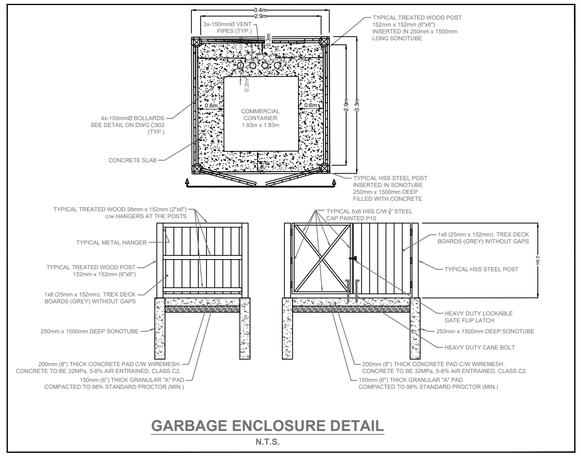
PROJECT NO.
210691

DATE
JANUARY 2022

C903

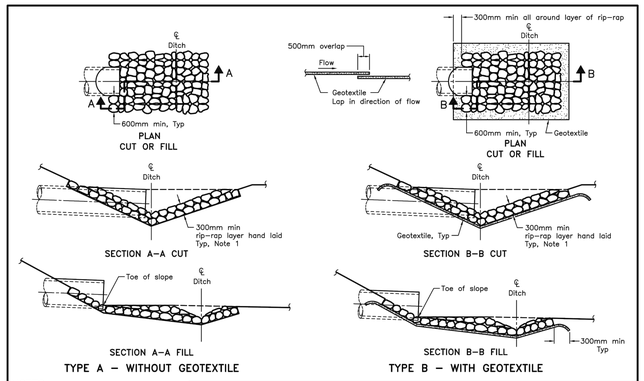
D07-12-22-0085

#18788



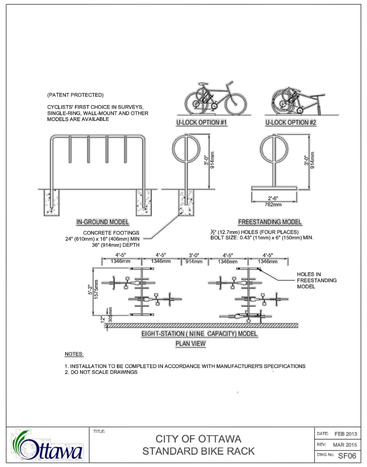
GARBAGE ENCLOSURE DETAIL

N.T.S.



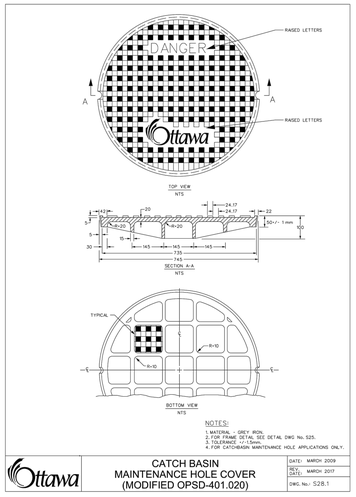
NOTES:
1 The thickness of the rip–rap layer shall be at least 1.5 times the rip–rap mean diameter.
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2018	Rev	3
GENERAL RIP–RAP LAYOUT FOR SEWER AND CULVERT OUTLETS			
	OPSD 810.010		



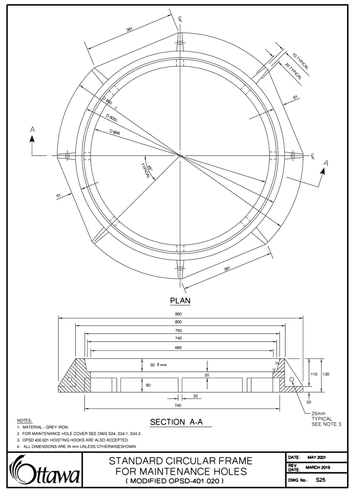
NOTES:
1. INSTALLATION TO BE COMPLETED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS
2. DO NOT SCALE DRAWINGS

