

Appendix D

Stormwater Management Study





Hamilton Road and Gore Road Intersection Improvements

Stormwater Management Report

Project Location:

Hamilton Road and Gore Road, London, ON

Prepared for:

City of London
300 Dufferin Avenue, London, ON

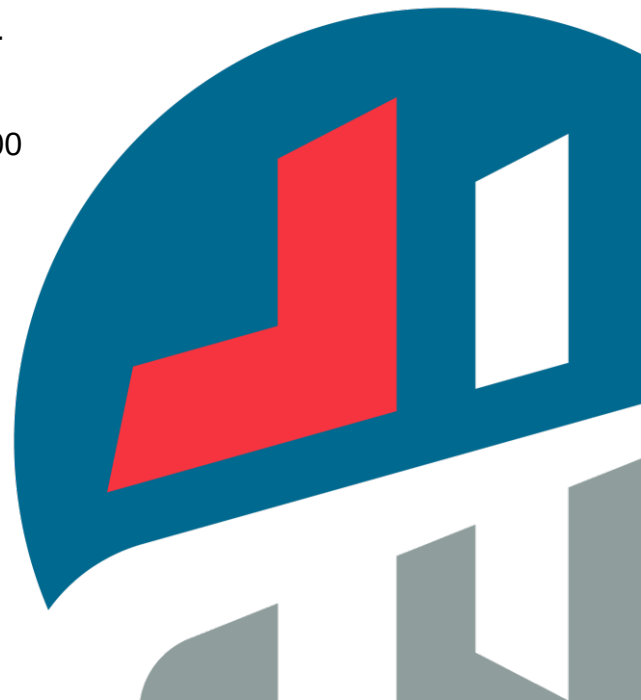
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Revised: January 2024

November 28, 2023

MTE File No.: 48214-100





Contents

1.0	Introduction	1
2.0	Background and Existing Conditions	1
2.1	Geotechnical.....	2
2.2	Hydrogeological Assessment.....	2
3.0	Proposed Design.....	2
4.0	Stormwater Source Controls	3
4.1	Stormwater Management System Constraints	5
4.2	Oil Grit Separator	5
4.3	Catchbasins	6
4.4	Quality Control	7
5.0	Capital Cost	7
6.0	Construction Process	7
6.1	Catchbasins and Maintenance Holes	7
6.2	OGS.....	7
6.3	General.....	7
7.0	Operation and Maintenance.....	8
7.1	Catchbasin Sump.....	8
7.2	OGS Maintenance	8
7.3	Street Sweeping.....	8
8.0	Conclusions and Recommendations	8

Figures

Figure 1: Study Area Location.....	1
Figure 2: Source Protection Information Atlas Mapping (from MECP)	4
Figure 3: Hazard and Natural Resources (from Map 6 of The London Plan)	5

Appendices

Appendix A	Sizing Reports
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1.0 INTRODUCTION

MTE Consultants Inc. (MTE) was retained by the City of London, to complete the preliminary design of the preferred alternative for Hamilton Road and Gore Road Intersection Improvements Schedule B Municipal Class Environmental Assessment (EA). This includes a stormwater management report for the Hamilton Road and Gore Road intersection (the Study Area) located in the east side of the City of London Ontario.

This report addresses the Stormwater Management (SWM) requirements set forth by the City of London, gives recommendations to further evaluate the of implementation Low-Impact Developments (LID) and proposes a preliminary design solution to provide treatment of stormwater runoff for the proposed roundabout design.

2.0 BACKGROUND AND EXISTING CONDITIONS

The Study Area is located within the South Thames subwatershed. The Study Area is not within a regulated area under the Upper Thames River Conservation Authority. The Study Area is bounded to the north, west and south by a mixture of residential and commercial lots and to the east by an open lot to be developed into a three-storey condominium. **Figure 1** presents the Study Area location.

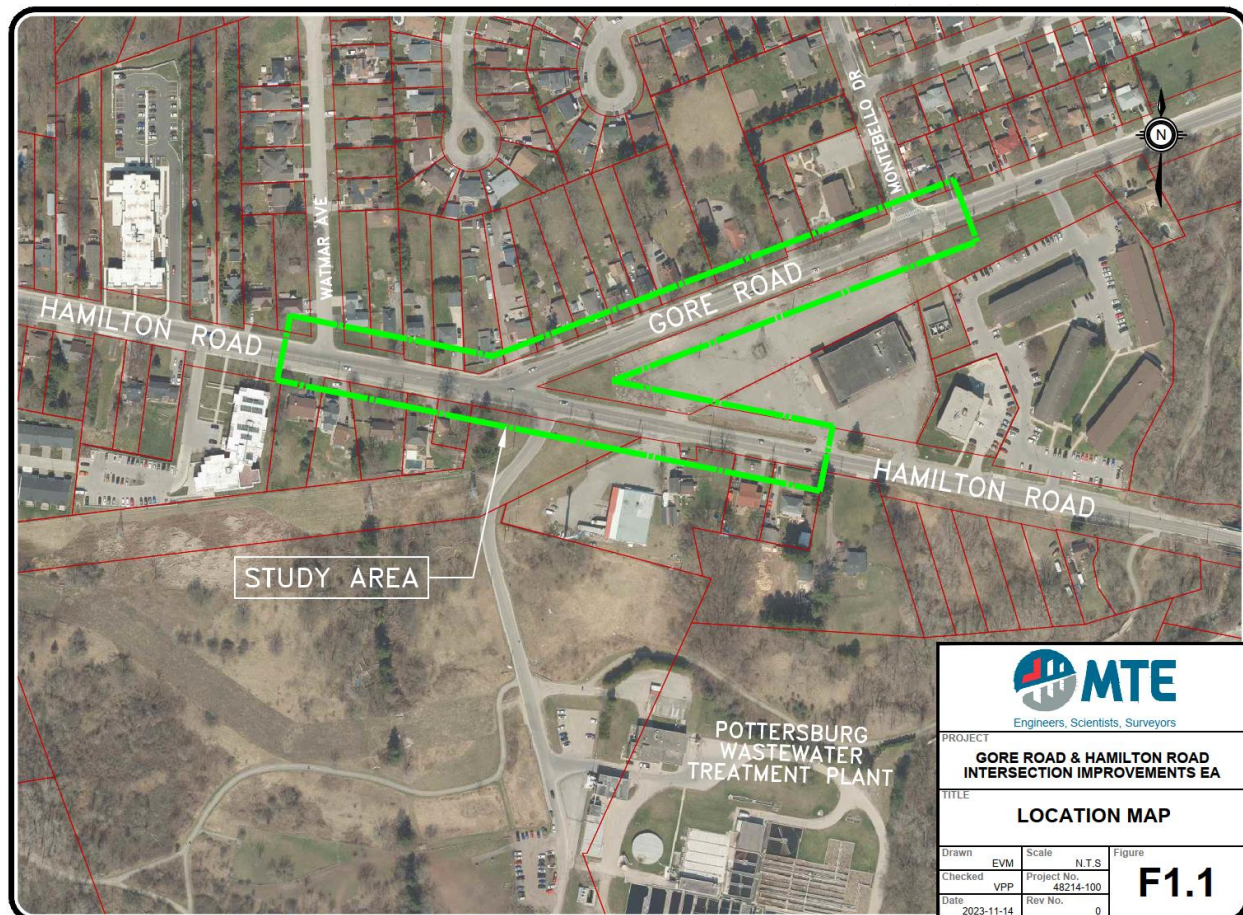


Figure 1: Study Area Location

The surrounding land around the Study Area generally slopes southeast on the east side (around Gore Road and Hamilton Road east leg) and northerly on the west side (along Hamilton Road west leg). The roadway within the Study Area east of the intersection currently has a series of ditching to convey stormwater easterly towards the existing curbs and gutters at the intersection of Montebello Drive and Gore Road and east of the driveway to 1166 Hamilton Road. To the west of the intersection along Hamilton Road to Watmar Avenue there is no ditching nor storm infrastructure.

The stormwater along Gore Road is conveyed by catchbasins on either side of the street along Gore Road from a maintenance hole at 1520 Gore Road to an OGS downstream which is then discharged into Pottersburg Creek. The stormwater along the east leg of Hamilton Road is conveyed by catchbasins on either side of the street from a maintenance hole at 1166 Hamilton Road to Pottersburg Creek by 600mm diameter storm sewers.

A 200mm diameter sanitary sewer (generally aligned with the center of Gore Road) conveys a mixed-use of residential and commercial flows along Gore Road to a maintenance hole downstream. Another 200mm diameter sanitary sewer is aligned along the south end of the east leg of Hamilton Road which also conveys mixed-use of residential and commercial flows and is taken to a maintenance hole downstream. Both sanitary sewers flows are finally discharged to the Pottersburg Wastewater Treatment Plant south of the Study Area.

