



November 22nd, 2022
File No.: LD-00203

VIA EMAIL

The Municipality of Middlesex Centre
10227 Ilderton Road
Ilderton, ON N0M 2A0

**Reference: MN 6, 10, 14 Elmhurst Street, Kilworth
Sweid Holdings Inc.
Stormwater Servicing Brief**

INTRODUCTION

Sweid Holdings Inc. has retained LDS Consultants Inc. (LDS) to develop a strategy to provide stormwater management (SWM) servicing for the proposed development of the properties located at MN 6, 10 and 14 Elmhurst Street, in the community of Kilworth. A site location plan is provided in Figure 1. The subject site comprises the assembly of three oversized single-family lots and is approximately 2.02 hectares in area. The site is bounded by Elmhurst Street to the east, a large single-family residential lot to the north, and single-family lots to the south and west.

Background Information

The SWM strategy presented herein was developed using the following information:

- Geotechnical Investigation, prepared by LDS Consultants Inc., dated November 6, 2022; and
- Middlesex Centre Infrastructure Design Standards, dated January 2018.
- Stormwater Management and Planning and Design Manual, prepared by the MOE, 2003.

EXISTING CONDITION

The site currently consists of three oversized single-family residential lots. These lots are generally comprised of landscaped areas, multiple structures, and trees along the north perimeter of the site. The site drains overland towards the west to the rear of the lots. External flows enter the area across the northwest property limit from a wooded portion of the adjacent oversized lot.

Existing catchment areas are described below. The site was modelled in SWMHYMO to calculate existing peak flows summarized in Table 1, and the catchment areas are illustrated in Figure 2. The hydrologic model documentation is attached in Appendix B.

Catchment 101 – This catchment area comprises landscaped areas, existing residential dwellings, and auxiliary buildings. This catchment drains overland to the west towards the existing residential lots fronting Kilworth Park Drive.

Catchment EX-1 – This area represents a wooded area situated north of the site. This area drains overland towards the south into the subject site.

Table 1 - Existing Runoff Peak Flows

Design Storm Event	2-year	5-year	10-year	25-year	50-year	100-year	250-year
Peak Flow (m ³ /s)	0.013	0.029	0.040	0.053	0.064	0.076	0.114

LDS conducted a geotechnical investigation to determine existing soil conditions at the subject site. The predominant soil on site is a sandy loam. For modelling purposes, it will be classified as Hydrologic Soil Group A. Five of the six boreholes were observed as dry, a borehole BH2 having a groundwater level depth of 4.27 meters measured below the existing ground surface.

PROPOSED DEVELOPMENT CONDITION

It is proposed to develop the site as a mixed-use residential development consisting of 15 single-family lots and 45 medium-density residential units. The proposed development will include paved, and some open space landscaped areas. All storm runoff occurring on-site will be conveyed to the internal storm sewer system and be allowed to infiltrate through proposed subsurface infiltration trenches and galleries. The proposed catchments are described below and are illustrated in Figure 3. The proposed condition was modelled using SWMHYMO, and the model results are attached to this letter report.

Catchment 201 – This catchment area comprises rear yards for the single-family lots 12 - 15 on the west side of the subject site. A perforated storm sewer network will convey minor and major flows to a subsurface infiltration trench.

Catchment 202 – This catchment area comprises rear yards for the single-family lots 1 - 9 on the southeast side of the subject site. A perforated storm sewer network will convey minor and major flows to a subsurface infiltration trench.

Catchment 203 – This catchment area consists of the internal street network, the townhouse units, and the front yards for all the single-family. The storm sewer network and overland flow routes (OLFR) will convey minor and major flows to infiltration galleries located in the center of the site.

Catchment EX-1 – This area represents a wooded area north of the site. This area drains overland towards the southeast into the subject site. Minor and major flows will be conveyed by surface grading and a perforated storm sewer system which connects to interceptor subsurface infiltration trenches.

Quantity Control

Quantity control is achieved through surface storage, a perforated storm sewer network and multiple subsurface infiltration trenches and galleries. A summation of all site controls is provided in Table 2.

Table 2 – Proposed and Allocated Stormwater Storage Volumes

Storage Feature	Storage Volume Provided (m ³)
Subsurface Infiltration Trenches and Infiltration Galleries	632
Surface Storage	372
Total Volume	1004

There is no physical outlet for this site. All flow will be contained within the site boundaries to mitigate potential adverse effects on the surrounding environment. Runoff from the rear yards of the single-family lots will flow to subsurface infiltration trenches in the backyards. Runoff from the fronts of the dwelling units will flow to the internal asphalt surface and be conveyed to the internal collection system. This system utilizes perforated pipes underneath the depressed green space to infiltrate the collected stormwater into the infiltration galleries. These infiltration galleries will store and exfiltrate flows to the underlying native sandy soils. When the minor system becomes overwhelmed by large amounts of runoff, major flows will be directed by overland flow routes to the depressed green spaces. These areas will allow stormwater runoff to pond on the surface and infiltrate through the greenspaces ground surface into the subsurface infiltration gallery. The design information of the infiltration galleries and subsurface infiltration trenches is presented in Table 3. The footprint of the infiltration features is depicted in Figure 4, with details illustrated in Figure 5. The SWMHYMO model is included in Appendix B.

Table 3 – Subsurface Infiltration Trenches and Galleries Design Parameters

Catchment	Trench Bottom Area (m ²)	Trench Depth (m)	Void Ratio	Drawdown Time (hrs)	Available Storage Volume (m ³)	Infiltration Rate (mm/hr)	Proposed Number of Galleries
Ex-1	210	0.37	0.4	24	78	39	3
C201	105	0.37	0.4	24	39	39	1
C202	155	0.65	0.4	24	101	69	1
C203	390	1.06	0.4	38.5	414	69	3

As shown by the model results, the infiltration features have been sized, so the total post-development runoff peak flow rates leaving the subject site are zero as the entire volume of the 250-year storm is stored on-site and infiltrated without overflowing the storage system.

Quality Control

An Enhanced Level of water quality protection is proposed. Quality control measures proposed will take the form of infiltration-type SWM facilities, servicing a total drainage area of 3.1ha with an average imperviousness of 41%. An Enhanced Level of water quality control (based on an infiltration SWMP type using an imperviousness of 41%) requires a storage volume of 26.5m³/ha.

Considering the total post-development drainage area draining to the SWM facility of 3.1ha, this equates to a required storage volume of 82m³. The subsurface storage volume provided on-site is 682m³, which exceeds the required volume recommended by the MOE.

Pre-treatment of road runoff for the area's tributary to the C203 infiltration galleries should be provided. Three BMP 24R SNOUT devices are recommended for pre-treatment of the runoff entering the infiltration beds. Also, FlexStorm Catch-It inlet protection for catch basins and mini catch basins tributary to backyard infiltration trenches will provide permanent inlet protection. Appendix C contains sell sheets for the FlexStorm and BMP products mentioned above. These sheets contain information regarding installation and maintenance requirements. Source controls should also be investigated (e.g., sanding/salting practices and public education concerning street/driveway sediments) in areas where an infiltration basin is proposed.

EROSION AND SEDIMENT CONTROL

This section describes the Erosion and Sediment Control Plan implemented before, during and immediately after construction to reduce the possibility of sediment being conveyed from the proposed construction site.

Types of Selected Erosion / Sediment Control Methods

The details and locations of the proposed temporary and longer-term erosion and sediment control measures will be identified at the detailed design stage. The construction drawings, once complete, will form a part of the sediment and erosion control plan. Proposed erosion and sediment control measures include the following:

- The Contractor will install a heavy-duty silt fence and robust siltation barrier along the east and south perimeters.
- The Contractor will install a light-duty silt fence along the north and west site perimeters.
- All disturbed areas where work will not take place for 30 days or more will be stabilized following OPSS 572.
- The Contractor will perform street sweeping to remove soil deposited on adjacent rights-of-way by construction traffic.

The proposed temporary erosion and sediment control measures have been selected based on the site's susceptibility to erosion, the sensitivity of the downstream environment, site slopes, and the total drainage area. The proposed measures should provide adequate erosion and sediment control for the proposed project without additional steps. However, the site will be monitored during construction, and other actions will be added if required.

Installation of Erosion Control Measures

Proposed erosion and sediment control measures are summarized in Table 4.

Table 4 – Erosion and Sediment Control Sequencing

Stage	Erosion and Sediment Control Measures
Pre-Construction	Create a contact list for emergency contingency plan operations.
	Install a silt fence around the proposed work limits, as appropriate.
	Install robust siltation barrier.
	Preparation of a Construction Dewatering Discharge Plan, including discharge location, temporary storage locations and identifying measures to reduce suspended solids or other treatment, if required

Construction	Monitor water quality (turbidity) for construction dewatering discharge water discharged at the surface.
	Regularly inspect erosion and sediment control measures to confirm they are practical and operating as intended.
	Monitor weather reports for significant precipitation events for contingency planning.
	Install filter cloth in on-site catch basins.
	Perform street sweeping as necessary to remove accumulated sediment from the adjacent right-of-way.
	Complete final paving.
	Complete final landscaping and vegetation plantings.
Post-Construction	Remove robust siltation barrier.
	Remove the silt fence from the proposed work limits.
	Remove filter cloth from on-site catch basins.
	Remove the construction fence from the proposed work limits.

The proposed erosion and sediment control measures have been designed according to the site slopes, drainage area, and the risks and consequences of failure. Based on these factors, additional steps will likely not be required.

However, the site will be monitored during construction, and additional measures (i.e., additional rows of silt fence) may be installed at the discretion of the Contract Administrator. Although this is not an exhaustive list, inspections should include checks on siltation barriers to confirm it is properly installed and secured. Including a review for evidence of damage, tears, overtopping or undermining; checking the condition of surface water ponding areas and storm drain inlets; and documenting areas where seeding / sodding / mulching is implemented to re-establish vegetative cover. In addition, due to the high groundwater condition, inspections shall include checking exposed banks for seepage. If seepage is encountered, erosion control blankets shall be installed to mitigate any damage to the banks.

The triggers for installing enhanced erosion and sediment control measures would include breaching the proposed erosion and sediment control measures and re-evaluation based on site conditions during construction. Site conditions and the proposed erosion and sediment control measures will be monitored regularly, as described below.

Inspection Requirements

The effectiveness of the erosion and sediment control measures will need to be monitored during site grading and site servicing work. This will require frequent inspections. Therefore, the following minimum inspection intervals are recommended:

- The Contractor and Contract Administrator shall monitor weather reports daily and record temperatures and rainfall. When rainfall is anticipated, the Contractor and the Contract Administrator shall inspect the erosion control works immediately before and immediately after the rainfall event and snowmelt event (timing for inspections is based on predicted weather forecasts);
- Daily during extended or significant precipitation (i.e., rainfall amounts that exceed 25 millimetres) or during significant snowmelt periods;
- Daily during any construction activity that would potentially yield significant runoff volumes or otherwise impact the quality of the runoff leaving the site;
- Daily while deficiencies are present which fail to contain, filter or otherwise treat runoff or contribute to sediment loading in surface water;
- Weekly during dry periods while construction activity is occurring at the site. The Contractor and the Contract Administrator shall inspect the erosion control measures the day before the last business day of the week (typically Thursday) to allow any work to be completed on damaged erosion control works before the weekend.; and,
- Monthly during inactive periods (> 30 days).

The Contract Administrator will document all inspection activities in weekly erosion and sediment control reports.

The Contractor shall construct and maintain all erosion and sediment control measures. This shall include but not be limited to preserving fencing and removing accumulated sediment. Temporary erosion and sediment control measures

will be removed once the areas they serve are restored and stable. Removal of the erosion and sediment control measures will be the builder's responsibility after the sod has been rooted on the site.

Contingency Plan

The contingency plan aims to help minimize the risk or consequence of a failure of the erosion and sediment control works. Failure could result from insufficient measures, maintenance, or severe weather conditions. The contingency plan includes two areas of consideration:

- Procedures that will be followed where a failure has occurred; and
- Contingency measures will be implemented where there is potential for loss.

The Contractor shall be responsible for following the contingency plan and will prepare the following items:

- The Contractor will maintain a contact list for emergencies.
- Workers shall be on call for emergencies for all aspects of the emergency, from design to installation of sediment and erosion control measures. Any associated health and safety issues are the responsibility of the Contractor.
- Sediment and erosion control measures such as erosion control blanket, straw bales and stakes, sandbags, and silt fences shall be available for emergency installation.
- Gas-powered pumps, appropriately sized hoses, filtration hose socks, and filter cloth will be available for emergency dewatering.
- Heavy equipment shall be on standby for emergency works.
- A supplemental contact list for any further required equipment or materials shall be prepared and made available for emergency use.

Monitoring

As noted previously, regular monitoring of the site's erosion and sediment control measures makes up an integral part of the contingency plan by providing an early indication should any environmental control measures (such as sediment and erosion control measures) or practices fail to achieve prescribed standards. Recommended inspection intervals were discussed previously.

If monitoring identifies a high potential for failure, steps will be taken to reduce the risk. These measures may include repairing existing efforts, modifying current measures, and adding new measures.

If unforeseen events cause the strategies set out in the contingency plan to be insufficient or inappropriate to meet the objective of containing sediment within the working limits, the Contractor, either independently or as directed by the Contract Administrator, will respond promptly with all reasonable measures to prevent, counteract, or remedy any effects on aquatic habitat, and human interest (i.e., public safety, property value).