	TITLE:	DATE: FEB 2013
Ottawa	CITY OF OTTAWA STANDARD BIKE RACK	MTU: MAR 2015
		DWG No.: SF06

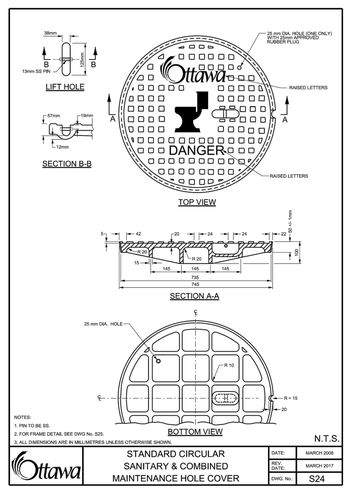


NOTES:
1. MATERIAL – GREY IRON.
2. FOR FRAME DETAIL SEE DETAIL DWG No. S25.
3. OPSD 400.01 HOISTING HOOKS ARE ALSO ACCEPTED.
4. FOR CATCHBASIN MAINTENANCE HOLE APPLICATIONS ONLY.

Ottawa	CATCH BASIN MAINTENANCE HOLE COVER (MODIFIED OPSD-401.020)	DATE: MARCH 2009
		REV. DATE: MARCH 2017
		DWG. No.: S28.1



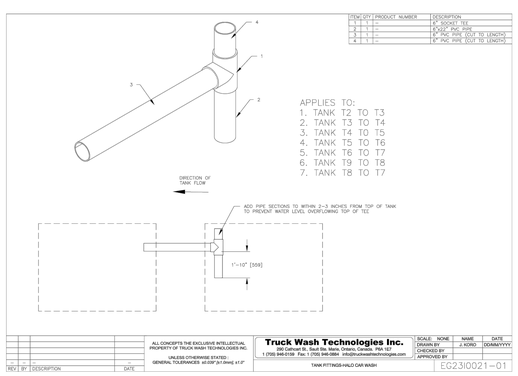
Ottawa	STANDARD CIRCULAR FRAME FOR MAINTENANCE HOLES (MODIFIED OPSD-401.020)	DATE: MAY 2001
		REV. DATE: MARCH 2015
		DWG. No.: S25



NOTES:
1. PIN TO BE SS.
2. FOR FRAME DETAIL SEE DWG No. S25.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SHOWN.

N.T.S.

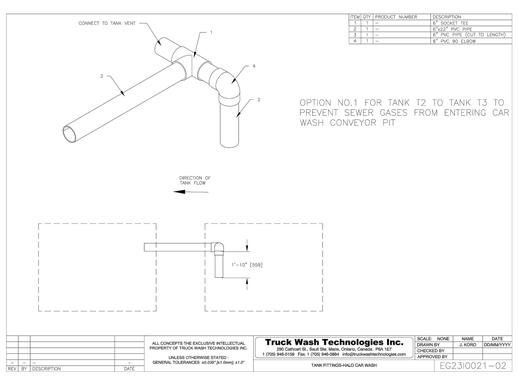
Ottawa	STANDARD CIRCULAR SANITARY & COMBINED MAINTENANCE HOLE COVER	DATE: MARCH 2006
		REV. DATE: MARCH 2017
		DWG. No.: S24



ALL CONCEPTS THE EXCLUSIVE INTELLECTUAL PROPERTY OF TRUCK WASH TECHNOLOGIES INC.
UNLESS OTHERWISE STATED: GENERAL TOLERANCES ±0.030"[±1.0mm] ±1.0°

Truck Wash Technologies Inc.	SCALE: NONE	NAME	DATE
290 Cathcart St., Sault Ste. Marie, Ontario, Canada. P6A 1E7	DRAWN BY:	J. KORO	DD/MM/YYYY
T: (705) 946-0159 Fax: T: (705) 946-0884 info@trucktechnologies.com	CHECKED BY:		
	APPROVED BY:		