There is a 300mm diameter cast iron watermain located along Gore Road and along the east leg of Hamilton Road aligned along the northside of the roadway. A 400mm diameter PVC watermain is located along the west leg of Hamilton Road aligned along the northside of the roadway.

2.1 Geotechnical

A geotechnical investigation was not performed during the preliminary design stage. It is recommended that one should be completed during the detailed design stage to further investigate any changes to the stormwater management solutions.

2.2 Hydrogeological Assessment

A hydrogeological assessment was not done during the preliminary design stage. MTE recommends that a hydrogeological assessment be completed during the detailed design stage to further determine the suitability of additional stormwater management solutions.

3.0 PROPOSED DESIGN

The proposed intersection improvements of the Hamilton Road and Gore Road intersection consist of a three-leg roundabout with pedestrian and cycling facilities including the introduction of storm sewers. As previously mentioned, there is no existing storm network within the Study Area, the proposed design will involve tying into the existing maintenance holes at 1520 Gore Road and 1166 Hamilton Road. The proposed storm infrastructure includes storm maintenance holes, catchbasins, catchbasin leads, concrete curb and gutter, storm sewers with diameters ranging from 300mm to 450mm.

The proposed design consists of three different storm networks. There are 300mm diameter storm sewers directing flows from the Access Road north of the roundabout down to the Wastewater Treatment Plant Road and out to the existing culvert under the hydro corridor. The

Access Road is a proposed new road that will allow for residents along the current alignment of Gore Road close to the intersection to still have access to their homes outside of the roundabout.

Immediately to the west and east of the roundabout, there are storm sewers directing stormwater in the southeast direction towards the existing maintenance hole at 1166 Hamilton Road. This network conveys the largest portion of the runoff created in the new roundabout footprint.

The final network is aligned along the north side of Gore Road conveying stormwater from the Access Road to the existing maintenance hole at the Montebello Drive intersection. The existing 250mm diameter storm sewer along Gore Road will need to be upsized along with the remainder of the network to accommodate the proposed 450mm diameter storm sewer connecting to the existing maintenance hole. An alternative can be reviewed during detailed design to connect more of this system with the sewers that outlet into the culvert at the hydro corridor south of the intersection.

The existing 400mm diameter PVC watermain to the west of the intersection will remain and the 300mm diameter cast iron watermain to the east will need to be replaced on Gore Road as well as water services up to property line. The existing watermain not identified for replacement should be protected and maintained when proceeding with the detailed design of the proposed storm sewers.

There are areas within the Study Area which are currently not serviced by a sanitary sewer. MTE was given direction to investigate servicing strategies for these areas and the proposed solution is to extend the existing 200mm diameter sanitary sewers on Watmar Avenue, Hamilton Road and Gore Road to meet at the intersection. This will also be used for future extension along the west leg of Hamilton Road. This will further be investigated during the detailed design stage to evaluate the need for upsizing or replacement of the existing sewers. This should be taken into consideration when proceeding with the storm sewer design.

As part of the intersection improvements, the City of London has also requested that green infrastructure or LID measures be incorporated into the design where feasible to offset the additional impervious area associated with the proposed roundabout.

4.0 STORMWATER SOURCE CONTROLS

The objectives of stormwater management are to reduce the impact of development on the natural environment, social environment by designing and constructing facilities that are sustainable to operate, to maintain and to integrate within the urban community.

All discharge to the Thames River is required to meet a Normal (70% TSS removal) water quality standard. Based on the Source Protection Information Atlas from MECP **Figure 2** and Map 6 from the Official London Plan **Figure 3**, the Site is not located within wellhead protection areas or abandoned oil/gas wells but is located within a highly vulnerable aquifer (score of 6) and significant groundwater recharge area.

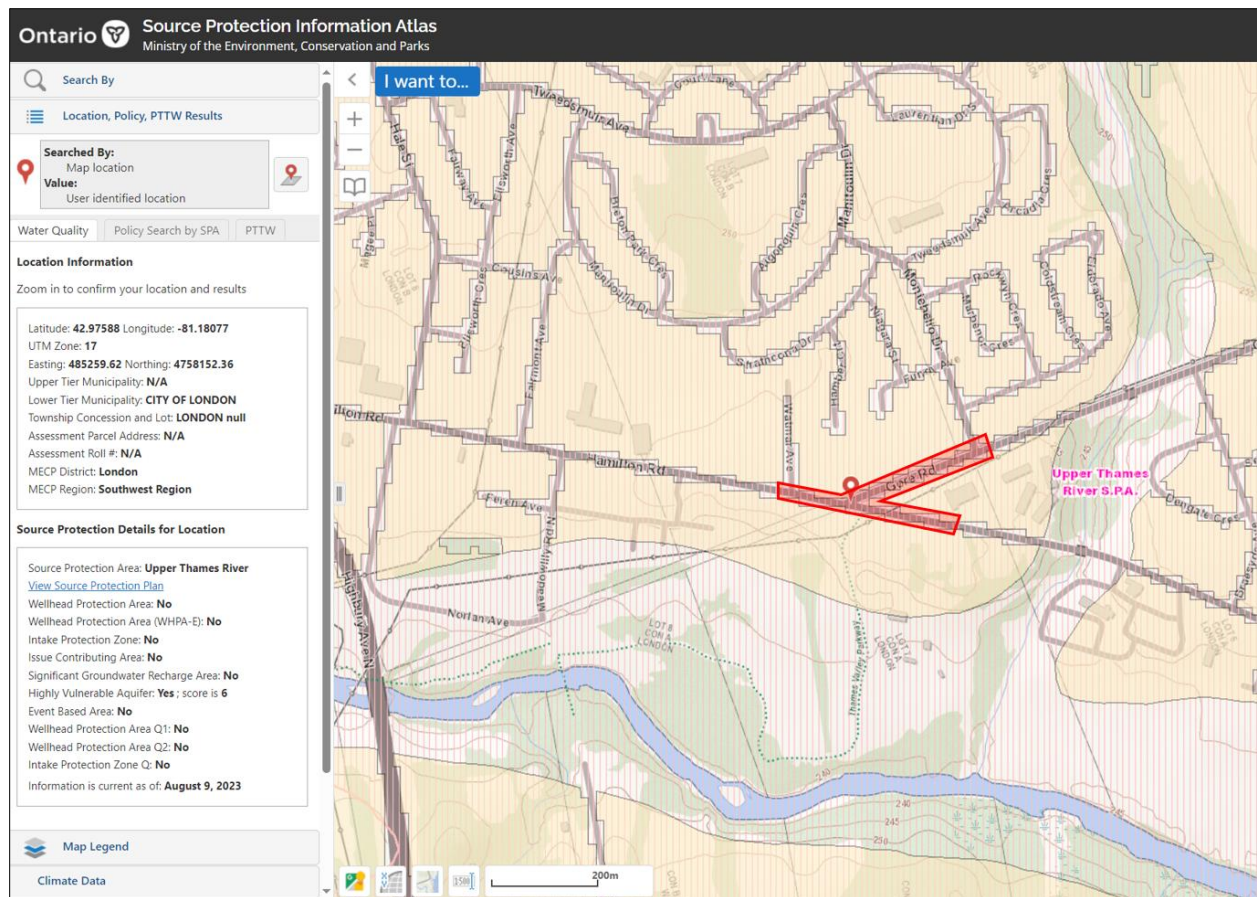


Figure 2: Source Protection Information Atlas Mapping (from MECP)