Updates to the Erosion and Sediment Control Plan may be required to reflect changes at the site during various stages of construction. The municipality will be circulated with updated plans to ensure they have the most current techniques available for review and consultation if needed.

Severe Weather Anticipated

In cases where the weather forecast indicates that significant rainfall is expected within 24 hours, the Contractor shall immediately complete the following:

- Inspect existing erosion and sediment control measures to confirm that they are secure and in good working order;
- Review site conditions to identify and protect areas of exposed soil that could be susceptible to surface erosion; and,
- Monitor all measures during the rainfall event and take corrective action where a potential for failure is identified.

The Contract Administrator shall document the status of the above-listed steps.

Responding to Failures

The Contractor will cease all construction-related work and focus on erosion and sediment control to stabilize the site where a failure has occurred or is imminent. The work shall be completed to the satisfaction of the Contract Administrator and any regulatory agencies having jurisdiction.

Any unexpected discharge of silt, sediment, or other deleterious substance shall be reported to the Municipality of Middlesex Centre within 24 hours. The Contractor is responsible for advising the contract administrator and promptly notifying the incident to the Spills Action Centre. Depending on the type of incident, water sampling and quality testing may be warranted to document the extent of the impact. Scoping for the required testing will depend on the incident report.

If significant long-term damage to aquatic habitat or property is suspected, the Owner's Engineer will develop a restoration plan. Consultation with an ecologist and biologist may be required to confirm that the remedial measures are appropriate. Development of the initial restoration plan will begin within 24 hours of discovering sediment discharge and will be implemented as soon as possible following consultation and approval from the MECP, Upper Thames River Conservation Authority (UTRCA), and Municipality of Middlesex Centre. The plan will address the following:

- Removal and disposal of sediment deposited outside of the work limits; and
- Restoration of any areas disturbed through deposition or removal.

Reporting Schedule

The Contract Administrator shall prepare weekly erosion and sediment control monitoring reports/summaries for the duration of site grading and site servicing and submit them to the Municipality of Thames Center by April 1, July 1, and November 1 of each year until all works and services included in the plan are assumed.

The monitoring reports should document the status of the ESC Plan, any repairs, rainfall or pumping that has occurred since the last report, and any risks of failure that may be present.

Additionally, any failure of the erosion and sediment control measures shall be reported as described in the contingency plan.

Construction Dewatering Requirements

Based on the Geotechnical Investigation prepared by LDS, shallow groundwater conditions are observed throughout the site. Therefore, where minor groundwater infiltration occurs within open excavations during construction, conventional sump pumping techniques are expected to be suitable for groundwater control.

Sediment controls should be incorporated into the construction of dewatering discharge outlets. These may be silt bags, constructed sediment traps, or other methods of filtering the discharge water. The Contractor will be responsible for regular maintenance, including sediment removal. Under no circumstances will dewatering effluent be discharged directly to the receiving watercourse without incorporating suitable measures to prevent sediment discharge or cause erosion or scouring at the waterway. Both the Contractor and the Contract Administrator will be responsible for monitoring the water quality leaving the site.

As an introductory guide, the water discharged at the site should have a turbidity level within 8 NTU of the background levels within the watercourse/municipal drain.

For construction dewatering efforts involving a sizeable daily pumping volume, additional sediment control or filtration measures, such as settlement tanks, may be implemented as part of the construction dewatering plan. The discharge and associated sediment controls will depend on the scope of work and the location of the excavation to be dewatered. Thus, the Owner's Engineer should review the dewatering plan in consultation with the Contractor and the Contract Administrator.

For projects requiring positive groundwater control with a removal rate of 50,000 to 400,000 litres per day, a submission to the Environmental Activity and Sector Registry (EASR) will be required. For construction dewatering activities with volumes over 400,000 litres per day, a Category 3 Permit to Take Water (PTTW) would be necessary for groundwater control. EASR submissions and PTTW applications are submitted to and approved by MECP according to Sections 34 and 98 of the Ontario Water Resources Act R.S.O. 1990 and Water Taking and Transfer Regulation O. Reg. 387/04.

The supporting documents to support an EASR submission or PTTW application should include calculations for the zone of influence and identify potential qualitative and quantitative impacts on the shallow groundwater table. Details regarding volume monitoring, water quality analyses and method/location of discharge water will also be required for either submission type. Impacts on local natural features will need to be assessed considering the proposed construction dewatering plan.

CONCLUSION AND RECOMMENDATIONS

The analysis completed by LDS yields the following conclusions:

- Zero peak runoff flows leave the proposed development;
- Sediment transport from the site during construction will be minimized;
- Subsurface infiltration trenches and infiltration galleries, perforated pipe systems and surface storage will provide quantity control for the subject site; and
- Pre-treatment is provided for the central infiltration galleries in the form of three (3) separate SNOUT devices, which receive road runoff. An enhanced level of water quality protection is provided for all water infiltrated on-site.

We trust this letter report to be complete and meet with your acceptance. Should you have any questions concerning the findings presented herein, please do not hesitate to contact the undersigned.

Sincerely,

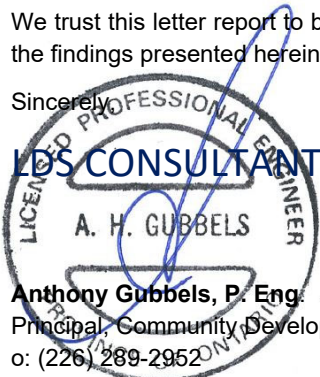
LDS CONSULTANTS INC.

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Principal, Community Development

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e: anthony.gubbels@LDSConsultants.ca



APPENDIX A
FIGURES

Z:\1614-00203 - ELMHURST, KILWORTH\DETAIL DESIGN\REPORTS\SWM\2022\ACAD\LD-00203 LOCATION PLAN.DWG
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MN 6, 10 & 14 ELMHURST, KILWORTH
SWEID HOLDINGS INC.

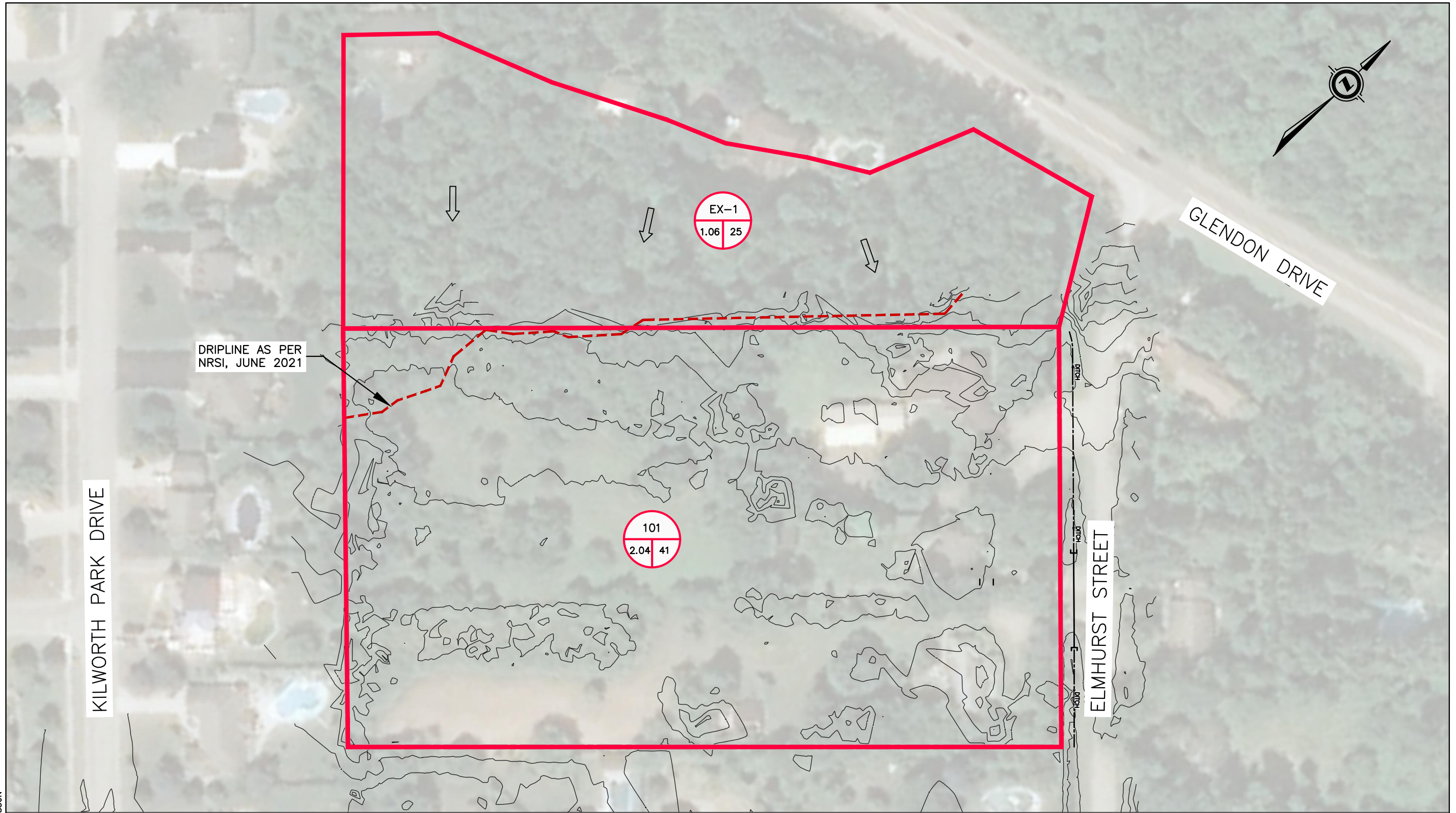
SITE LOCATION PLAN

PROJECT: LD-00203

SCALE: N.T.S.

FIGURE 1

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KILWORTH PARK DRIVE

GLENDON DRIVE

ELMHURST STREET

DRIPLINE AS PER NRSI, JUNE 2021

LEGEND:

	CATCHMENT ID		CATCHMENT AREA
AREA (ha)	CURVE NUMBER		EXISTING OVERLAND FLOW ROUTE



MN 6, 10 & 14 ELMHURST, KILWORTH
SWEID HOLDINGS INC.

EXISTING CONDITIONS DRAINAGE AREA PLAN

PROJECT: LD-00203

SCALE: N.T.S.

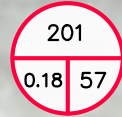
FIGURE 2

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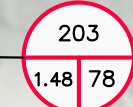


KILWORTH PARK DRIVE

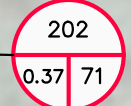
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 NRSI, JUNE 2021



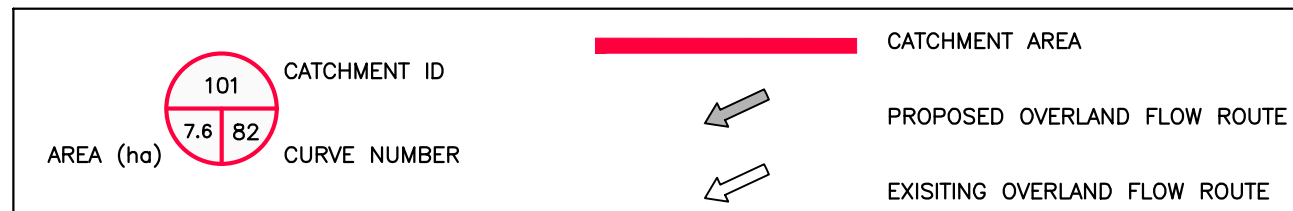
GLENDON DRIVE



ELMHURST STREET



LEGEND:



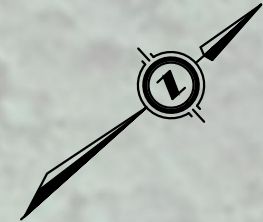
MN 6,10 & 14 ELMHURST, KILWORTH
 SWEID HOLDINGS INC.