TANK FITTINGS-HALO CAR WASH — EG23I0021–01



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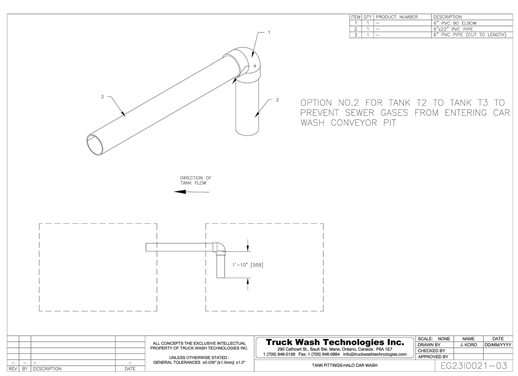
290 Cathcart St., Sault Ste. Marie, Ontario, Canada. P6A 1E7	DRAWN BY:	J. KORO	DD/MM/YYYY
T: (705) 946-0159 Fax: T: (705) 946-0884 info@trucktechnologies.com	CHECKED BY:		
	APPROVED BY:		

TANK FITTINGS-HALO CAR WASH — EG23I0021–02



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Truck Wash Technologies Inc.	SCALE: NONE	NAME	DATE
290 Cathcart St., Sault Ste. Marie, Ontario, Canada. P6A 1E7	DRAWN BY:	J. KORO	DD/MM/YYYY
T: (705) 946-0159 Fax: T: (705) 946-0884 info@trucktechnologies.com	CHECKED BY:		
	APPROVED BY:		

TANK FITTINGS-HALO CAR WASH — EG23I0021–03

USE AND INTERPRETATION OF DRAWINGS

GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION ARE PART OF THE CONTRACT DOCUMENTS AND DESCRIBE USE AND INTENT OF THE DRAWING. THE CONTRACT DOCUMENTS INCLUDE NOT ONLY THE DRAWINGS, BUT ALSO THE OWNER-CONTRACTOR AGREEMENTS, CONDITIONS OF THE CONTRACT, THE SPECIFICATIONS, ADDENDA, AND MODIFICATIONS ISSUED AFTER EXECUTION OF THE CONTRACT. THESE CONTRACT DOCUMENTS ARE COMPLEMENTARY, AND WHAT IS REQUIRED BY ANY ONE SHALL BE BINDING AS IF REQUIRED BY ALL. WORK NOT COMPLETELY DELINEATED HEREON SHALL BE CONSTRUCTED OF THE SAME MATERIALS AND DETAILED SIMILARLY AS WORK SHOWN MORE COMPLETELY ELSEWHERE IN THE CONTRACT DOCUMENTS.

BY USE OF THE DRAWINGS FOR CONSTRUCTION OF THE PROJECT, THE OWNER CONFIRMS THAT HE HAS REVIEWED AND APPROVED THE DRAWINGS. THE CONTRACTOR CONFIRMS THAT HE HAS VISITED THE SITE, FAMILIARIZED HIMSELF WITH THE LOCAL CONDITIONS, VERIFIED FIELD DIMENSIONS AND CORRELATED HIS OBSERVATIONS WITH THE REQUIREMENTS OF THE CONTRACT DOCUMENTS.

AS INSTRUMENTS OF SERVICE, ALL DRAWINGS, SPECIFICATIONS, CADD FILES OR OTHER ELECTRONIC MEDIA AND COPIED THERE OF FURNISHED BY THE ENGINEER ARE HIS PROPERTY. THEY ARE TO BE USED ONLY FOR THIS PROJECT AND ARE NOT TO BE USED ON ANY OTHER PROJECT, INCLUDING REPEATS OF THE PROJECT. CHANGES TO THE DRAWINGS MAY ONLY BE MADE BY THE ENGINEER.

UNLESS THE REVISION TITLE IS "ISSUED FOR CONSTRUCTION", THESE DRAWINGS SHALL BE CONSIDERED PRELIMINARY AND SHALL NOT BE USED AS A CONSTRUCTION DOCUMENT.