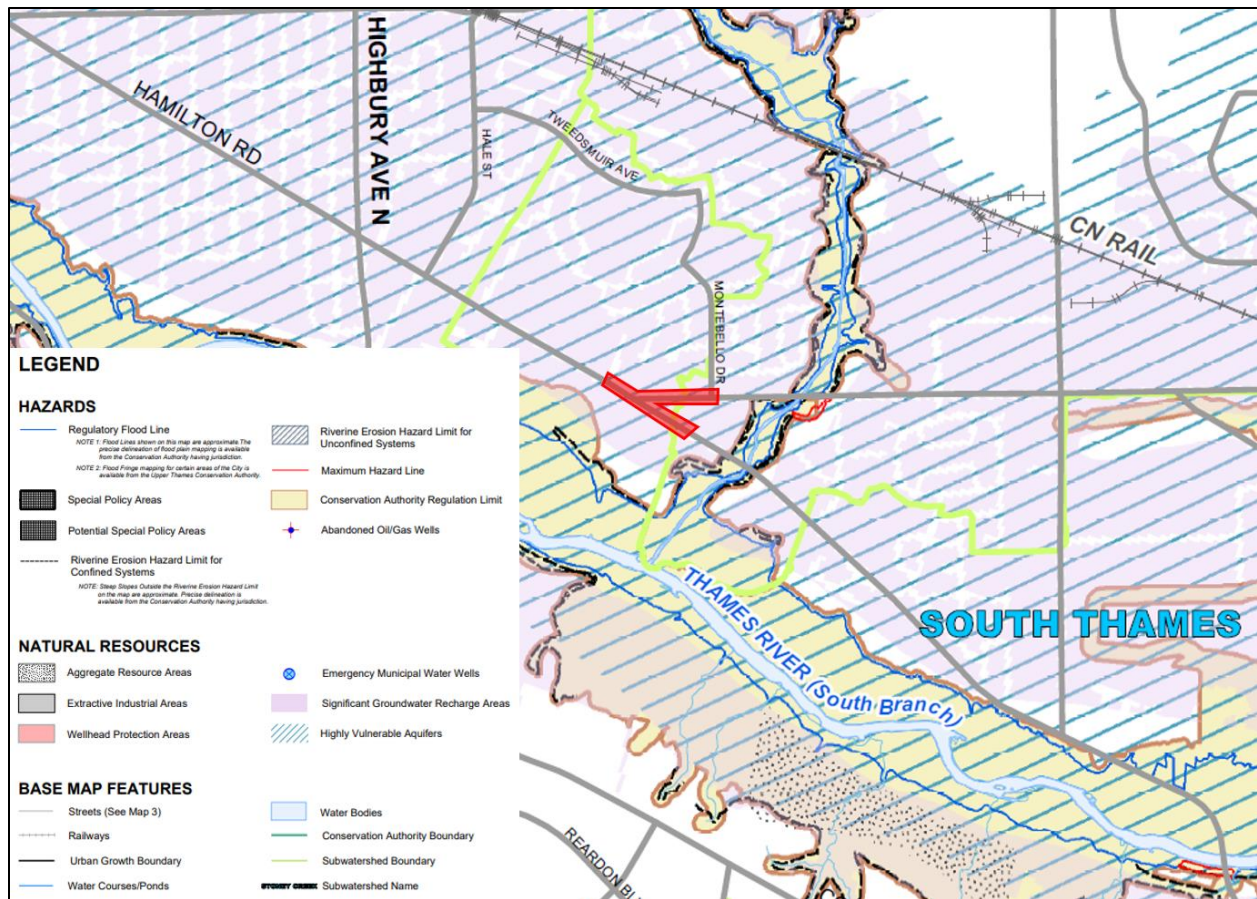


Figure 3: Hazard and Natural Resources (from Map 6 of The London Plan)

4.1 Stormwater Management System Constraints

As previously mentioned, the Study Area currently consists of a series of ditches conveying the stormwater towards the existing maintenance holes at Montebello Drive and Gore Road Intersection and 1166 Hamilton Road. To incorporate the proposed storm design, majority of the existing ditches will be filled in to accommodate the curbing and urbanization of the intersection.

When exploring the possibility of Low Impact Development (LID) options, an infiltration gallery was proposed for stormwater storage prior to changing the design of the roundabout due to conflicts with Hydro One infrastructure. The roundabout had to be shifted 10m from a Hydro One tower as per Hydro One's Technical Considerations. This resulted in the reduction of the proposed green infrastructure which meant it no longer met the spacing requirements for an infiltration gallery. To explore other options, it is recommended that a feasibility investigation be complete once the geotechnical and hydrogeological investigations are completed to evaluate the feasibility of other LID options.

4.2 Oil Grit Separator

An OGS has been identified as a potential water quality system given the probability that LID SWM systems present integration, operation and cost concerns when investigating at the detailed design stage. These will be placed downstream, nearest the connection to existing maintenance holes at Montebello Drive (1520 Gore Road), 1166 Hamilton Road and potentially

prior to the outlet at the ditch and culvert near the hydro corridor. There is currently an OGS on Gore Road at Pottersburg Creek.

Traditionally, small-scale water quality systems, such as an OGS, have been implemented during road reconstruction projects to meet water quality objectives where LIDs are not feasible. The City of London only permits the use of OGS units verified to meet water quality objectives through the Environmental Technology Verification Canada program. Where an OGS unit is used, the OGS must be sized to provide stormwater quality treatment based on treating a minimum of 90% of the average annual runoff volume and a minimum average annual removal of 80% of the sediment (TSS) load.

The sizing of the three potential OGS units were determined using water quality objectives, catchment areas, runoff coefficient (for % imperviousness), London International Airport historical rainfall data and an Ontario Fine particle size distribution. Based on the Site parameters provided, Hydroworks sized and provided an approximate cost for the three OGS units to be placed at each outlet and is summarized below in **Table 1**. The OGS units are ETV verified and will provide the required water quality treatment to the respective upstream areas. The sizing reports for each unit can be found in **Appendix A**.

Table 1: Proposed OGS Units

	Ditch	1520 Gore Road	1166 Hamilton Road
OGS Proposed	HydroStorm HS 5	HydroStorm HS 6	HydroStorm HS 10
Catchment Area	0.66 ha	0.894 ha	1.811 ha
% Imperviousness	85%	97%	98%
Dimensions & Capacity			
Average Annual Flow Capture	95%	98%	95%
Average Annual TSS Removal	81%	81%	86%
Diameter	1.52 m	1.83 m	3.05 m
Depth (Outlet Invert to Inside Bottom of Tank)	1.52 m	1.83 m	2.74 m
Floatable Volume	0.642 m ³	1.041 m ³	4.327 m ³
Sediment Volume	1.8 m ³	3.2 m ³	13.2 m ³
Total Volume	2.8 m ³	4.8 m ³	20 m ³
Cost (includes delivery)	\$25,000	\$30,000	\$70,000

4.3 Catchbasins

Catchbasin (CB) sumps of 600 mm are proposed at all CB structures within the Study Area to capture unwanted contaminants and increase the performance and reduce the maintenance of the existing and proposed downstream OGS systems.

4.4 Quality Control

Traditionally, municipal storm sewers provide little water quality aside from CB sumps. The CBs within the Study Area are proposed to include sumps to reduce sediment, debris and pollutants from entering downstream receivers. Although the CB sumps provide a low level of water quality, installing these upstream of the OGS improves influent quality for the OGS treatment unit. Given the sediment, scour and light liquid removal efficiencies of the OGS and the inclusion of CB sumps, these design considerations should provide higher stormwater quality control than traditional storm sewer designs without LID SWM controls.

5.0 CAPITAL COST

Depending on the overall proposed SWM strategy, the capital cost could vary based on number of OGS units used, any LID or infiltration galleries designed and overall depth of the systems. Another consideration is the maintenance costs after construction, how often the OGS units and LID's will require maintenance throughout their lifetimes.

6.0 CONSTRUCTION PROCESS

6.1 Catchbasins and Maintenance Holes

During construction, existing and proposed catchbasins and catchbasin maintenance holes are to have temporary inlet protection/sediment traps (heavy duty silt sacks) to reduce sediment, pollutants and debris loading to the OGS and downstream receivers. The contractor is to supply and install temporary heavy duty silt sacks at all existing catchbasins prior to removals, including maintenance until catchbasins are removed. The contractor is to supply and install temporary heavy duty silt sacks at all new catchbasins, immediately after installation/connection to new sewer, including removal after base asphalt is placed. The temporary silt sacks require inspection after every two weeks and after every large rain event. The silt sack should never be over half full (the restraint cord should always be visible). If the cord is covered with sediment, the entire silt sack can be removed (insert rebar through the straps), dumped, cleaned and reinstalled into the structure appropriately.

6.2 OGS

To meet the City of London's OGS Design Requirements, every OGS shall be provided with a downstream sampling/inspection maintenance hole. This sampling maintenance hole shall be located on private property as close to the property line as possible. The contractor should ensure that they are following the unit's manufacture's operation and maintenance manual for maintenance procedures during construction and at the end of construction prior to operation.

6.3 General

It is recommended during construction that the contractor develop a plan to minimize wind-blown dust such as using calcium chloride or water on an as needed basis.

7.0 OPERATION AND MAINTENANCE

7.1 Catchbasin Sump

Catchbasin sumps generally require annual inspection and/or sediment and debris removal to prevent build-up and potential for sediment or pollutants to migrate downstream. It is recommended to clean out the sump through a vacuum truck if the sediment depth reaches 25 - 50% of the sump.