PROPOSED DRAINAGE AREA PLAN

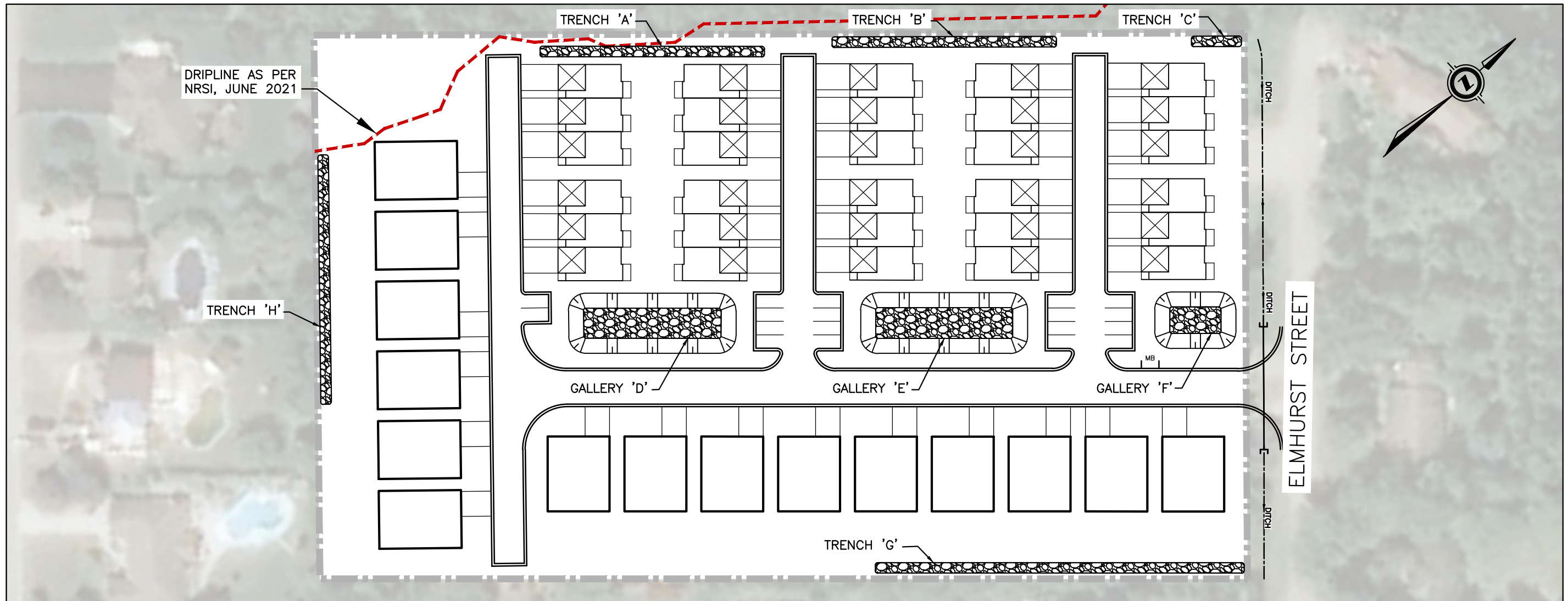
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FIGURE 3



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INFILTRATION TRENCH AND GALLERY DIMENSIONS			
TRENCH/GALLERY	LENGTH (m)	WIDTH (m)	DEPTH (m)
A	45.0	2.1	0.4
B	45.0	2.1	0.4
C	10.0	2.1	0.4
D	27.6	6.0	1.1
E	27.5	6.2	1.1
F	10.3	5.3	1.1
G	50.0	2.1	0.4
H	74.0	2.1	0.7

LEGEND:



MN 6, 10 & 14 ELMHURST, KILWORTH
 SWEID HOLDINGS INC.

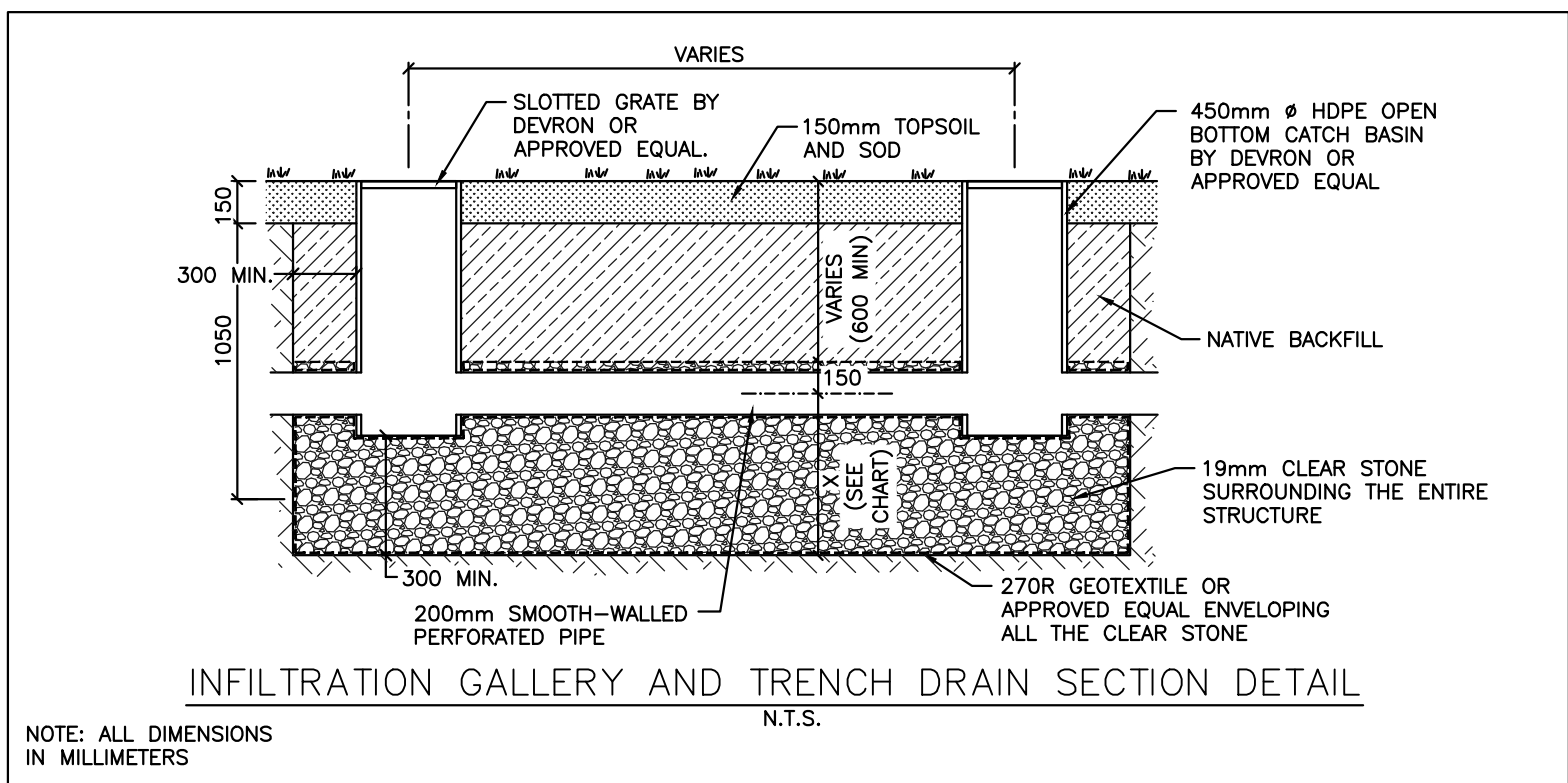
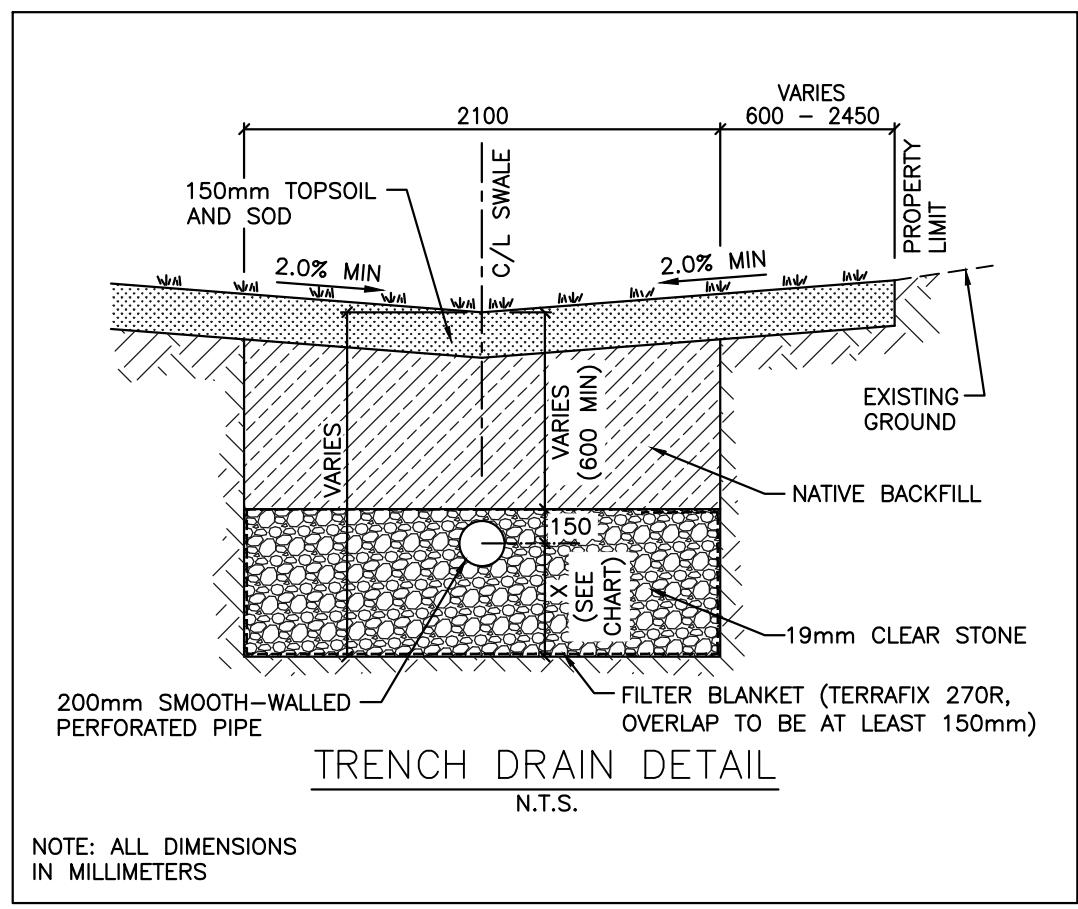
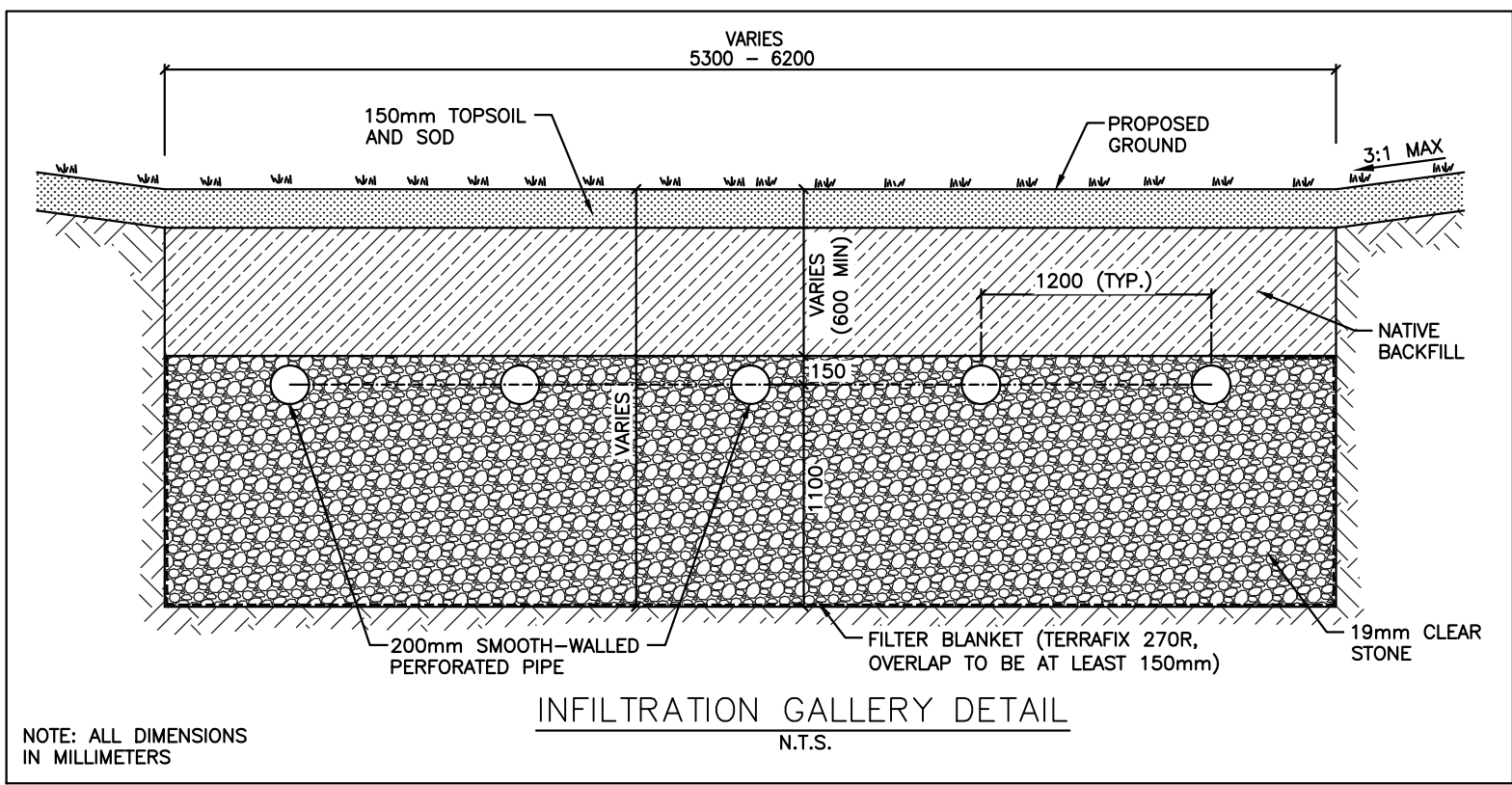
INFILTRATION TRENCH & GALLERY PLAN

PROJECT: LD-00203

SCALE: N.T.S.