THESE DRAWINGS ILLUSTRATES THE WORK TO BE DONE. THE ENGINEER IS NOT RESPONSIBLE FOR THE MEANS, METHODS, TECHNIQUES, SEQUENCES, AND PROCEDURES USED TO DO THE WORK, OR THE SAFETY ASPECTS OF CONSTRUCTION, AND NOTHING ON THESE DRAWINGS EXPRESSED OR IMPLIED CHANGES THIS CONDITION. CONTRACTOR SHALL DETERMINE ALL CONDITIONS AT THE SITE AND SHALL BE RESPONSIBLE FOR KNOWING HOW THEY AFFECT THE WORK. SUBMITTAL OF A BID TO PERFORM THIS WORK IS ACKNOWLEDGEMENT OF THE RESPONSIBILITIES, AND THAT THEY HAVE BEEN FULLY CONSIDERED IN PLANNING OF THE WORK, AND THE BID PRICE. NO CLAIMS FOR EXTRA CHANGES DUE TO THESE CONDITIONS WILL BE FORTHCOMING.

UNAUTHORIZED CHANGES:

IN THE EVENT THE CLIENT, THE CLIENT'S CONTRACTORS OR SUBCONTRACTORS, OR ANYONE FOR WHOM THE CLIENT IS LEGALLY LIABLE MAKES OR PERMITS TO BE MADE ANY CHANGES TO ANY REPORTS, PLANS, SPECIFICATIONS OR OTHER CONSTRUCTION DOCUMENTS PREPARED BY LRL ASSOCIATES LTD. (LRL) WITHOUT OBTAINING LRL'S PRIOR WRITTEN CONSENT, THE CLIENT SHALL ASSUME FULL RESPONSIBILITY FOR THE RESULTS OF SUCH CHANGES, THEREFORE THE CLIENT AGREES TO WAIVE ANY CLAIM AGAINST LRL AND TO RELEASE LRL FROM ANY LIABILITY ARISING DIRECTLY OR INDIRECTLY FROM SUCH UNAUTHORIZED CHANGES.

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06	RE-ISSUED FOR APPROVAL	P.P.	31 MAR 2023
05	RE-ISSUED FOR APPROVAL	P.P.	22 FEB 2023
04	RE-ISSUED FOR APPROVAL	P.P.	17 NOV 2022
03	REVISED FLOOR AREA FOR MV. APPLICATION	P.P.	13 JULY 2022
02	REVISED FLOOR AREA FOR MV. APPLICATION	P.P.	23 JUNE 2022
01	ISSUED FOR APPROVAL	M.L.	22 APR 2022

LICENSED PROFESSIONAL ENGINEER M. BASNET 100501996 2023/07/03 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
3555 BORRISOKANE RD
BARRHAVEN, ON