7.2 OGS Maintenance

As storm water treatment structures fill up with pollutants, they become less effective in removing new pollution. Therefore, it is important that storm water treatment structures be maintained on a regular basis to ensure that they are operating at optimum performance. The chosen OGS manufacture's operation and maintenance manual should be included in the appendix of the updated stormwater design report at the detailed design stage and a copy of this manual shall be provided to the owner for future and regular operation and maintenance activities.

7.3 Street Sweeping

Pollutants on the Site are expected to be primarily generated by vehicle traffic and winter maintenance. Once a season pavement sweeping is recommended to remove accumulated sediment and thereby reducing the sediment loading on the CB sumps and OGS unit. The swept grit should be properly disposed of so that it is not reintroduced to the storm drainage system.

8.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the foregoing analysis, it is concluded that:

- i) Geotechnical and Hydrogeological investigations need to be completed to assess the feasibility of implementing LID solutions;
- ii) the existing 250mm diameter storm sewer at Montebello Drive will need to be upsized to accommodate the proposed design if this is the alignment of the sewers that move forward;
- iii) the implementation of OGS units should be investigated at the detailed design stage to be installed at the existing maintenance holes at 1520 Gore Road and 1166 Hamilton Road.

It is recommended that:

- i) the redirection of the storm sewers that connect at Montebello Drive be considered to a southern direction towards the local access road and brought to the hydro corridor; and
- ii) the other stormwater management facilities be used for detailed design.

All of which is respectfully submitted,
MTE Consultants Inc.



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VPP:EVM:zeg

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Appendix A

Sizing Reports



Hydroworks Sizing Summary

**Hamilton Gore EA-1166 Ham Road
City of London**

01-12-2024

Recommended Size: HydroStorm HS 10

A HydroStorm HS 10 is recommended to provide 80 % annual TSS removal based on a drainage area of 1.811 (ha) with an imperviousness of 98 % and London Intl Airport, Ontario rainfall for the 20 um to 2000 um particle size distribution.

The recommended HydroStorm HS 10 treats 95 % of the annual runoff and provides 86 % annual TSS removal for the London Intl Airport rainfall records and 20 um to 2000 um particle size distribution.

The HydroStorm has a headloss coefficient (K) of 1.04. Since a peak flow was not specified, headloss was calculated using the full pipe flow of 1.18 (m³/s) for the given 600 (mm) pipe diameter at 3.7% slope. The headloss was calculated to be 930 (mm) based on a flow depth of 600 (mm) (full pipe flow).

This summary report provides the main parameters that were used for sizing. These parameters are shown on the summary tables and graphs provided in this report.

If you have any questions regarding this sizing summary please do not hesitate to contact Hydroworks at 888-290-7900 or email us at support@hydroworks.com.

The sizing program is for sizing purposes only and does not address any site specific parameters such as hydraulic gradeline, tailwater submergence, groundwater, soils bearing capacity, etc. Headloss calculations are not a hydraulic gradeline calculation since this requires a starting water level and an analysis of the entire system downstream of the HydroStorm .

TSS Removal Sizing Summary

Hydroworks Hydrodynamic Separator Sizing Program - HydroStorm

File Product Units CAD Video Help

General Dimensions Rainfall Site TSS PSD TSS Loading Quantity Storage By-Pass Custom CAD Video Other

Site Parameters

Area (ha) 1.811

Imperviousness (%) 98

Units

☐ U.S.

☒ Metric

Rainfall Station

London Intl Airport Ontario

1960 To 2002 Rainfall Timestep = 60 min.

Project Title (2 lines)

Hamilton Gore EA-1166 Ham Road

City of London

ETV Lab Testing Results ☐ Post Treatment Recharge

Outlet Pipe

Diam. (mm) 600 Peak Design Flow (m3/s)

Slope (%) 3.72

HydroStorm Annual Sizing Results

Model #	Qlow (m3/s)	Qtot (m3/s)	Flow Capture (%)	TSS Removal (%)
Unavailable	.013	1.184	71 %	43 %
HS 4	.023	1.184	81 %	54 %
HS 5	.028	1.184	84 %	64 %
HS 6	.034	1.184	86 %	71 %
Unavailable	.047	1.184	90 %	75 %
HS 8	.062	1.184	93 %	79 %
HS 10	.089	1.184	95 %	86 %
HS 12	.118	1.184	97 %	90 %

Particle Size Distribution

Size (um)	%	SG
20	20	2.65
60	20	2.65
150	20	2.65
400	20	2.65
2000	20	2.65

Note: Results vary significantly based on particle size distribution

Simulate

TSS Particle Size Distribution

Hydroworks Hydrodynamic Separator Sizing Program - HydroStorm

File Product Units CAD Video Help

General Dimensions Rainfall Site TSS PSD TSS Loading Quantity Storage By-Pass Custom CAD Video Other

TSS Particle Size Distribution

Size (um)	%	SG
20	20	2.65
60	20	2.65
150	20	2.65
400	20	2.65
2000	20	2.65
*		

Notes:

1. To change data just click a cell and type in the new value(s)
2. To add a row just go to the bottom of the table and start typing.
3. To delete a row, select the row by clicking on the first pointer column, then press delete
4. To sort the table click on one of the column headings

TSS Distributions

☐ ETV Canada / NJDEP

☐ Standard HDS Design

☐ Alden Laboratory

☐ OK110

☐ Toronto

☒ Ontario Fine

☐ Calgary Forebay

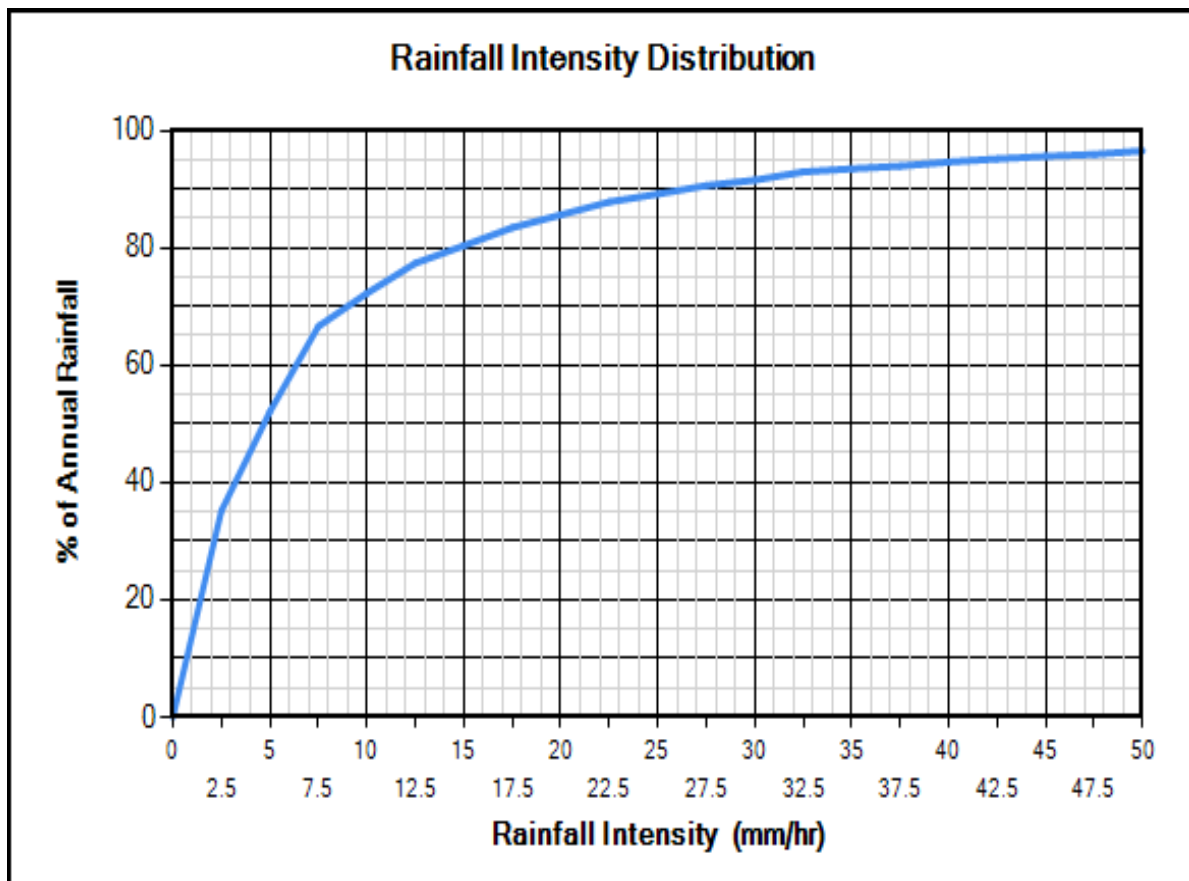
☐ Kitchener

☐ User Defined

Clear

You must select a particle size distribution for TSS to simulate TSS removal

Water Temp (C) 20



Site Physical Characteristics

Hydroworks Hydrodynamic Separator Sizing Program - HydroStorm

File Product Units CAD Video Help

General Dimensions Rainfall Site TSS PSD TSS Loading Quantity Storage By-Pass Custom CAD Video Other

Catchment Parameters

Width (m) Imperv. Mannings n Maintenance Frequency (months)

Perv Mannings n

Slope (%) Imp. Depress. Storage (mm)

Perv. Depress. Storage (mm)

Daily Evaporation (mm/day)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	2.54	2.54	3.81	3.81	3.81	2.54	2.54	0	0

Infiltration

Max. Infiltration Rate (mm/hr)

Min. Infiltration Rate (mm/hr)

Infiltration Decay Rate (1/s)

Infiltration Regen. Rate (1/s)

Catch Basins

of Catch basins

Controlled Roof Runoff

Roof Runoff (m3/s)

Resets all parameters excluding input catchment width.