FIGURE 4

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APPENDIX B
SWMHYMO HYDROLOGIC MODEL

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00005> SSSSS W W M M M H H H Y Y M M O O ## 9 9 9 9 Ver 4.05
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00008> 9 9 9 9 # 4058874
00009> StormWater Management Hydrologic Model 999 999 =====
00010>
00011> *****
00012> ***** SWMMHYMO Ver/4.05 *****
00013> ***** A single event and continuous hydrologic simulation model *****
00014> ***** based on the principles of HYMO and its successors *****
00015> ***** OTHYMO-83 and OTHYMO-89. *****
00016> *****
00017> ***** Distributed by: J.F. Sabourin and Associates Inc. *****
00018> ***** Ottawa, Ontario: (613) 836-3884 *****
00019> ***** Gatineau, Quebec: (819) 243-6858 *****
00020> ***** E-Mail: swmhyo@jfsa.Com *****
00021> *****
00022>
00023> *****
00024> ***** Licensed user: Land Development Solutions *****
00025> ***** London SERIAL#:4058874 *****
00026> *****
00027> *****
00028> *****
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00030> ***** Maximum value for ID numbers : 10 *****
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00035> *****
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00128> RUNOFF VOLUME (mm) = .813
00129> TOTAL RAINFALL (mm) = 33.307
00130> RUNOFF COEFFICIENT = .024
00131>
00132> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00133>
00134>
00135> 001:0005-----
00136>
00137> # ADD HYD (EXISTING ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
00138> (ha) (cms) (hrs) (mm) (cms)
00139> ID1 01:C101 2.04 .012 1.28 2.03 .000
00140> +ID2 02:EX-1 1.06 .001 1.80 .81 .000
00141> =====
00142> SUM 03:EXISTING 3.10 .013 1.30 1.62 .000
00143>
00144>
00145> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00146>
00147>
00148>
00149> *****
00150> ***** PROPOSED CONDITIONS *****
00151> *****
00152> *****
00153> *****
00154> CALIB NASHYD | Area (ha)= 1.06 Curve Number (CN)=25.00
00155> 01:EX-1 DT= 1.00 | Ia (mm)= 8.000 # of Linear Res. (N)= 3.00
00156> U.H. Tp (hrs)= .500
00157>
00158>
00159> Unit Hyd Qpeak (cms)= .081
00160>
00161> PEAK FLOW (cms)= .001 (i)
00162> TIME TO PEAK (hrs)= 1.800
00163> RUNOFF VOLUME (mm)= .813
00164> TOTAL RAINFALL (mm)= 33.307
00165> RUNOFF COEFFICIENT = .024
00166>
00167> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00168>
00169> 001:0007-----
00170> *****
00171> ***** COMPUTE VOLUME *****
00172> ID:02 (EX-1 ) | DISCHARGE TIME
00173> (cms) (hrs)
00174> START CONTROLLING AT .000 .917
00175> INFLOW HYD. PEAKS AT .001 1.800
00176> STOP CONTROLLING AT .000 .000
00177>
00178>
00179> REQUIRED STORAGE VOLUME (ha.m.)= .0009
00180> TOTAL HYDROGRAPH VOLUME (ha.m.)= .0009
00181> % OF HYDROGRAPH TO STORE = 99.9960
00182>
00183> NOTE: Storage was computed to reduce the Inflow
00184>
00185> 001:0008-----
00186> *****
00187> CALIB STANDHYD | Area (ha)= .18
00188> 02:C201 DT= 1.00 | Total Imp(%)= 38.00 Dir. Conn.(%)= 1.00
00189>
00190>
00191> IMPERVIOUS PERVIOUS (i)
00192> Surface Area (ha)= .07
00193> Dep. Storage (mm)= 2.00 5.00
00194> Average Slope (%)= 2.00 2.00
00195> Length (m)= 8.00 25.00
00196> Mannings n = .013 .240
00197>
00198> Max.eff.Inten.(mm/hr)= 110.46 9.07
00199> over (min)= 1.00 14.00
00200> Storage Coeff. (min)= .44 (ii) 14.01 (ii)
00201> Unit Hyd. Tpeak (min)= 1.00 14.00
00202> Unit Hyd. peak (cms)= 1.53 .08
00203>
00204> PEAK FLOW (cms)= .00 .00 *TOTALS*
00205> TIME TO PEAK (hrs)= .98 1.28 1.250 (iii)
00206> RUNOFF VOLUME (mm)= 31.30 3.26 3.544
00207> TOTAL RAINFALL (mm)= 33.31 33.31 33.307
00208> RUNOFF COEFFICIENT = .94 .10 .106
00209>
00210> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00211> CN = 39.0 Ia = Dep. Storage (Above)
00212> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00213> THAN THE STORAGE COEFFICIENT.
00214> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00215>
00216> 001:0009-----
00217> *****
00218> ***** COMPUTE VOLUME *****
00219> ID:02 (C201 ) | DISCHARGE TIME
00220> (cms) (hrs)
00221> START CONTROLLING AT .000 .533
00222> INFLOW HYD. PEAKS AT .002 1.250
00223> STOP CONTROLLING AT .000 .000
00224>
00225>
00226> REQUIRED STORAGE VOLUME (ha.m.)= .0006
00227> TOTAL HYDROGRAPH VOLUME (ha.m.)= .0006
00228> % OF HYDROGRAPH TO STORE = 99.997
00229>
00230> NOTE: Storage was computed to reduce the Inflow
00231>
00232> 001:0010-----
00233> *****
00234> CALIB STANDHYD | Area (ha)= .37
00235> 03:C202 DT= 1.00 | Total Imp(%)= 55.00 Dir. Conn.(%)= 1.00
00236>
00237>
00238> IMPERVIOUS PERVIOUS (i)
00239> Surface Area (ha)= .20 .17
00240> Dep. Storage (mm)= 2.00 5.00
00241> Average Slope (%)= 2.00 2.00
00242> Length (m)= 8.00 25.00
00243> Mannings n = .013 .240
00244>
00245> Max.eff.Inten.(mm/hr)= 110.46 20.82
00246> over (min)= 1.00 10.00
00247> Storage Coeff. (min)= .44 (ii) 10.17 (ii)
00248> Unit Hyd. Tpeak (min)= 1.00 10.00
00249> Unit Hyd. peak (cms)= 1.53 .11
00250>
00251> PEAK FLOW (cms)= .00 .01 *TOTALS*
00252> TIME TO PEAK (hrs)= 1.00 1.18 1.167 (iii)
00253> RUNOFF VOLUME (mm)= 31.31 4.55 4.819
00254> TOTAL RAINFALL (mm)= 33.31 33.31 33.307
00255> RUNOFF COEFFICIENT = .94 .14 .145

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00255> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00256> CN* = 39.0 Ia = Dep. Storage (Above)
00257> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00258> THAN THE STORAGE COEFFICIENT.
00259> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00260>
00261> -----
00262> 001:0011-----
00263> | COMPUTE VOLUME |
00264> | ID:03 (C202 ) | DISCHARGE TIME
00265> | (cms) (hrs)
00266> | START CONTROLLING AT .000 .533
00267> | INFLOW HYD. PEAKS AT .006 1.167
00268> | STOP CONTROLLING AT .000 .000
00269>
00270> REQUIRED STORAGE VOLUME (ha.m.)= .0018
00271> TOTAL HYDROGRAPH VOLUME (ha.m.)= .0018
00272> % OF HYDROGRAPH TO STORE = 99.9997
00273>
00274> NOTE: Storage was computed to reduce the Inflow
00275>
00276> -----
00277> 001:0012-----
00278> | CALIB STANDHYD | Area (ha)= 1.48
00279> | 04:C203 DT= 1.00 | Total Imp(%)= 66.00 Dir. Conn.(%)= 52.00
00280>
00281> | IMPERVIOUS PERVIOUS (i)
00282> | Surface Area (ha)= 99 5.00
00283> | Dep. Storage (mm)= 2.00 5.00
00284> | Average Slope (%)= .60 2.00
00285> | Length (m)= 8.00 25.00
00286> | Mannings n = .013 .240
00287>
00288> Max.eff.Inten.(mm/hr)= 110.46 6.52
00289> over (min) 1.00 16.00
00290> Storage Coeff. (min)= .63 (ii) 16.11 (ii)
00291> Unit Hyd. Tpeak (min)= 1.00 16.00
00292> Unit Hyd. peak (cms)= 1.35 .07
00293>
00294> *TOTALS*
00295> PEAK FLOW (cms)= .24 .01
00296> TIME TO PEAK (hrs)= 1.00 1.32
00297> RUNOFF VOLUME (mm)= 31.31 2.85 17.646
00298> TOTAL RAINFALL (mm)= 33.31 33.31 33.307
00299> RUNOFF COEFFICIENT = .94 .09 .530
00300>
00301> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00302> CN* = 39.0 Ia = Dep. Storage (Above)
00303> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00304> THAN THE STORAGE COEFFICIENT.
00305> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00306>
00307> -----
00308> 001:0013-----
00309> | COMPUTE VOLUME |
00310> | ID:04 (C203 ) | DISCHARGE TIME
00311> | (cms) (hrs)
00312> | START CONTROLLING AT .000 .533
00313> | INFLOW HYD. PEAKS AT .237 1.000
00314> | STOP CONTROLLING AT .000 .000
00315>
00316> REQUIRED STORAGE VOLUME (ha.m.)= .0261
00317> TOTAL HYDROGRAPH VOLUME (ha.m.)= .0261
00318> % OF HYDROGRAPH TO STORE = 99.9996
00319>
00320> NOTE: Storage was computed to reduce the Inflow
00321>
00322> -----
00323> 001:0014-----
00324> *#*****
00325> *# 5-year *****
00326> *# *****
00327> *# *****
00328> *# *****
00329> *# *****
00330> *# *****
00331> *# *****
00332> *# *****
00333> | CHICAGO STORM | IDF curve parameters: A=1330.310
00334> | Ptotal= 45.37 mm | B= 7.938
00335> | C= .855
00336> used in: INTENSITY = A / (t + B)^C
00337>
00338> Duration of storm = 3.00 hrs
00339> Storm time step = 5.00 min
00340> Time to peak ratio = .33
00341>
00342>
00343> TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
00344> hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
00345> .08 3.038 | .83 21.781 | 1.58 10.023 | 2.33 4.120
00346> .17 3.356 | .92 53.191 | 1.67 8.657 | 2.42 3.868
00347> .25 3.752 | 1.00 149.041 | 1.75 7.613 | 2.50 3.646
00348> .33 4.257 | 1.08 68.676 | 1.83 6.790 | 2.58 3.449
00349> .42 4.925 | 1.17 37.777 | 1.92 6.127 | 2.67 3.273
00350> .50 5.845 | 1.25 25.123 | 2.00 5.581 | 2.75 3.114
00351> .58 7.190 | 1.33 18.497 | 2.08 5.125 | 2.83 2.971
00352> .67 9.326 | 1.42 14.506 | 2.17 4.739 | 2.92 2.841
00353> .75 13.171 | 1.50 11.874 | 2.25 4.407 | 3.00 2.722
00354>
00355> -----
00356> 001:0015-----
00357> *#*****
00358> *# *****
00359> *# EXISTING CONDITIONS *****
00360> *# *****
00361> *# *****
00362>
00363> | CALIB NASHYD | Area (ha)= 2.04 Curve Number (CN)=41.00
00364> | 01:C101 DT= 1.00 | Ia (mm)= 5.000 # of Linear Res. (N)= 3.00
00365> | U.H. Tp(hrs)= .200
00366>
00367> Unit Hyd Qpeak (cms)= .390
00368>
00369> PEAK FLOW (cms)= .027 (i)
00370> TIME TO PEAK (hrs)= 1.283
00371> RUNOFF VOLUME (mm)= 4.014
00372> TOTAL RAINFALL (mm)= 45.366
00373> RUNOFF COEFFICIENT = .088
00374>
00375> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00376>
00377> -----
00378> 001:0016-----
00379> | CALIB NASHYD | Area (ha)= 1.06 Curve Number (CN)=25.00
00380> | 02:EX-1 DT= 1.00 | Ia (mm)= 8.000 # of Linear Res. (N)= 3.00