DRAWING TITLE
CONSTRUCTION DETAIL PLAN

PROJECT NO.
210691

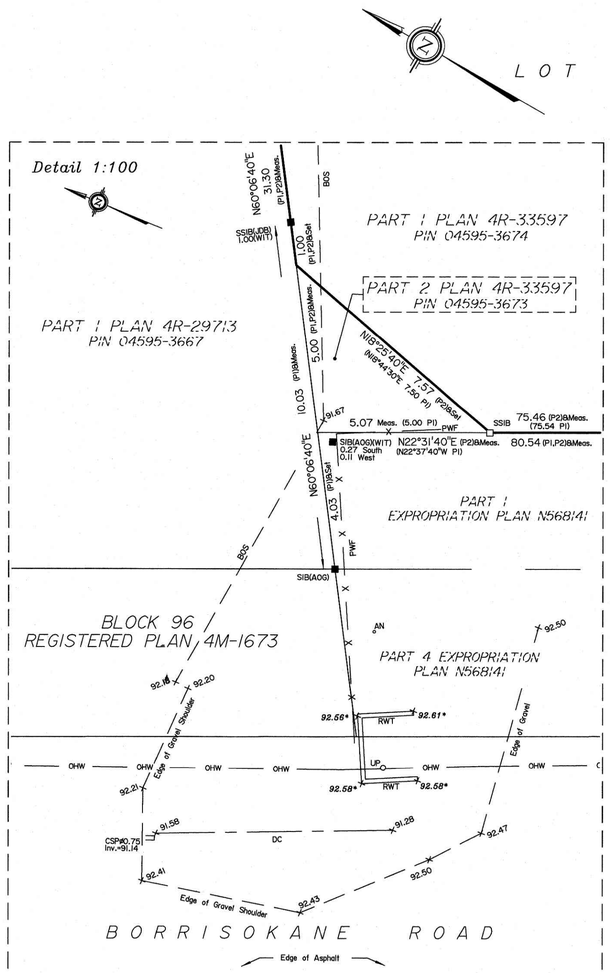
DATE
JANUARY 2022

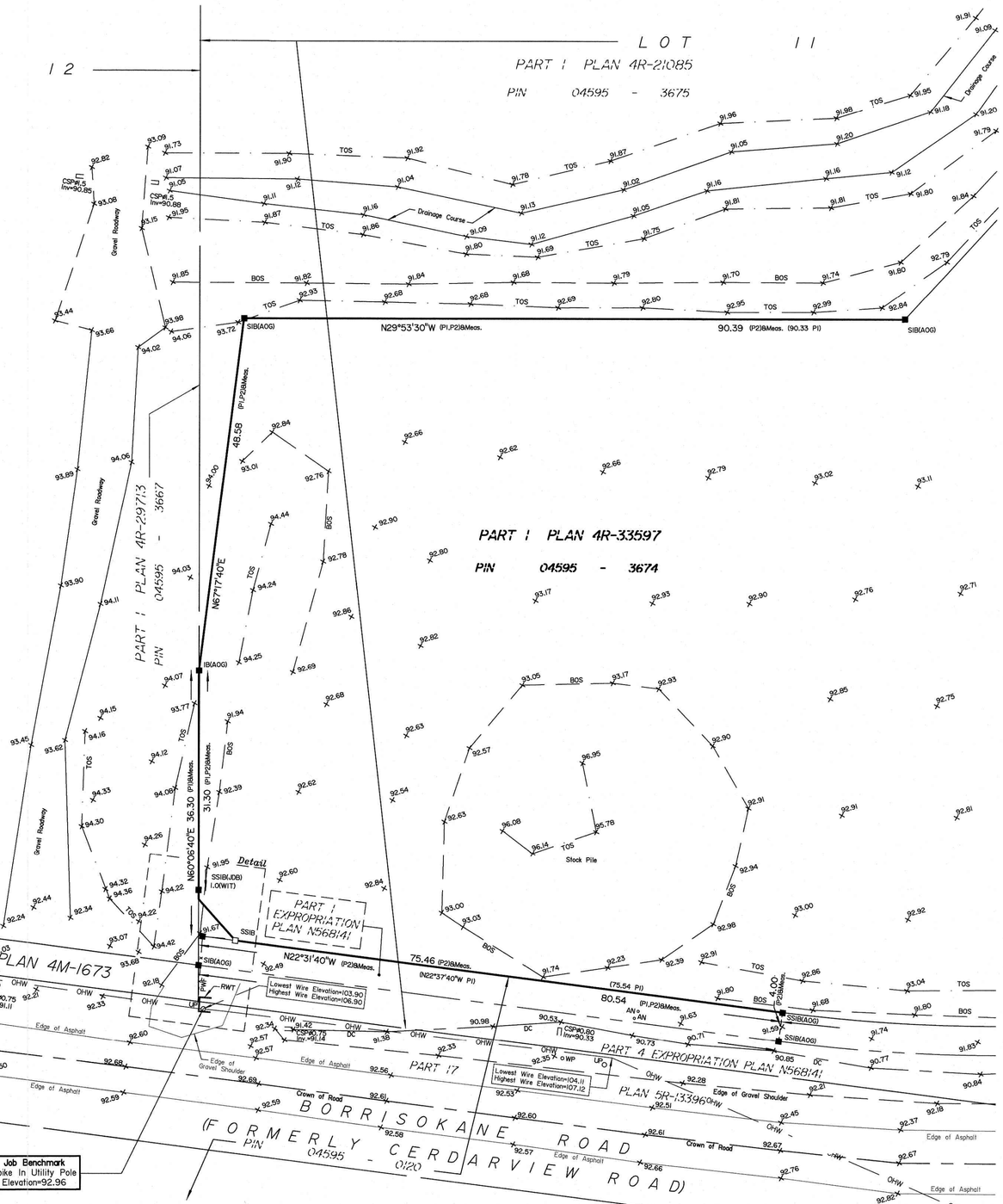
C904

D07-12-22-0085

#18788

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
O WP	"	Wood Pole
O 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).

Ontario Land Surveyors
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