Dimensions And Capacities

Hydroworks Hydrodynamic Separator Sizing Program - HydroStorm

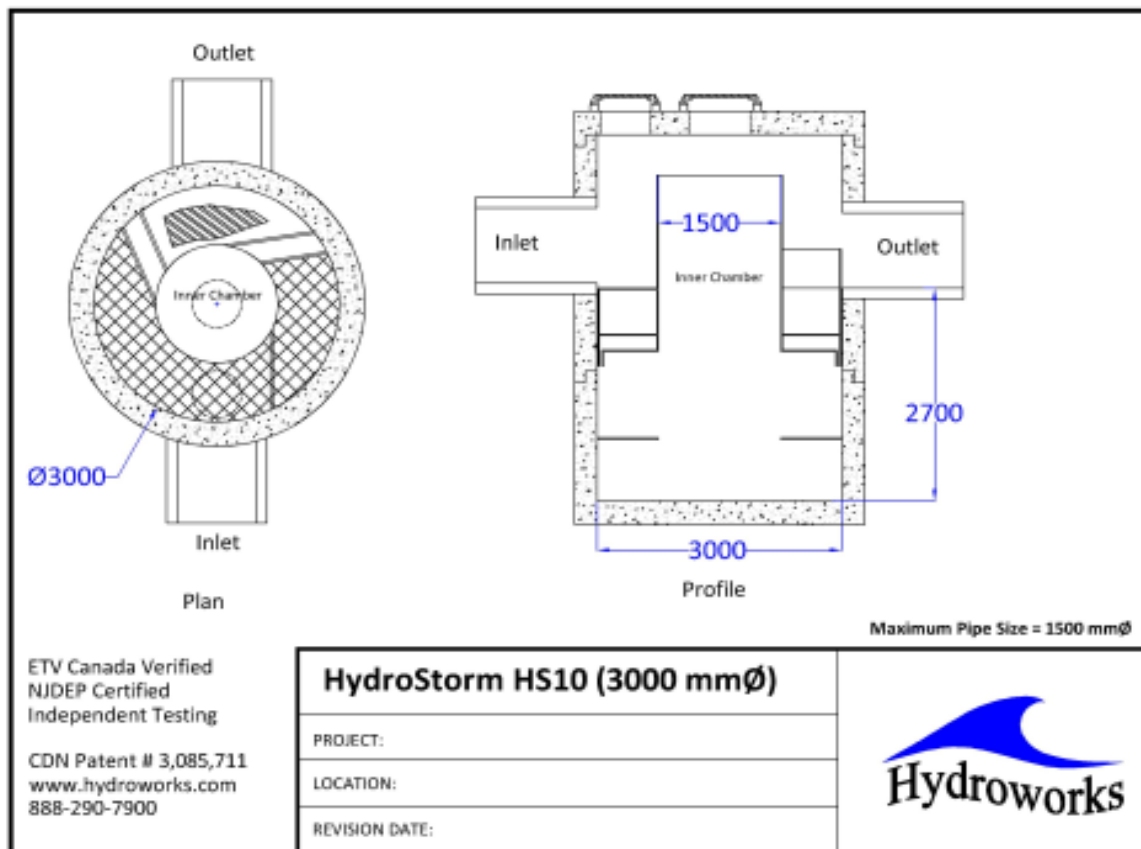
File Product Units CAD Video Help

General Dimensions Rainfall Site TSS PSD TSS Loading Quantity Storage By-Pass Custom CAD Video Other

Dimensions and Capacities					
Model	Diam. (m)	Depth (m)	Float. Vol. (L)	Sediment Vol. (m3)	Total Vol. (m3)
HS 3	0.91	1.07	185	0.4	0.7
HS 4	1.22	1.22	381	0.9	1.4
HS 5	1.52	1.52	642	1.8	2.8
HS 6	1.83	1.83	1041	3.2	4.8
HS 7	2.13	1.98	1575	4.6	7.1
HS 8	2.44	2.13	2354	6.3	10
HS 10	3.05	2.74	4327	13.2	20
HS 12	3.66	3.35	7164	23.8	35.2

Depth = Depth from outlet invert to inside bottom of tank

Generic HS 10 CAD Drawing



TSS Buildup And Washoff

Hydroworks Hydrodynamic Separator Sizing Program - HydroStorm

File Product Units CAD Video Help

General Dimensions Rainfall Site TSS PSD TSS Loading Quantity Storage By-Pass Custom CAD Video Other

TSS Buildup

☐ Power Linear
☒ Exponential

TSS Washoff

☒ Power-Exponential
☐ Rating Curve (no upper limit)

Street Sweeping

Efficiency (%)
 Start Month
 Stop Month
 Frequency (days)
 Available Fraction

Soil Erosion

☐ Add Erosion to TSS

Reset to Default Values

TSS Buildup Parameters

Limit (kg/ha)
 Coeff (kg/ha)
 Exponent

TSS Washoff Parameters

Coefficient
 Exponent

TSS Buildup

☒ Based on Area
☐ Based on Curb Length

Upstream Quantity Storage

Hydroworks Hydrodynamic Separator Sizing Program - HydroStorm

File Product Units CAD Video Help

General Dimensions Rainfall Site TSS PSD TSS Loading Quantity Storage By-Pass Custom CAD Video Other

Quantity Control Storage

	Storage (m3)	Discharge (m3/s)
▶	0	0
*		

Notes:

1. To change data just click a cell and type in the new value (s)
2. To add a row just go to the bottom of the table and start typing.
3. To delete a row, select the row by clicking on the first pointer column, then press delete
4. To sort the table click on one of the column headings

Clear

Other Parameters

The screenshot shows the 'Hydroworks Hydrodynamic Separator Sizing Program - HydroStorm' window. The 'Other' tab is selected in the top navigation bar. The interface includes a menu bar (File, Product, Units, CAD, Video, Help) and a toolbar. The 'Other' tab contains several sections:

- Scaling Law**
 - ☒ Peclet Scaling based on diameter x depth
 - ☐ Peclet Scaling based on surface area (diameter x diameter)
- TSS Removal Extrapolation**
 - ☒ Extrapolate TSS Removal for flows lower than tested
 - ☐ No TSS Removal extrapolation for flows lower than tested
 - ☐ No TSS Removal extrapolation for lower flows or inter-event periods
- Lab Testing**
 - ☐ Use NJDEP Lab Testing Results
 - ☒ Use ETV Canada Lab Testing Results
- Oil / Sediment Storage**
 - ☒ Oil Spill Storage in Pretreatment Area
 - ☐ Sediment Storage in Pretreatment Area
 - ☐ 50% Oil Spill / 50% Sediment Storage in Pretreatment Area
- TSS Removal Results**
 - ☒ Required TSS Removal
 - ☐ Choose Model #
- TSS Removal Required**
 - TSS Removal (%) Enter required TSS Removal (%)

Flagged Issues

None

Hydroworks Sizing Program - Version 5.8

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1-800-290-7900

www.hydroworks.com



Hydroworks Sizing Summary

**Hamilton Gore EA-1520 Gore Rd
City of London**

01-12-2024

Recommended Size: HydroStorm HS 6

A HydroStorm HS 6 is recommended to provide 80 % annual TSS removal based on a drainage area of .894 (ha) with an imperviousness of 97 % and London Intl Airport, Ontario rainfall for the 20 um to 2000 um particle size distribution.

The recommended HydroStorm HS 6 treats 98 % of the annual runoff and provides 81 % annual TSS removal for the London Intl Airport rainfall records and 20 um to 2000 um particle size distribution.