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00382> ----- U.H. Tp(hrs)= .500
00383>
00384> Unit Hyd Qpeak (cms)= .081
00385>
00386> PEAK FLOW (cms)= .003 (i)
00387> TIME TO PEAK (hrs)= 1.733
00388> RUNOFF VOLUME (mm)= 1.746
00389> TOTAL RAINFALL (mm)= 45.366
00390> RUNOFF COEFFICIENT = .038
00391>
00392> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00393>
00394> -----
00395> 001:0017-----
00396>
00397> | ADD HYD (EXISTING) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
00398> | (ha) (cms) (hrs) (mm) (cms)
00399> | ID1 01:C101 2.04 .027 1.28 4.01 .000
00400> | +ID2 02:EX-1 1.06 .003 1.73 1.75 .000
00401> | =====
00402> | SUM 03:EXISTING 3.10 .029 1.30 3.24 .000
00403>
00404> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00405>
00406> -----
00407> 001:0018-----
00408> *#*****
00409> *# PROPOSED CONDITIONS *****
00410> *# *****
00411> *# *****
00412> *# *****
00413>
00414> | CALIB NASHYD | Area (ha)= 1.06 Curve Number (CN)=25.00
00415> | 01:EX-1 DT= 1.00 | Ia (mm)= 8.000 # of Linear Res. (N)= 3.00
00416> | U.H. Tp(hrs)= .500
00417>
00418> Unit Hyd Qpeak (cms)= .081
00419>
00420> PEAK FLOW (cms)= .003 (i)
00421> TIME TO PEAK (hrs)= 1.733
00422> RUNOFF VOLUME (mm)= 1.746
00423> TOTAL RAINFALL (mm)= 45.366
00424> RUNOFF COEFFICIENT = .038
00425>
00426> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00427>
00428> -----
00429> 001:0019-----
00430>
00431> | COMPUTE VOLUME |
00432> | ID:02 (EX-1 ) | DISCHARGE TIME
00433> | (cms) (hrs)
00434> | START CONTROLLING AT .000 .850
00435> | INFLOW HYD. PEAKS AT .003 1.733
00436> | STOP CONTROLLING AT .000 .000
00437>
00438> REQUIRED STORAGE VOLUME (ha.m.)= .0019
00439> TOTAL HYDROGRAPH VOLUME (ha.m.)= .0019
00440> % OF HYDROGRAPH TO STORE = 99.9980
00441>
00442> NOTE: Storage was computed to reduce the Inflow
00443>
00444> -----
00445> 001:0020-----
00446>
00447> | CALIB STANDHYD | Area (ha)= .18
00448> | 02:C201 DT= 1.00 | Total Imp(%)= 38.00 Dir. Conn.(%)= 1.00
00449>
00450> | IMPERVIOUS PERVIOUS (i)
00451> | Surface Area (ha)= .07 .11
00452> | Dep. Storage (mm)= 2.00 5.00
00453> | Average Slope (%)= 2.00 2.00
00454> | Length (m)= 8.00 25.00
00455> | Mannings n = .013 .240
00456>
00457> Max.eff.Inten.(mm/hr)= 149.04 21.07
00458> over (min) 1.00 10.00
00459> Storage Coeff. (min)= .39 (ii) 10.07 (ii)
00460> Unit Hyd. Tpeak (min)= 1.00 10.00
00461> Unit Hyd. peak (cms)= 1.57 .11
00462>
00463> *TOTALS*
00464> PEAK FLOW (cms)= .00 .00 .004 (iii)
00465> TIME TO PEAK (hrs)= .98 1.20 1.200
00466> RUNOFF VOLUME (mm)= 43.36 6.13 6.501
00467> TOTAL RAINFALL (mm)= 45.37 45.37 45.366
00468> RUNOFF COEFFICIENT = .96 .14
00469>
00470> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00471> CN* = 39.0 Ia = Dep. Storage (Above)
00472> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00473> THAN THE STORAGE COEFFICIENT.
00474> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00475>
00476> -----
00477> 001:0021-----
00478> | COMPUTE VOLUME |
00479> | ID:02 (C201 ) | DISCHARGE TIME
00480> | (cms) (hrs)
00481> | START CONTROLLING AT .000 .467
00482> | INFLOW HYD. PEAKS AT .004 1.200
00483> | STOP CONTROLLING AT .000 .000
00484>
00485> REQUIRED STORAGE VOLUME (ha.m.)= .0012
00486> TOTAL HYDROGRAPH VOLUME (ha.m.)= .0012
00487> % OF HYDROGRAPH TO STORE = 99.9996
00488>
00489> NOTE: Storage was computed to reduce the Inflow
00490>
00491> -----
00492> 001:0022-----
00493>
00494> | CALIB STANDHYD | Area (ha)= .37
00495> | 03:C202 DT= 1.00 | Total Imp(%)= 55.00 Dir. Conn.(%)= 1.00
00496>
00497> | IMPERVIOUS PERVIOUS (i)
00498> | Surface Area (ha)= .20 .17
00499> | Dep. Storage (mm)= 2.00 5.00
00500> | Average Slope (%)= 2.00 2.00
00501> | Length (m)= 8.00 25.00
00502> | Mannings n = .013 .240
00503>
00504> Max.eff.Inten.(mm/hr)= 149.04 41.76
00505> over (min) 1.00 8.00
00506> Storage Coeff. (min)= .39 (ii) 7.76 (ii)
00507> Unit Hyd. Tpeak (min)= 1.00 8.00
00508> Unit Hyd. peak (cms)= 1.57 .14

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00509> *TOTALS*
00510> PEAK FLOW (cms)= .00 .01 .013 (iii)
00511> TIME TO PEAK (hrs)= 1.00 1.15 1.150
00512> RUNOFF VOLUME (mm)= 43.37 8.30 8.653
00513> TOTAL RAINFALL (mm)= 45.37 45.37 45.366
00514> RUNOFF COEFFICIENT = .96 .18 .191
00515>
00516> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00517> CN* = 39.0 Ia = Dep. Storage (Above)
00518> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00519> THAN THE STORAGE COEFFICIENT.
00520> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00521>
00522> -----
00523> 001:0023-----
00524>
00525> COMPUTE VOLUME | DISCHARGE TIME
00526> | ID:03 (C202 ) | (cms) (hrs)
00527> -----
00528> START CONTROLLING AT .000 .467
00529> INFLOW HYD. PEAKS AT .013 1.150
00530> STOP CONTROLLING AT .000 .000
00531>
00532> REQUIRED STORAGE VOLUME (ha.m.)= .0032
00533> TOTAL HYDROGRAPH VOLUME (ha.m.)= .0032
00534> % OF HYDROGRAPH TO STORE = 99.9996
00535>
00536> NOTE: Storage was computed to reduce the Inflow
00537>
00538> -----
00539> 001:0024-----
00540>
00541> CALIB STANDHYD | Area (ha)= 1.48
00542> | 04:C203 DT= 1.00 | Total Imp(%)= 66.00 Dir. Conn.(%)= 52.00
00543> -----
00544> IMPERVIOUS PERVIOUS (i)
00545> Surface Area (ha)= .98 .50
00546> Dep. Storage (mm)= 2.00 5.00
00547> Average Slope (%)= .60 2.00
00548> Length (m)= 8.00 25.00
00549> Mannings n = .013 .240
00550>
00551> Max.eff.Inten.(mm/hr)= 149.04 15.01
00552> over (min)= 1.00 12.00
00553> Storage Coeff. (min)= .56 (ii) 11.65 (ii)
00554> Unit Hyd. Tpeak (min)= 1.00 12.00
00555> Unit Hyd. peak (cms)= 1.42 .10
00556>
00557> *TOTALS*
00558> PEAK FLOW (cms)= .32 .01 .321 (iii)
00559> TIME TO PEAK (hrs)= 1.00 1.25 1.000
00560> RUNOFF VOLUME (mm)= 43.37 5.41 25.148
00561> TOTAL RAINFALL (mm)= 45.37 45.37 45.366
00562> RUNOFF COEFFICIENT = .96 .12 .554
00563>
00564> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00565> CN* = 39.0 Ia = Dep. Storage (Above)
00566> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00567> THAN THE STORAGE COEFFICIENT.
00568> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00569>
00570> -----
00571> 001:0025-----
00572>
00573> COMPUTE VOLUME | DISCHARGE TIME
00574> | ID:04 (C203 ) | (cms) (hrs)
00575> -----
00576> START CONTROLLING AT .000 .467
00577> INFLOW HYD. PEAKS AT .321 1.000
00578> STOP CONTROLLING AT .000 .000
00579>
00580> REQUIRED STORAGE VOLUME (ha.m.)= .0372
00581> TOTAL HYDROGRAPH VOLUME (ha.m.)= .0372
00582> % OF HYDROGRAPH TO STORE = 99.9997
00583>
00584> NOTE: Storage was computed to reduce the Inflow
00585>
00586> -----
00587> 001:0026-----
00588> *#*****
00589> *# 10-year *****
00590> *# *****
00591> *# *****
00592> *#*****
00593>
00594> CHICAGO STORM | IDF curve parameters: A=1497.190
00595> | Ptotal= 52.59 mm | B= 7.188
00596> | C= .850
00597> used in: INTENSITY = A / (t + B)^C
00598>
00599> Duration of storm = 3.00 hrs
00600> Storm time step = 5.00 min
00601> Time to peak ratio = .33
00602>
00603>
00604> TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
00605> hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
00606> .08 3.544 | .83 24.635 | 1.58 11.418 | 2.33 4.775
00607> .17 3.907 | .92 60.893 | 1.67 9.886 | 2.42 4.490
00608> .25 4.357 | 1.00 178.745 | 1.75 8.714 | 2.50 4.237
00609> .33 4.931 | 1.08 79.026 | 1.83 7.789 | 2.58 4.013
00610> .42 5.686 | 1.17 42.842 | 1.92 7.043 | 2.67 3.812
00611> .50 6.725 | 1.25 28.407 | 2.00 6.428 | 2.75 3.631
00612> .58 8.239 | 1.33 20.928 | 2.08 5.913 | 2.83 3.467
00613> .67 10.636 | 1.42 16.445 | 2.17 5.476 | 2.92 3.318
00614> .75 14.947 | 1.50 13.493 | 2.25 5.101 | 3.00 3.182
00615>
00616> 001:0027-----
00617> *#*****
00618> *# *****
00619> *# *****
00620> *# *****
00621> *#*****
00622>
00623> CALIB NASHYD | Area (ha)= 2.04 Curve Number (CN)=41.00
00624> | 01:C101 DT= 1.00 | Ia (mm)= 5.000 # of Linear Res.(N)= 3.00
00625> | U.H. Tp(hrs)= .200
00626>
00627> Unit Hyd Qpeak (cms)= .390
00628>
00629> PEAK FLOW (cms)= .037 (i)
00630> TIME TO PEAK (hrs)= 1.283
00631> RUNOFF VOLUME (mm)= 5.482
00632> TOTAL RAINFALL (mm)= 52.590
00633> RUNOFF COEFFICIENT = .104
00634>
00635> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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00636>
00637> -----
00638> 001:0028-----
00639>
00640> CALIB NASHYD | Area (ha)= 1.06 Curve Number (CN)=25.00
00641> | 02:EX-1 DT= 1.00 | Ia (mm)= 8.000 # of Linear Res.(N)= 3.00
00642> | U.H. Tp(hrs)= .500
00643>
00644> Unit Hyd Qpeak (cms)= .081
00645>
00646> PEAK FLOW (cms)= .005 (i)
00647> TIME TO PEAK (hrs)= 1.717
00648> RUNOFF VOLUME (mm)= 2.464
00649> TOTAL RAINFALL (mm)= 52.590
00650> RUNOFF COEFFICIENT = .047
00651>
00652> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00653>
00654> -----
00655> 001:0029-----
00656>
00657> ADD HYD (EXISTING ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
00658> | (ha) (cms) (hrs) (mm) (cms)
00659> | ID1 01:C101 2.04 .037 1.28 5.48 .000
00660> | +ID2 02:EX-1 1.06 .005 1.72 2.46 .000
00661> | =====
00662> | SUM 03:EXISTING 3.10 .040 1.28 4.45 .000
00663>
00664> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00665>
00666> -----
00667> 001:0030-----
00668> *#*****
00669> *# *****
00670> *# PROPOSED CONDITIONS *****
00671> *# *****
00672> *#*****
00673>
00674> CALIB NASHYD | Area (ha)= 1.06 Curve Number (CN)=25.00
00675> | 01:EX-1 DT= 1.00 | Ia (mm)= 8.000 # of Linear Res.(N)= 3.00
00676> | U.H. Tp(hrs)= .500
00677>
00678> Unit Hyd Qpeak (cms)= .081
00679>
00680> PEAK FLOW (cms)= .005 (i)
00681> TIME TO PEAK (hrs)= 1.717
00682> RUNOFF VOLUME (mm)= 2.464
00683> TOTAL RAINFALL (mm)= 52.590
00684> RUNOFF COEFFICIENT = .047
00685>
00686> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00687>
00688> -----
00689> 001:0031-----
00690>
00691> COMPUTE VOLUME | DISCHARGE TIME
00692> | ID:02 (EX-1 ) | (cms) (hrs)
00693> -----
00694> START CONTROLLING AT .000 .833
00695> INFLOW HYD. PEAKS AT .005 1.717
00696> STOP CONTROLLING AT .000 .000
00697>
00698> REQUIRED STORAGE VOLUME (ha.m.)= .0026
00699> TOTAL HYDROGRAPH VOLUME (ha.m.)= .0026
00700> % OF HYDROGRAPH TO STORE = 99.9984
00701>
00702> NOTE: Storage was computed to reduce the Inflow
00703>
00704> -----
00705> 001:0032-----
00706>
00707> CALIB STANDHYD | Area (ha)= .18
00708> | 02:C201 DT= 1.00 | Total Imp(%)= 38.00 Dir. Conn.(%)= 1.00
00709> -----
00710> IMPERVIOUS PERVIOUS (i)
00711> Surface Area (ha)= .07 .11
00712> Dep. Storage (mm)= 2.00 5.00
00713> Average Slope (%)= 2.00 2.00
00714> Length (m)= 8.00 25.00
00715> Mannings n = .013 .240
00716>
00717> Max.eff.Inten.(mm/hr)= 178.75 29.86
00718> over (min)= 1.00 9.00
00719> Storage Coeff. (min)= .36 (ii) 8.79 (ii)
00720> Unit Hyd. Tpeak (min)= 1.00 9.00
00721> Unit Hyd. peak (cms)= 1.59 .13
00722>
00723> *TOTALS*
00724> PEAK FLOW (cms)= .00 .01 .006 (iii)
00725> TIME TO PEAK (hrs)= .98 1.17 1.167
00726> RUNOFF VOLUME (mm)= 50.59 8.20 8.625
00727> TOTAL RAINFALL (mm)= 52.59 52.59 52.590
00728> RUNOFF COEFFICIENT = .96 .16 .164
00729>
00730> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00731> CN* = 39.0 Ia = Dep. Storage (Above)
00732> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00733> THAN THE STORAGE COEFFICIENT.
00734> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00735>
00736> -----
00737> 001:0033-----
00738>
00739> COMPUTE VOLUME | DISCHARGE TIME
00740> | ID:02 (C201 ) | (cms) (hrs)
00741> -----
00742> START CONTROLLING AT .000 .433
00743> INFLOW HYD. PEAKS AT .006 1.167
00744> STOP CONTROLLING AT .000 .000
00745>
00746> REQUIRED STORAGE VOLUME (ha.m.)= .0016
00747> TOTAL HYDROGRAPH VOLUME (ha.m.)= .0016
00748> % OF HYDROGRAPH TO STORE = 99.9996
00749>
00750> NOTE: Storage was computed to reduce the Inflow
00751>
00752> -----
00753> 001:0034-----
00754>
00755> CALIB STANDHYD | Area (ha)= .37
00756> | 03:C202 DT= 1.00 | Total Imp(%)= 55.00 Dir. Conn.(%)= 1.00
00757> -----
00758> IMPERVIOUS PERVIOUS (i)
00759> Surface Area (ha)= .20 .17
00760> Dep. Storage (mm)= 2.00 5.00
00761> Average Slope (%)= 2.00 2.00
00762> Length (m)= 8.00 25.00
00763> Mannings n = .013 .240

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00763> Max.eff.Inten.(mm/hr)= 178.75 59.06
00765> over (min) = 1.00 7.00
00766> Storage Coeff (mm) = .36 (ii) 6.77 (ii)
00767> Unit Hyd. Tpeak (min) = 1.00 7.00
00768> Unit Hyd. peak (cms) = 1.59 .17
00769>
00770> PEAK FLOW (cms) = .00 .02 *.TOTALS*
00771> TIME TO PEAK (hrs) = .98 1.10 .019 (iii)
00772> RUNOFF VOLUME (mm) = 50.59 10.96 11.361
00773> TOTAL RAINFALL (mm) = 52.59 52.59 52.590
00774> RUNOFF COEFFICIENT = .96 .21 .216
00775>
00776> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00777> CN* = 39.0 Ia = Dep. Storage (Above)
00778> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00779> THAN THE STORAGE COEFFICIENT.
00780> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00781>
-----
00782> 001:0035-----
00783>
00784> | COMPUTE VOLUME |
00785> | ID:03 (C202 ) | DISCHARGE TIME
00786> | (cms) (hrs)
00787> START CONTROLLING AT .000 .433
00788> INFLOW HYD. PEAKS AT .019 1.100
00789> STOP CONTROLLING AT .000 .000
00790>
00791> REQUIRED STORAGE VOLUME (ha.m.) = .0042
00792> TOTAL HYDROGRAPH VOLUME (ha.m.) = .0042
00793> % OF HYDROGRAPH TO STORE = 99.9997
00794>
00795> NOTE: Storage was computed to reduce the Inflow
00796>
-----
00797>
00798> 001:0036-----
00799>
00800>
00801> | CALIB STANDHYD | Area (ha)= 1.48
00802> | 04:C203 DT= 1.00 | Total Imp(%)= 66.00 Dir. Conn.(%)= 52.00
00803>
00804> IMPERVIOUS PERVIOUS (i)
00805> Surface Area (ha) = .98 .50
00806> Dep. Storage (mm) = 2.00 5.00
00807> Average Slope (%) = .60 2.00
00808> Length (m) = 8.00 25.00
00809> Mannings n = .013 .240
00810>
00811> Max.eff.Inten.(mm/hr)= 178.75 22.69
00812> over (min) = 1.00 1.00
00813> Storage Coeff (mm) = .52 (ii) 9.92 (ii)
00814> Unit Hyd. Tpeak (min) = 1.00 10.00
00815> Unit Hyd. peak (cms) = 1.45 .11
00816>
00817> PEAK FLOW (cms) = .38 .02 *.TOTALS*
00818> TIME TO PEAK (hrs) = 1.00 1.20 1.000
00819> RUNOFF VOLUME (mm) = 50.59 7.28 29.801
00820> TOTAL RAINFALL (mm) = 52.59 52.59 52.590
00821> RUNOFF COEFFICIENT = .96 .14 .567
00822>
00823> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00824> CN* = 39.0 Ia = Dep. Storage (Above)
00825> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00826> THAN THE STORAGE COEFFICIENT.
00827> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00828>
-----
00829>
00830> 001:0037-----
00831>
00832> | COMPUTE VOLUME |
00833> | ID:04 (C203 ) | DISCHARGE TIME
00834> | (cms) (hrs)
00835> START CONTROLLING AT .000 .433
00836> INFLOW HYD. PEAKS AT .387 1.000
00837> STOP CONTROLLING AT .000 .000
00838>
00839> REQUIRED STORAGE VOLUME (ha.m.) = .0441
00840> TOTAL HYDROGRAPH VOLUME (ha.m.) = .0441
00841> % OF HYDROGRAPH TO STORE = 99.9997
00842>
00843> NOTE: Storage was computed to reduce the Inflow
00844>
-----
00845>
00846> 001:0038-----
00847> *****
00848> *#
00849> *# 25-year
00850> *# *****
00851> *#
00852> *#
00853> *#
00854> | CHICAGO STORM | IDF curve parameters: A=1455.000
00855> | Ptotal= 60.37 mm | B= 5.000
00856> | C= .820
00857> used in: INTENSITY = A / (t + B)^C
00858>
00859> Duration of storm = 3.00 hrs
00860> Storm time step = 5.00 min
00861> Time to peak ratio = .33
00862>
00863> TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
00864> hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
00865> .08 4.464 | .83 26.338 | 1.58 12.906 | 2.33 5.854
00866> .17 4.878 | .92 65.076 | 1.67 11.320 | 2.42 5.536
00867> .25 5.387 | 1.00 220.223 | 1.75 10.095 | 2.50 5.253
00868> .33 6.027 | 1.08 85.162 | 1.83 9.119 | 2.58 4.999
00869> .42 6.858 | 1.17 45.078 | 1.92 8.324 | 2.67 4.771
00870> .50 7.983 | 1.25 30.164 | 2.00 7.664 | 2.75 4.564
00871> .58 9.594 | 1.33 22.579 | 2.08 7.106 | 2.83 4.376
00872> .67 12.097 | 1.42 18.039 | 2.17 6.629 | 2.92 4.204
00873> .75 16.515 | 1.50 15.035 | 2.25 6.216 | 3.00 4.046
00874>
00875>
00876> 001:0039-----
00877> *****
00878> *# *****
00879> *#
00880> *#
00881> *****
00882> *****
00883> | CALIB NASHYD | Area (ha)= 2.04 Curve Number (CN)=41.00
00884> | 01:C101 DT= 1.00 | Ia (mm)= 5.000 # of Linear Res.(N)= 3.00
00885> | U.H. Tp(hrs)= .200
00886>
00887> Unit Hyd Qpeak (cms) = .390
00888>
00889> PEAK FLOW (cms) = .050 (i)

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00890> TIME TO PEAK (hrs)= 1.267
00891> RUNOFF VOLUME (mm)= 7.285
00892> TOTAL RAINFALL (mm)= 60.373
00893> RUNOFF COEFFICIENT = .121
00894>
00895> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00896>
-----
00897>
00898> 001:0040-----
00899>
00900> | CALIB NASHYD | Area (ha)= 1.06 Curve Number (CN)=25.00
00901> | 02:EX-1 DT= 1.00 | Ia (mm)= 8.000 # of Linear Res.(N)= 3.00
00902> | U.H. Tp(hrs)= .500
00903>
00904> Unit Hyd Qpeak (cms) = .081
00905>
00906> PEAK FLOW (cms) = .006 (i)
00907> TIME TO PEAK (hrs)= 1.700
00908> RUNOFF VOLUME (mm)= 3.368
00909> TOTAL RAINFALL (mm)= 60.373
00910> RUNOFF COEFFICIENT = .056
00911>
00912> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00913>
-----
00914>
00915> 001:0041-----
00916>
00917> | ADD HYD (EXISTING ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
00918> | (ha) (cms) (hrs) (mm) (cms)
00919> | ID1 01:C101 2.04 .050 1.27 7.28 .000
00920> | ID2 02:EX-1 1.06 .006 1.70 3.37 .000
00921> =====
00922> SUM 03:EXISTING 3.10 .053 1.27 5.95 .000
00923>
00924> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00925>
-----
00926>
00927> 001:0042-----
00928> *****
00929> *#
00930> *# PROPOSED CONDITIONS
00931> *#
00932> *#
00933> *#
00934> | CALIB NASHYD | Area (ha)= 1.06 Curve Number (CN)=25.00
00935> | 01:EX-1 DT= 1.00 | Ia (mm)= 8.000 # of Linear Res.(N)= 3.00
00936> | U.H. Tp(hrs)= .500
00937>
00938> Unit Hyd Qpeak (cms) = .081
00939>
00940> PEAK FLOW (cms) = .006 (i)
00941> TIME TO PEAK (hrs)= 1.700
00942> RUNOFF VOLUME (mm)= 3.368
00943> TOTAL RAINFALL (mm)= 60.373
00944> RUNOFF COEFFICIENT = .056
00945>
00946> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00947>
-----
00948>
00949> 001:0043-----
00950>
00951> | COMPUTE VOLUME |
00952> | ID:02 (EX-1 ) | DISCHARGE TIME
00953> | (cms) (hrs)
00954> START CONTROLLING AT .000 .817
00955> INFLOW HYD. PEAKS AT .006 1.700
00956> STOP CONTROLLING AT .000 .000
00957>
00958> REQUIRED STORAGE VOLUME (ha.m.) = .0036
00959> TOTAL HYDROGRAPH VOLUME (ha.m.) = .0036
00960> % OF HYDROGRAPH TO STORE = 99.9988
00961>
00962> NOTE: Storage was computed to reduce the Inflow
00963>
-----
00964>
00965> 001:0044-----
00966>
00967> | CALIB STANDHYD | Area (ha)= .18
00968> | 02:C201 DT= 1.00 | Total Imp(%)= 38.00 Dir. Conn.(%)= 1.00
00969>
00970> IMPERVIOUS PERVIOUS (i)
00971> Surface Area (ha) = .07 .11
00972> Dep. Storage (mm) = 2.00 5.00
00973> Average Slope (%) = 2.00 2.00
00974> Length (m) = 8.00 25.00
00975> Mannings n = .013 .240
00976>
00977> Max.eff.Inten.(mm/hr)= 220.22 41.71
00978> over (min) = 1.00 8.00
00979> Storage Coeff (min) = .33 (ii) 7.70 (ii)
00980> Unit Hyd. Tpeak (min) = 1.00 8.00
00981> Unit Hyd. peak (cms) = 1.62 .15
00982>
00983> PEAK FLOW (cms) = .00 .01 *.TOTALS*
00984> TIME TO PEAK (hrs) = .98 1.12 1.117
00985> RUNOFF VOLUME (mm) = 58.37 10.71 11.183
00986> TOTAL RAINFALL (mm) = 60.37 60.37 60.373
00987> RUNOFF COEFFICIENT = .97 .18 .185
00988>
00989> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00990> CN* = 39.0 Ia = Dep. Storage (Above)
00991> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00992> THAN THE STORAGE COEFFICIENT.
00993> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00994>
-----
00995>
00996> 001:0045-----
00997>
00998> | COMPUTE VOLUME |
00999> | ID:02 (C201 ) | DISCHARGE TIME
10000> | (cms) (hrs)
10001> START CONTROLLING AT .000 .367
10002> INFLOW HYD. PEAKS AT .009 1.117
10003> STOP CONTROLLING AT .000 .000
10004>
10005> REQUIRED STORAGE VOLUME (ha.m.) = .0020
10006> TOTAL HYDROGRAPH VOLUME (ha.m.) = .0020
10007> % OF HYDROGRAPH TO STORE = 99.9997
10008>
10009> NOTE: Storage was computed to reduce the Inflow
10010>
-----
10011>
10012> 001:0046-----
10013>
10014> | CALIB STANDHYD | Area (ha)= .37
10015> | 03:C202 DT= 1.00 | Total Imp(%)= 55.00 Dir. Conn.(%)= 1.00
10016>