The HydroStorm has a headloss coefficient (K) of 1.04. Since a peak flow was not specified, headloss was calculated using the full pipe flow of .2 (m³/s) for the given 450 (mm) pipe diameter at .5% slope. The headloss was calculated to be 85 (mm) based on a flow depth of 450 (mm) (full pipe flow).

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If you have any questions regarding this sizing summary please do not hesitate to contact Hydroworks at 888-290-7900 or email us at support@hydroworks.com.

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TSS Removal Sizing Summary

Hydroworks Hydrodynamic Separator Sizing Program - HydroStorm

File Product Units CAD Video Help

General Dimensions Rainfall Site TSS PSD TSS Loading Quantity Storage By-Pass Custom CAD Video Other

Site Parameters

Area (ha) .894

Imperviousness (%) 97

Units

☐ U.S.

☒ Metric

Rainfall Station

London Intl Airport Ontario

1960 To 2002 Rainfall Timestep = 60 min.

Project Title

Hamilton Gore EA-1520 Gore Rd

City of London

ETV Lab Testing Results ☐ Post Treatment Recharge

Outlet Pipe

Diam. (mm) 450 Peak Design Flow (m3/s)

Slope (%) .5

HydroStorm Annual Sizing Results

Model #	Qlow (m3/s)	Qtot (m3/s)	Flow Capture (%)	TSS Removal (%)
Unavailable	.027	.202	91 %	56 %
HS 4	.046	.202	95 %	67 %
HS 5	.058	.202	97 %	75 %
HS 6	.07	.202	98 %	81 %
Unavailable	.097	.202	99 %	84 %
HS 8	.128	.202	99 %	87 %
HS 10	.174	.202	100 %	92 %
HS 12	.202	.202	100 %	95 %

Particle Size Distribution

Size (um)	%	SG
20	20	2.65
60	20	2.65
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400	20	2.65
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Note: Results vary significantly based on particle size distribution

Simulate

TSS Particle Size Distribution

Hydroworks Hydrodynamic Separator Sizing Program - HydroStorm

File Product Units CAD Video Help

General Dimensions Rainfall Site TSS PSD TSS Loading Quantity Storage By-Pass Custom CAD Video Other

TSS Particle Size Distribution

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TSS Distributions

☐ ETV Canada / NJDEP

☐ Standard HDS Design

☐ Alden Laboratory

☐ OK110

☐ Toronto

☒ Ontario Fine

☐ Calgary Forebay

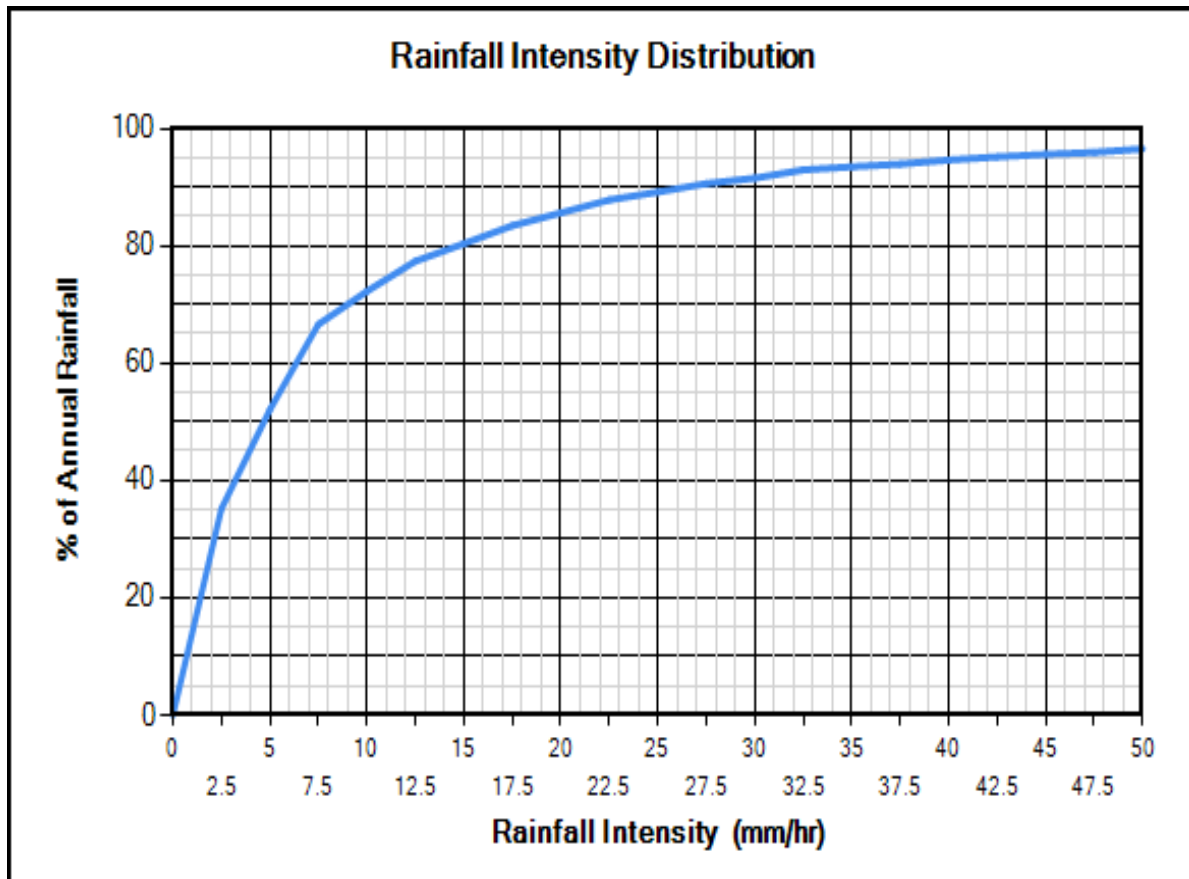
☐ Kitchener

☐ User Defined

Clear

You must select a particle size distribution for TSS to simulate TSS removal

Water Temp (C) 20



Site Physical Characteristics

Hydroworks Hydrodynamic Separator Sizing Program - HydroStorm

File Product Units CAD Video Help

General Dimensions Rainfall Site TSS PSD TSS Loading Quantity Storage By-Pass Custom CAD Video Other

Catchment Parameters

Width (m) Imperv. Mannings n Maintenance Frequency (months)

Perv Mannings n

Slope (%) Imp. Depress. Storage (mm)

Perv. Depress. Storage (mm)

Daily Evaporation (mm/day)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	2.54	2.54	3.81	3.81	3.81	2.54	2.54	0	0

Infiltration

Max. Infiltration Rate (mm/hr)

Min. Infiltration Rate (mm/hr)

Infiltration Decay Rate (1/s)

Infiltration Regen. Rate (1/s)

Catch Basins

of Catch basins

Controlled Roof Runoff

Roof Runoff (m3/s)

Resets all parameters excluding input catchment width.

Dimensions And Capacities

Hydroworks Hydrodynamic Separator Sizing Program - HydroStorm

File Product Units CAD Video Help

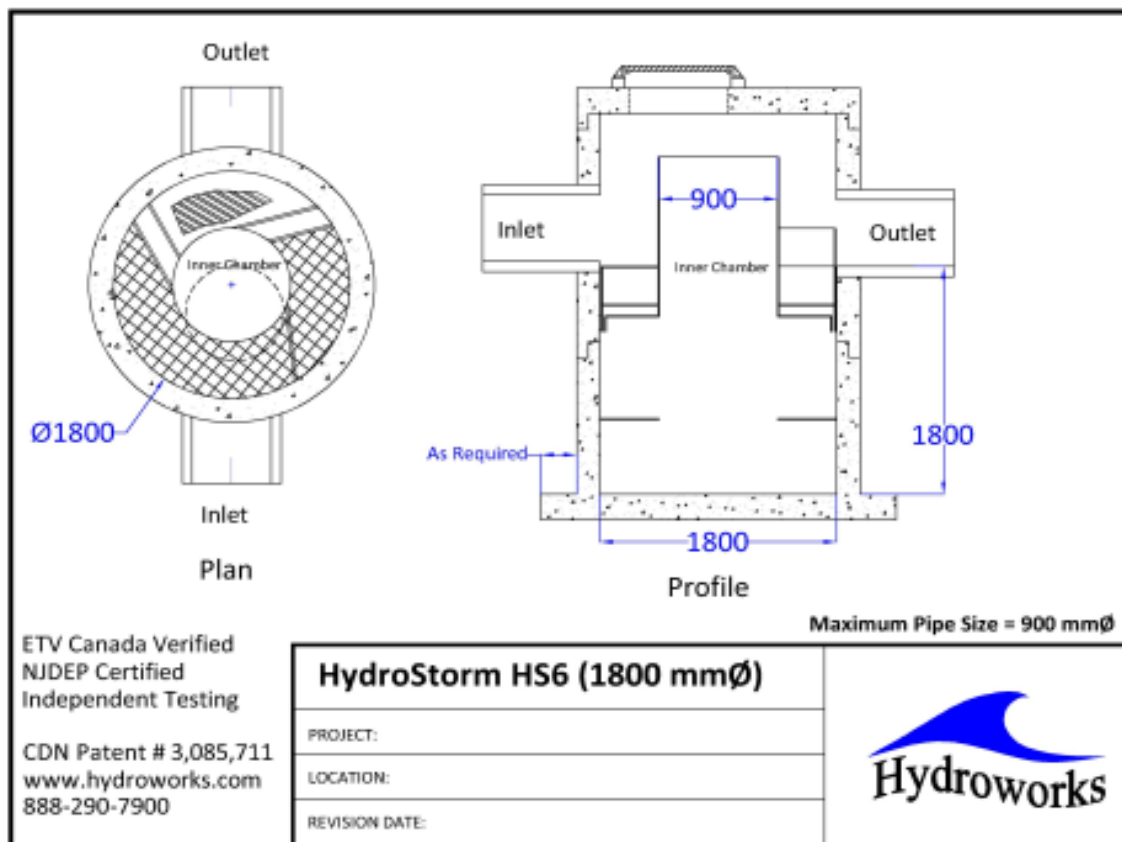
General Dimensions Rainfall Site TSS PSD TSS Loading Quantity Storage By-Pass Custom CAD Video Other

Dimensions and Capacities

Model	Diam. (m)	Depth (m)	Float. Vol. (L)	Sediment Vol. (m3)	Total Vol. (m3)
HS 3	0.91	1.07	185	0.4	0.7
HS 4	1.22	1.22	381	0.9	1.4
HS 5	1.52	1.52	642	1.8	2.8
HS 6	1.83	1.83	1041	3.2	4.8
HS 7	2.13	1.98	1575	4.6	7.1
HS 8	2.44	2.13	2354	6.3	10
HS 10	3.05	2.74	4327	13.2	20
HS 12	3.66	3.35	7164	23.8	35.2

Depth = Depth from outlet invert to inside bottom of tank

Generic HS 6 CAD Drawing



TSS Buildup And Washoff

Hydroworks Hydrodynamic Separator Sizing Program - HydroStorm

File Product Units CAD Video Help

General Dimensions Rainfall Site TSS PSD TSS Loading Quantity Storage By-Pass Custom CAD Video Other

TSS Buildup

☐ Power Linear
☒ Exponential

TSS Washoff

☒ Power-Exponential
☐ Rating Curve (no upper limit)

Street Sweeping

Efficiency (%)
 Start Month
 Stop Month
 Frequency (days)
 Available Fraction

Soil Erosion

☐ Add Erosion to TSS

Reset to Default Values

TSS Buildup Parameters

Limit (kg/ha)
 Coeff (kg/ha)
 Exponent

TSS Washoff Parameters

Coefficient
 Exponent

TSS Buildup

☒ Based on Area
☐ Based on Curb Length

Upstream Quantity Storage

Hydroworks Hydrodynamic Separator Sizing Program - HydroStorm

File Product Units CAD Video Help

General Dimensions Rainfall Site TSS PSD TSS Loading Quantity Storage By-Pass Custom CAD Video Other

Quantity Control Storage

	Storage (m3)	Discharge (m3/s)
▶	0	0
*		

Notes:

1. To change data just click a cell and type in the new value (s)
2. To add a row just go to the bottom of the table and start typing.
3. To delete a row, select the row by clicking on the first pointer column, then press delete
4. To sort the table click on one of the column headings

Clear

Other Parameters

The screenshot shows the 'Hydroworks Hydrodynamic Separator Sizing Program - HydroStorm' window. The 'Other' tab is selected in the top navigation bar. The interface includes a menu bar (File, Product, Units, CAD, Video, Help) and a toolbar. The 'Other' tab contains several sections:

- Scaling Law**
 - ☒ Peclet Scaling based on diameter x depth
 - ☐ Peclet Scaling based on surface area (diameter x diameter)
- TSS Removal Extrapolation**
 - ☒ Extrapolate TSS Removal for flows lower than tested
 - ☐ No TSS Removal extrapolation for flows lower than tested
 - ☐ No TSS Removal extrapolation for lower flows or inter-event periods
- Lab Testing**
 - ☐ Use NJDEP Lab Testing Results
 - ☒ Use ETV Canada Lab Testing Results
- Oil / Sediment Storage**
 - ☒ Oil Spill Storage in Pretreatment Area
 - ☐ Sediment Storage in Pretreatment Area
 - ☐ 50% Oil Spill / 50% Sediment Storage in Pretreatment Area
- TSS Removal Results**
 - ☒ Required TSS Removal
 - ☐ Choose Model #
- TSS Removal Required**
 - TSS Removal (%) Enter required TSS Removal (%)

Flagged Issues

None

Hydroworks Sizing Program - Version 5.8

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Hydroworks Sizing Summary

Hamilton Gore EA

City of London

01-12-2024

Recommended Size: HydroStorm HS 5

A HydroStorm HS 5 is recommended to provide 80 % annual TSS removal based on a drainage area of .66 (ha) with an imperviousness of 85 % and London Intl Airport, Ontario rainfall for the 20 um to 2000 um particle size distribution.

The recommended HydroStorm HS 5 treats 95 % of the annual runoff and provides 81 % annual TSS removal for the London Intl Airport rainfall records and 20 um to 2000 um particle size distribution.

The HydroStorm has a headloss coefficient (K) of 1.04. Since a peak flow was not specified, headloss was calculated using the full pipe flow of .14 (m³/s) for the given 300 (mm) pipe diameter at 2% slope. The headloss was calculated to be 199 (mm) based on a flow depth of 300 (mm) (full pipe flow).

This summary report provides the main parameters that were used for sizing. These parameters are shown on the summary tables and graphs provided in this report.

If you have any questions regarding this sizing summary please do not hesitate to contact Hydroworks at 888-290-7900 or email us at support@hydroworks.com.

The sizing program is for sizing purposes only and does not address any site specific parameters such as hydraulic gradeline, tailwater submergence, groundwater, soils bearing capacity, etc. Headloss calculations are not a hydraulic gradeline calculation since this requires a starting water level and an analysis of the entire system downstream of the HydroStorm .

TSS Removal Sizing Summary

Hydroworks Hydrodynamic Separator Sizing Program - HydroStorm

File Product Units CAD Video Help

General Dimensions Rainfall Site TSS PSD TSS Loading Quantity Storage By-Pass Custom CAD Video Other

Site Parameters
 Area (ha) .66
 Imperviousness (%) 85

Units
☐ U.S.
☒ Metric

Rainfall Station
 London Intl Airport Ontario
 1960 To 2002 Rainfall Timestep = 60 min.

Project Title
 (2 lines) Hamilton Gore EA
 City of London

ETV Lab Testing Results ☐ Post Treatment Recharge

Outlet Pipe
 Diam. (mm) 300 Peak Design Flow (m3/s)
 Slope (%) 2

HydroStorm Annual Sizing Results

Model #	Qlow (m3/s)	Qtot (m3/s)	Flow Capture (%)	TSS Removal (%)
Unavailable	.015	.137	88 %	63 %
HS 4	.025	.137	93 %	73 %
HS 5	.031	.137	95 %	81 %
HS 6	.038	.137	96 %	85 %
Unavailable	.053	.137	98 %	88 %
HS 8	.071	.137	99 %	90 %
HS 10	.102	.137	99 %	94 %
HS 12	.137	.137	100 %	97 %

Particle Size Distribution

Size (um)	%	SG
20	20	2.65
60	20	2.65
150	20	2.65
400	20	2.65
2000	20	2.65

Note: Results vary significantly based on particle size distribution

Simulate

TSS Particle Size Distribution

Hydroworks Hydrodynamic Separator Sizing Program - HydroStorm

File Product Units CAD Video Help

General Dimensions Rainfall Site TSS PSD TSS Loading Quantity Storage By-Pass Custom CAD Video Other

TSS Particle Size Distribution

	Size (um)	%	SG
▶	20	20	2.65
	60	20	2.65
	150	20	2.65
	400	20	2.65
	2000	20	2.65
*			