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01017> IMPERVIOUS PERVIOUS (i)
01018> Surface Area (ha)= .20 .17
01019> Dep. Storage (mm)= 2.00 5.00
01020> Average Slope (%)= 2.00 2.00
01021> Length (m)= 8.00 25.00
01022> Mannings n = .013 .240
01023>
01024> Max.eff.Inten.(mm/hr)= 220.22 86.39
01025> over (min)= 1.00 6.00
01026> Storage Coeff. (min)= .33 (ii) 5.94 (ii)
01027> Unit Hyd. Tpeak (min)= 1.00 6.00
01028> Unit Hyd. peak (cms)= 1.62 .19
01029>
01030> *TOTALS*
01031> PEAK FLOW (cms)= .00 .03 .028 (iii)
01032> TIME TO PEAK (hrs)= .98 1.08 1.083
01033> RUNOFF VOLUME (mm)= 58.37 14.14 14.585
01034> TOTAL RAINFALL (mm)= 60.37 60.37 60.373
01035> RUNOFF COEFFICIENT = .97 .23 .242
01036> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01037> CN* = 39.0 Ia = Dep. Storage (Above)
01038> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01039> THAN THE STORAGE COEFFICIENT.
01040> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01041>
01042> -----
01043> 001:0047-----
01044>
01045> | COMPUTE VOLUME | DISCHARGE TIME
01046> | ID:03 (C202 ) | (cms) (hrs)
01047>
01048> START CONTROLLING AT .000 .367
01049> INFLOW HYD. PEAKS AT .028 1.083
01050> STOP CONTROLLING AT .000 .000
01051>
01052> REQUIRED STORAGE VOLUME (ha.m.)= .0054
01053> TOTAL HYDROGRAPH VOLUME (ha.m.)= .0054
01054> % OF HYDROGRAPH TO STORE = 99.9996
01055>
01056> NOTE: Storage was computed to reduce the Inflow
01057>
01058> -----
01059> 001:0048-----
01060>
01061> | CALIB STANDHYD | Area (ha)= 1.48
01062> | 04:C203 DT= 1.00 | Total Imp(%)= 66.00 Dir. Conn.(%)= 52.00
01063>
01064> IMPERVIOUS PERVIOUS (i)
01065> Surface Area (ha)= .98 .50
01066> Dep. Storage (mm)= 2.00 5.00
01067> Average Slope (%)= 6.00 2.00
01068> Length (m)= 8.00 25.00
01069> Mannings n = .013 .240
01070>
01071> Max.eff.Inten.(mm/hr)= 220.22 31.62
01072> over (min)= 1.00 9.00
01073> Storage Coeff. (min)= .48 (ii) 8.71 (ii)
01074> Unit Hyd. Tpeak (min)= 1.00 9.00
01075> Unit Hyd. peak (cms)= 1.49 .13
01076>
01077> *TOTALS*
01078> PEAK FLOW (cms)= .47 .03 .479 (iii)
01079> TIME TO PEAK (hrs)= 1.00 1.15 1.000
01080> RUNOFF VOLUME (mm)= 58.37 9.55 34.937
01081> TOTAL RAINFALL (mm)= 60.37 60.37 60.373
01082> RUNOFF COEFFICIENT = .97 .16 .579
01083> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01084> CN* = 39.0 Ia = Dep. Storage (Above)
01085> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01086> THAN THE STORAGE COEFFICIENT.
01087> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01088>
01089> -----
01090> 001:0049-----
01091>
01092> | COMPUTE VOLUME | DISCHARGE TIME
01093> | ID:04 (C203 ) | (cms) (hrs)
01094>
01095> START CONTROLLING AT .000 .367
01096> INFLOW HYD. PEAKS AT .479 1.000
01097> STOP CONTROLLING AT .000 .000
01098>
01099> REQUIRED STORAGE VOLUME (ha.m.)= .0517
01100> TOTAL HYDROGRAPH VOLUME (ha.m.)= .0517
01101> % OF HYDROGRAPH TO STORE = 99.9996
01102>
01103> NOTE: Storage was computed to reduce the Inflow
01104>
01105> -----
01106> 001:0050-----
01107> *****
01108> *#
01109> *# 50-year
01110> *#
01111> *#
01112> *****
01113>
01114> | CHICAGO STORM | IDF curve parameters: A=1499.060
01115> | Ptotal= 66.11 mm | B= 4.188
01116> | | C= .809
01117> used in: INTENSITY = A / (t + B)^C
01118>
01119> Duration of storm = 3.00 hrs
01120> Storm time step = 5.00 min
01121> Time to peak ratio = .33
01122>
01123> TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
01124> hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
01125> .08 5.048 | .83 27.983 | 1.58 14.045 | 2.33 6.561
01126> .17 5.501 | .92 68.751 | 1.67 12.381 | 2.42 6.216
01127> .25 6.054 | 1.00 249.214 | 1.75 11.088 | 2.50 5.909
01128> .33 6.747 | 1.08 90.168 | 1.83 10.056 | 2.58 5.633
01129> .42 7.643 | 1.17 47.427 | 1.92 9.210 | 2.67 5.384
01130> .50 8.846 | 1.25 31.940 | 2.00 8.506 | 2.75 5.158
01131> .58 10.558 | 1.33 24.096 | 2.08 7.909 | 2.83 4.952
01132> .67 13.195 | 1.42 19.393 | 2.17 7.396 | 2.92 4.763
01133> .75 17.808 | 1.50 16.269 | 2.25 6.951 | 3.00 4.590
01134>
01135> -----
01136> 001:0051-----
01137> *****
01138> *#
01139> *# EXISTING CONDITIONS
01140> *#
01141> *****
01142>
01143> | CALIB NASHYD | Area (ha)= 2.04 Curve Number (CN)=41.00

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01144> | 01:C101 DT= 1.00 | Ia (mm)= 5.000 # of Linear Res.(N)= 3.00
01145> | | U.H. Tp(hrs)= .200
01146>
01147> Unit Hyd Qpeak (cms)= .390
01148>
01149> PEAK FLOW (cms)= .060 (i)
01150> TIME TO PEAK (hrs)= 1.250
01151> RUNOFF VOLUME (mm)= 8.754
01152> TOTAL RAINFALL (mm)= 66.112
01153> RUNOFF COEFFICIENT = .132
01154>
01155> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01156>
01157> -----
01158> 001:0052-----
01159>
01160> | CALIB NASHYD | Area (ha)= 1.06 Curve Number (CN)=25.00
01161> | 02:EX-1 DT= 1.00 | Ia (mm)= 8.000 # of Linear Res.(N)= 3.00
01162> | | U.H. Tp(hrs)= .500
01163>
01164> Unit Hyd Qpeak (cms)= .081
01165>
01166> PEAK FLOW (cms)= .008 (i)
01167> TIME TO PEAK (hrs)= 1.700
01168> RUNOFF VOLUME (mm)= 4.117
01169> TOTAL RAINFALL (mm)= 66.112
01170> RUNOFF COEFFICIENT = .062
01171>
01172> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01173>
01174> -----
01175> 001:0053-----
01176>
01177> | ADD HYD (EXISTING ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
01178> | | (ha) (cms) (hrs) (mm) (cms)
01179> ID1 01:C101 2.04 .060 1.25 8.75 .000
01180> ID2 02:EX-1 1.06 .008 1.70 4.12 .000
01181> =====
01182> SUM 03:EXISTING 3.10 .064 1.27 7.17 .000
01183>
01184> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01185>
01186> -----
01187> 001:0054-----
01188> *****
01189> *#
01190> *# PROPOSED CONDITIONS
01191> *#
01192> *#
01193>
01194> | CALIB NASHYD | Area (ha)= 1.06 Curve Number (CN)=25.00
01195> | 01:EX-1 DT= 1.00 | Ia (mm)= 8.000 # of Linear Res.(N)= 3.00
01196> | | U.H. Tp(hrs)= .500
01197>
01198> Unit Hyd Qpeak (cms)= .081
01199>
01200> PEAK FLOW (cms)= .008 (i)
01201> TIME TO PEAK (hrs)= 1.700
01202> RUNOFF VOLUME (mm)= 4.117
01203> TOTAL RAINFALL (mm)= 66.112
01204> RUNOFF COEFFICIENT = .062
01205>
01206> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01207>
01208> -----
01209> 001:0055-----
01210>
01211> | COMPUTE VOLUME | DISCHARGE TIME
01212> | ID:02 (EX-1 ) | (cms) (hrs)
01213>
01214> START CONTROLLING AT .000 .783
01215> INFLOW HYD. PEAKS AT .008 1.700
01216> STOP CONTROLLING AT .000 .000
01217>
01218> REQUIRED STORAGE VOLUME (ha.m.)= .0044
01219> TOTAL HYDROGRAPH VOLUME (ha.m.)= .0044
01220> % OF HYDROGRAPH TO STORE = 99.9989
01221>
01222> NOTE: Storage was computed to reduce the Inflow
01223>
01224> -----
01225> 001:0056-----
01226>
01227> | CALIB STANDHYD | Area (ha)= .18
01228> | 02:C201 DT= 1.00 | Total Imp(%)= 38.00 Dir. Conn.(%)= 1.00
01229>
01230> IMPERVIOUS PERVIOUS (i)
01231> Surface Area (ha)= .07 .11
01232> Dep. Storage (mm)= 2.00 5.00
01233> Average Slope (%)= 2.00 2.00
01234> Length (m)= 8.00 25.00
01235> Mannings n = .013 .240
01236>
01237> Max.eff.Inten.(mm/hr)= 249.21 53.42
01238> over (min)= 1.00 7.00
01239> Storage Coeff. (min)= .32 (ii) 6.99 (ii)
01240> Unit Hyd. Tpeak (min)= 1.00 7.00
01241> Unit Hyd. peak (cms)= 1.63 .16
01242>
01243> *TOTALS*
01244> PEAK FLOW (cms)= .00 .01 .011 (iii)
01245> TIME TO PEAK (hrs)= .98 1.10 1.100
01246> RUNOFF VOLUME (mm)= 64.11 12.72 13.236
01247> TOTAL RAINFALL (mm)= 66.11 66.11 66.112
01248> RUNOFF COEFFICIENT = .97 .19 .200
01249>
01250> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01251> CN* = 39.0 Ia = Dep. Storage (Above)
01252> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01253> THAN THE STORAGE COEFFICIENT.
01254> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01255>
01256> -----
01257> 001:0057-----
01258>
01259> | COMPUTE VOLUME | DISCHARGE TIME
01260> | ID:02 (C201 ) | (cms) (hrs)
01261>
01262> START CONTROLLING AT .000 .333
01263> INFLOW HYD. PEAKS AT .011 1.100
01264> STOP CONTROLLING AT .000 .000
01265>
01266> REQUIRED STORAGE VOLUME (ha.m.)= .0024
01267> TOTAL HYDROGRAPH VOLUME (ha.m.)= .0024
01268> % OF HYDROGRAPH TO STORE = 99.9997
01269>
01270> NOTE: Storage was computed to reduce the Inflow

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01271> -----
01272> 001:0058-----
01273> | CALIB STANDHYD | Area (ha)= .37
01274> | 03:C202 DT= 1.00 | Total Imp(%)= 55.00 Dir. Conn.(%)= 1.00
01275> |-----
01276> IMPERVIOUS PERVIOUS (i)
01277> Surface Area (ha)= .20 .17
01278> Dep. Storage (mm)= 2.00 5.00
01279> Average Slope (%)= 2.00 2.00
01280> Length (m)= 8.00 25.00
01281> Mannings n = .013 .240
01282> -----
01283> Max.eff.Inten.(mm/hr)= 249.21 115.57
01284> over (min) 1.00 5.00
01285> Storage Coeff. (min)= .32 (ii) 5.22 (ii)
01286> Unit Hyd. Tpeak (min)= 1.00 5.00
01287> Unit Hyd. peak (cms)= 1.63 .22
01288> -----
01289> *TOTALS*
01290> PEAK FLOW (cms)= .00 .03 .035 (iii)
01291> TIME TO PEAK (hrs)= .98 1.07 1.067
01292> RUNOFF VOLUME (mm)= 64.11 16.67 17.148
01293> TOTAL RAINFALL (mm)= 66.11 66.11 66.112
01294> RUNOFF COEFFICIENT = .97 .25 .259
01295> -----
01296> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01297> CN* = 39.0 Ia = Dep. Storage (Above)
01298> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01299> THAN THE STORAGE COEFFICIENT.
01300> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01301> -----
01302> 001:0059-----
01303> | COMPUTE VOLUME |
01304> | ID:03 (C202 ) | DISCHARGE TIME
01305> |-----
01306> START CONTROLLING AT .000 .333
01307> INFLOW HYD. PEAKS AT .035 1.067
01308> STOP CONTROLLING AT .000 .000
01309> -----
01310> REQUIRED STORAGE VOLUME (ha.m.)= .0063
01311> TOTAL HYDROGRAPH VOLUME (ha.m.)= .0063
01312> % OF HYDROGRAPH TO STORE = 99.9997
01313> -----
01314> NOTE: Storage was computed to reduce the Inflow
01315> -----
01316> 001:0060-----
01317> | CALIB STANDHYD | Area (ha)= 1.48
01318> | 04:C203 DT= 1.00 | Total Imp(%)= 66.00 Dir. Conn.(%)= 52.00
01319> |-----
01320> IMPERVIOUS PERVIOUS (i)
01321> Surface Area (ha)= .98 .50
01322> Dep. Storage (mm)= 2.00 5.00
01323> Average Slope (%)= .60 2.00
01324> Length (m)= 8.00 25.00
01325> Mannings n = .013 .240
01326> -----
01327> Max.eff.Inten.(mm/hr)= 249.21 39.93
01328> over (min) 1.00 8.00
01329> Storage Coeff. (min)= .45 (ii) 7.95 (ii)
01330> Unit Hyd. Tpeak (min)= 1.00 8.00
01331> Unit Hyd. peak (cms)= 1.51 .14
01332> -----
01333> *TOTALS*
01334> PEAK FLOW (cms)= .53 .04 .545 (iii)
01335> TIME TO PEAK (hrs)= 1.00 1.12 1.000
01336> RUNOFF VOLUME (mm)= 64.11 11.38 38.802
01337> TOTAL RAINFALL (mm)= 66.11 66.11 66.112
01338> RUNOFF COEFFICIENT = .97 .17 .587
01339> -----
01340> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01341> CN* = 39.0 Ia = Dep. Storage (Above)
01342> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01343> THAN THE STORAGE COEFFICIENT.
01344> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01345> -----
01346> 001:0061-----
01347> | COMPUTE VOLUME |
01348> | ID:04 (C203 ) | DISCHARGE TIME
01349> |-----
01350> START CONTROLLING AT .000 .333
01351> INFLOW HYD. PEAKS AT .545 1.000
01352> STOP CONTROLLING AT .000 .000
01353> -----
01354> REQUIRED STORAGE VOLUME (ha.m.)= .0574
01355> TOTAL HYDROGRAPH VOLUME (ha.m.)= .0574
01356> % OF HYDROGRAPH TO STORE = 99.9996
01357> -----
01358> NOTE: Storage was computed to reduce the Inflow
01359> -----
01360> 001:0062-----
01361> *#-----
01362> *#-----
01363> *#-----
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01523> *#-----
01524> *#-----