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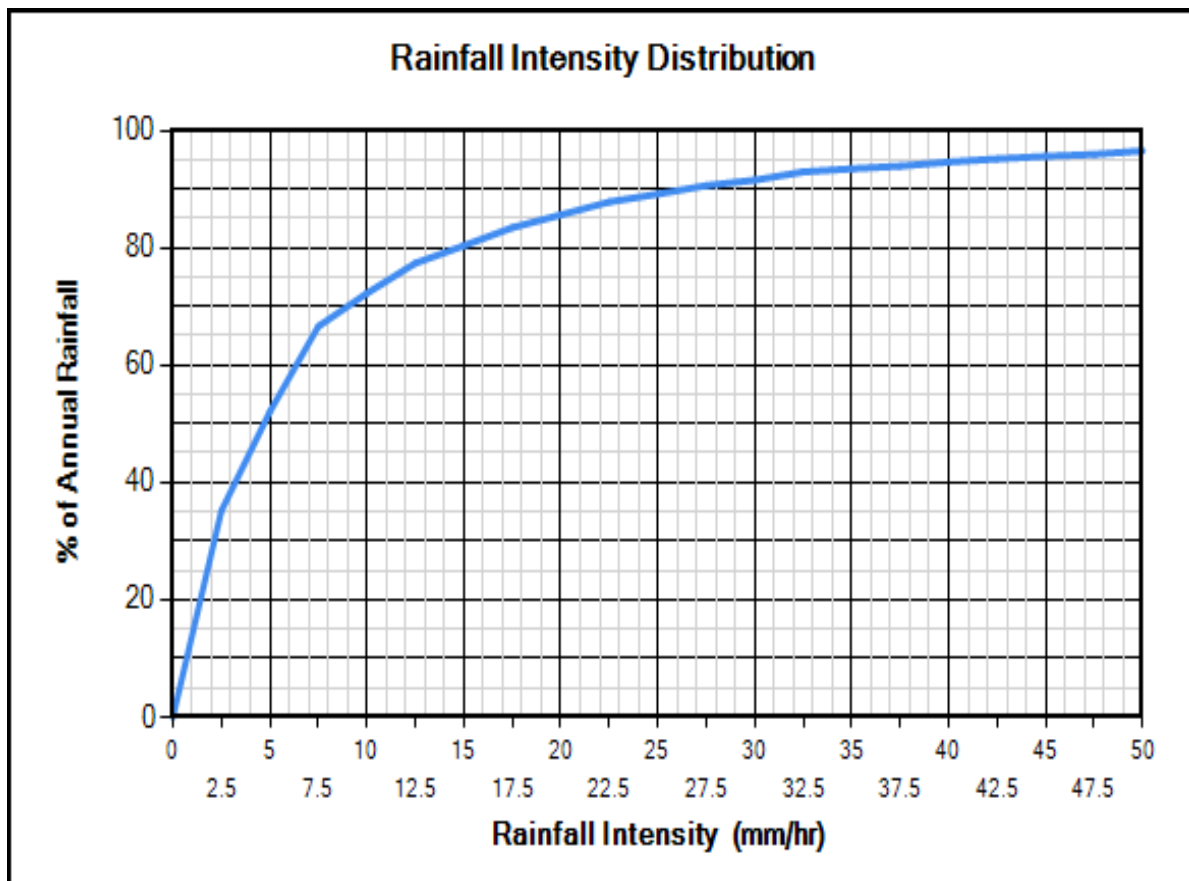
TSS Distributions

☐ ETV Canada / NJDEP
☐ Standard HDS Design
☐ Alden Laboratory
☐ OK110
☐ Toronto
☒ Ontario Fine
☐ Calgary Forebay
☐ Kitchener
☐ User Defined

Clear

You must select a particle size distribution for TSS to simulate TSS removal

Water Temp (C) 20



Site Physical Characteristics

Hydroworks Hydrodynamic Separator Sizing Program - HydroStorm

File Product Units CAD Video Help

General Dimensions Rainfall Site TSS PSD TSS Loading Quantity Storage By-Pass Custom CAD Video Other

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Infiltration

Max. Infiltration Rate (mm/hr)

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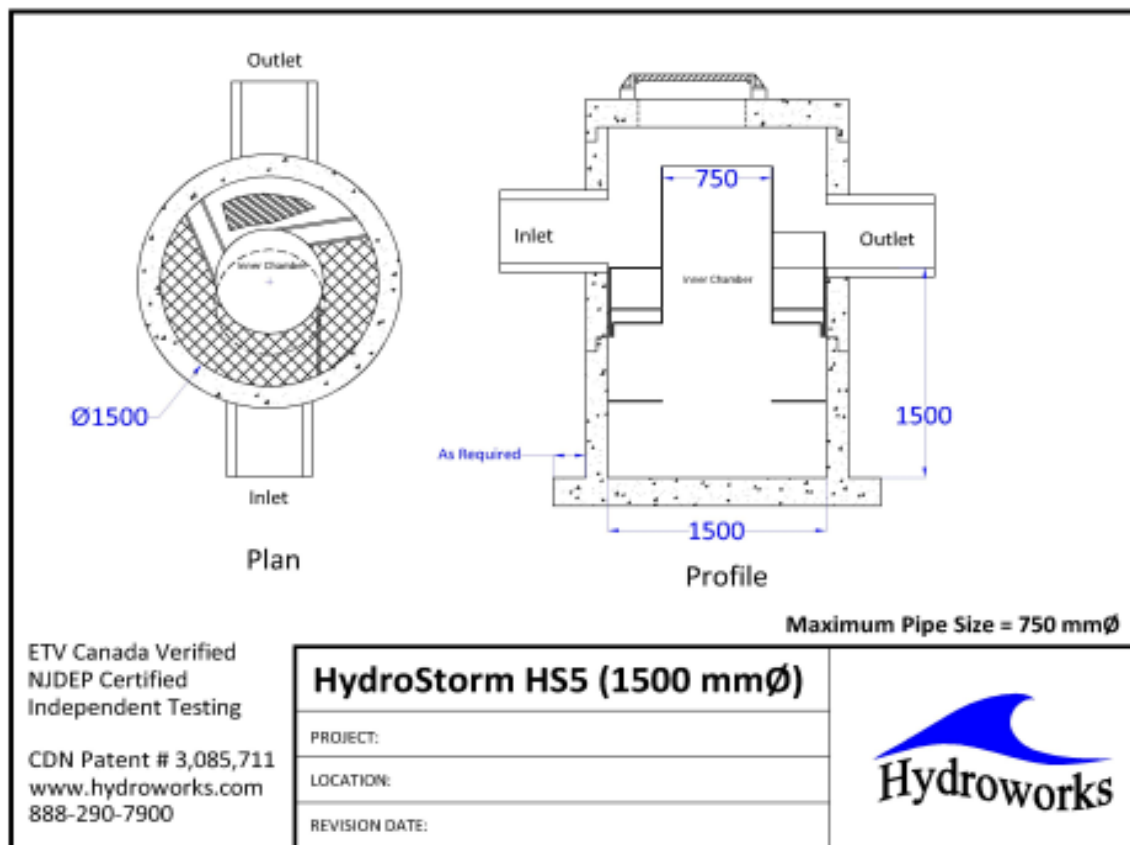
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Generic HS 5 CAD Drawing



TSS Buildup And Washoff

Hydroworks Hydrodynamic Separator Sizing Program - HydroStorm

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TSS Buildup

☐ Power Linear
☒ Exponential

TSS Washoff

☒ Power-Exponential
☐ Rating Curve (no upper limit)

Street Sweeping

Efficiency (%) 30
Start Month May
Stop Month Sep
Frequency (days) 30
Available Fraction .3

Soil Erosion

☐ Add Erosion to TSS

Reset to Default Values

TSS Buildup Parameters

Limit (kg/ha) 28.02
Coeff (kg/ha) 67.25
Exponent .5

TSS Washoff Parameters

Coefficient .0855
Exponent 1.1

TSS Buildup

☒ Based on Area
☐ Based on Curb Length

Upstream Quantity Storage

Hydroworks Hydrodynamic Separator Sizing Program - HydroStorm

File Product Units CAD Video Help

General Dimensions Rainfall Site TSS PSD TSS Loading Quantity Storage By-Pass Custom CAD Video Other

Quantity Control Storage

	Storage (m3)	Discharge (m3/s)
▶	0	0
*		

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- ☒ Oil Spill Storage in Pretreatment Area
- ☐ Sediment Storage in Pretreatment Area
- ☐ 50% Oil Spill / 50% Sediment Storage in Pretreatment Area

TSS Removal Results

- ☒ Required TSS Removal
- ☐ Choose Model #

TSS Removal Required

TSS Removal (%) Enter required TSS Removal (%)

Flagged Issues

None

Hydroworks Sizing Program - Version 5.8

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