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01525> REQUIRED STORAGE VOLUME (ha.m.)= .0028
01526> TOTAL HYDROGRAPH VOLUME (ha.m.)= .0028
01527> % OF HYDROGRAPH TO STORE = 99.9997
01528>
01529> NOTE: Storage was computed to reduce the Inflow
01530>
01531>-----
01532> 001:0070-----
01533>-----
01534> | CALIB STANDHYD | Area (ha)= .37
01535> | 03:C202 DT= 1.00 | Total Imp(%)= 55.00 Dir. Conn.(%)= 1.00
01536>-----
01537> IMPERVIOUS PERVIOUS (i)
01538> Surface Area (ha)= .20 .17
01539> Dep. Storage (mm)= 2.00 5.00
01540> Average Slope (%)= 2.00 2.00
01541> Length (m)= 8.00 25.00
01542> Mannings n = .013 .240
01543>
01544> Max.eff.Inten.(mm/hr)= 279.47 139.99
01545> over (min) 1.00 5.00
01546> Storage Coeff. (min)= .30 (ii) 4.84 (ii)
01547> Unit Hyd. Tpeak (min)= 1.00 5.00
01548> Unit Hyd. peak (cms)= 1.64 .23
01549>
01550> PEAK FLOW (cms)= .00 .04
01551> TIME TO PEAK (hrs)= .98 1.07
01552> RUNOFF VOLUME (mm)= 69.79 19.32
01553> TOTAL RAINFALL (mm)= 71.79 71.79
01554> RUNOFF COEFFICIENT = .97 .27
01555>
01556> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01557> CN* = 39.0 Ia = Dep. Storage (Above)
01558> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01559> THAN THE STORAGE COEFFICIENT.
01560> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01561>
01562>-----
01563> 001:0071-----
01564>-----
01565> | COMPUTE VOLUME | DISCHARGE TIME
01566> | ID:03 (C202) | (cms) (hrs)
01567> START CONTROLLING AT .000 3.00
01568> INFLOW HYD. PEAKS AT .043 1.067
01569> STOP CONTROLLING AT .000 .000
01570>
01571> REQUIRED STORAGE VOLUME (ha.m.)= .0073
01572> TOTAL HYDROGRAPH VOLUME (ha.m.)= .0073
01573> % OF HYDROGRAPH TO STORE = 99.9996
01574>
01575> NOTE: Storage was computed to reduce the Inflow
01576>
01577>-----
01578> 001:0072-----
01579>-----
01580> | CALIB STANDHYD | Area (ha)= 1.48
01581> | 04:C203 DT= 1.00 | Total Imp(%)= 66.00 Dir. Conn.(%)= 52.00
01582>-----
01583> IMPERVIOUS PERVIOUS (i)
01584> Surface Area (ha)= .98 .50
01585> Dep. Storage (mm)= 2.00 5.00
01586> Average Slope (%)= .60 2.00
01587> Length (m)= 8.00 25.00
01588> Mannings n = .013 .240
01589>
01590> Max.eff.Inten.(mm/hr)= 279.47 50.39
01591> over (min) 1.00 7.00
01592> Storage Coeff. (min)= .43 (ii) 7.27 (ii)
01593> Unit Hyd. Tpeak (min)= 1.00 7.00
01594> Unit Hyd. peak (cms)= 1.53 .16
01595>
01596> PEAK FLOW (cms)= .60 .04
01597> TIME TO PEAK (hrs)= 1.00 1.10
01598> RUNOFF VOLUME (mm)= 69.79 13.32
01599> TOTAL RAINFALL (mm)= 71.79 71.79
01600> RUNOFF COEFFICIENT = .97 .19
01601>
01602> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01603> CN* = 39.0 Ia = Dep. Storage (Above)
01604> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01605> THAN THE STORAGE COEFFICIENT.
01606> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01607>
01608>-----
01609> 001:0073-----
01610>-----
01611> | COMPUTE VOLUME | DISCHARGE TIME
01612> | ID:04 (C203) | (cms) (hrs)
01613> START CONTROLLING AT .000 3.00
01614> INFLOW HYD. PEAKS AT .616 1.000
01615> STOP CONTROLLING AT .000 .000
01616>
01617> REQUIRED STORAGE VOLUME (ha.m.)= .0632
01618> TOTAL HYDROGRAPH VOLUME (ha.m.)= .0632
01619> % OF HYDROGRAPH TO STORE = 99.9996
01620>
01621> NOTE: Storage was computed to reduce the Inflow
01622>
01623>-----
01624> 001:0074-----
01625>-----
01626> *#-----
01627> *#-----
01628> *#-----
01629> *#-----
01630> *#-----
01631> *#-----
01632> *#-----
01633> *#-----
01634> | CHICAGO STORM | IDF curve parameters: A=3048.220
01635> | Ptotal= 86.60 mm | B= 10.030
01636> | C= .888
01637> used in: INTENSITY = A / (t + B)^C
01638>
01639> Duration of storm = 3.00 hrs
01640> Storm time step = 5.00 min
01641> Time to peak ratio = .33
01642>
01643> TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
01644> hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
01645> .08 5.146 | .83 43.789 | 1.58 19.207 | 2.33 7.218
01646> .17 5.748 | .92 106.492 | 1.67 16.378 | 2.42 6.730
01647> .25 6.505 | 1.00 274.730 | 1.75 14.228 | 2.50 6.302
01648> .33 7.486 | 1.08 136.493 | 1.83 12.548 | 2.58 5.925
01649> .42 8.799 | 1.17 76.628 | 1.92 11.204 | 2.67 5.589
01650> .50 10.637 | 1.25 50.754 | 2.00 10.107 | 2.75 5.289
01651> .58 13.366 | 1.33 36.943 | 2.08 9.197 | 2.83 5.020

01652> .67 17.763 | 1.42 28.579 | 2.17 8.431 | 2.92 4.776
01653> .75 25.782 | 1.50 23.067 | 2.25 7.779 | 3.00 4.554
01654>
01655>-----
01656> 001:0075-----
01657> *#-----
01658> *#-----
01659> *#-----
01660> *#-----
01661> *#-----
01662> *#-----
01663> | CALIB NASHYD | Area (ha)= 2.04 Curve Number (CN)=41.00
01664> | 01:C101 DT= 1.00 | Ia (mm)= 5.000 # of Linear Res.(N)= 3.00
01665> | U.H. Tp(hrs)= .200
01666>
01667> Unit Hyd Qpeak (cms)= .390
01668>
01669> PEAK FLOW (cms)= .105 (i)
01670> TIME TO PEAK (hrs)= 1.267
01671> RUNOFF VOLUME (mm)= 14.892
01672> TOTAL RAINFALL (mm)= 86.599
01673> RUNOFF COEFFICIENT = .172
01674>
01675> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01676>
01677>-----
01678> 001:0076-----
01679>-----
01680> | CALIB NASHYD | Area (ha)= 1.06 Curve Number (CN)=25.00
01681> | 02:EX-1 DT= 1.00 | Ia (mm)= 8.000 # of Linear Res.(N)= 3.00
01682> | U.H. Tp(hrs)= .500
01683>
01684> Unit Hyd Qpeak (cms)= .081
01685>
01686> PEAK FLOW (cms)= .015 (i)
01687> TIME TO PEAK (hrs)= 1.700
01688> RUNOFF VOLUME (mm)= 7.349
01689> TOTAL RAINFALL (mm)= 86.599
01690> RUNOFF COEFFICIENT = .085
01691>
01692> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01693>
01694>-----
01695> 001:0077-----
01696>-----
01697> | ADD HYD (EXISTING) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
01698> | ID1 01:C101 (ha) (cms) (hrs) (mm) (cms)
01699> | ID2 02:EX-1 2.04 .105 1.27 14.89 .000
01700> | ID3 03:EXISTING 1.06 .015 1.70 7.35 .000
01701>-----
01702> SUM 03:EXISTING 3.10 .114 1.28 12.31 .000
01703>
01704> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01705>
01706>-----
01707> 001:0078-----
01708> *#-----
01709> *#-----
01710> *#-----
01711> *#-----
01712> *#-----
01713> *#-----
01714> | CALIB NASHYD | Area (ha)= 1.06 Curve Number (CN)=25.00
01715> | 01:EX-1 DT= 1.00 | Ia (mm)= 8.000 # of Linear Res.(N)= 3.00
01716> | U.H. Tp(hrs)= .500
01717>
01718> Unit Hyd Qpeak (cms)= .081
01719>
01720> PEAK FLOW (cms)= .015 (i)
01721> TIME TO PEAK (hrs)= 1.700
01722> RUNOFF VOLUME (mm)= 7.349
01723> TOTAL RAINFALL (mm)= 86.599
01724> RUNOFF COEFFICIENT = .085
01725>
01726> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01727>
01728>-----
01729> 001:0079-----
01730>-----
01731> | COMPUTE VOLUME | DISCHARGE TIME
01732> | ID:02 (EX-1) | (cms) (hrs)
01733> START CONTROLLING AT .000 .717
01734> INFLOW HYD. PEAKS AT .015 1.700
01735> STOP CONTROLLING AT .000 .000
01736>
01737> REQUIRED STORAGE VOLUME (ha.m.)= .0078
01738> TOTAL HYDROGRAPH VOLUME (ha.m.)= .0078
01739> % OF HYDROGRAPH TO STORE = 99.9993
01740>
01741> NOTE: Storage was computed to reduce the Inflow
01742>
01743>-----
01744> 001:0080-----
01745>-----
01746> | CALIB STANDHYD | Area (ha)= .18
01747> | 02:C201 DT= 1.00 | Total Imp(%)= 38.00 Dir. Conn.(%)= 1.00
01748>-----
01749> IMPERVIOUS PERVIOUS (i)
01750> Surface Area (ha)= .07 .11
01751> Dep. Storage (mm)= 2.00 5.00
01752> Average Slope (%)= 2.00 2.00
01753> Length (m)= 8.00 25.00
01754> Mannings n = .013 .240
01755>
01756> Max.eff.Inten.(mm/hr)= 274.73 82.13
01757> over (min) 1.00 6.00
01758> Storage Coeff. (min)= .30 (ii) 5.92 (ii)
01759> Unit Hyd. Tpeak (min)= 1.00 6.00
01760> Unit Hyd. peak (cms)= 1.64 .19
01761>
01762> PEAK FLOW (cms)= .00 .02
01763> TIME TO PEAK (hrs)= .98 1.10
01764> RUNOFF VOLUME (mm)= 84.60 20.97
01765> TOTAL RAINFALL (mm)= 86.60 86.60
01766> RUNOFF COEFFICIENT = .98 .24
01767>
01768> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01769> CN* = 39.0 Ia = Dep. Storage (Above)
01770> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01771> THAN THE STORAGE COEFFICIENT.
01772> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01773>
01774>-----
01775> 001:0081-----
01776>-----
01777> | COMPUTE VOLUME |

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01779> | ID:02 (C201 ) | DISCHARGE TIME
01780> ----- (cms) (hrs)
01781> START CONTROLLING AT .000 .317
01782> INFLOW HYD. PEAKS AT .019 1.083
01783> STOP CONTROLLING AT .000 .000
01784>
01785> REQUIRED STORAGE VOLUME (ha.m.)= .0039
01786> TOTAL HYDROGRAPH VOLUME (ha.m.)= .0039
01787> % OF HYDROGRAPH TO STORE = 99.9997
01788>
01789> NOTE: Storage was computed to reduce the Inflow
01790>
-----
01791>
01792> 001:0082-----
01793>
01794> | CALIB STANDHYD | Area (ha)= .37
01795> | 03:C202 DT= 1.00 | Total Imp(%)= 55.00 Dir. Conn.(%)= 1.00
01796> -----
01797> IMPERVIOUS PERVIOUS (i)
01798> Surface Area (ha)= .20 .17
01799> Dep. Storage (mm)= 2.00 5.00
01800> Average Slope (%)= 2.00 2.00
01801> Length (m)= 8.00 25.00
01802> Mannings n = .013 .240
01803>
01804> Max.eff.Inten.(mm/hr)= 274.73 159.19
01805> over (min) 1.00 5.00
01806> Storage Coeff. (min)= .30 (ii) 4.62 (ii)
01807> Unit Hyd. Tpeak (min)= 1.00 5.00
01808> Unit Hyd. peak (cms)= 1.64 .24
01809>
01810> PEAK FLOW (cms)= .00 .05 *TOTALS*
01811> TIME TO PEAK (hrs)= .98 1.07 .055 (iii)
01812> RUNOFF VOLUME (mm)= 84.60 26.84 27.421
01813> TOTAL RAINFALL (mm)= 86.60 86.60 86.599
01814> RUNOFF COEFFICIENT = .98 .31 .317
01815>
01816> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01817> CN* = 39.0 Ia = Dep. Storage (Above)
01818> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01819> THAN THE STORAGE COEFFICIENT.
01820> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01821>
-----
01822>
01823> 001:0083-----
01824>
01825> | COMPUTE VOLUME |
01826> | ID:03 (C202 ) | DISCHARGE TIME
01827> ----- (cms) (hrs)
01828> START CONTROLLING AT .000 .317
01829> INFLOW HYD. PEAKS AT .055 1.067
01830> STOP CONTROLLING AT .000 .000
01831>
01832> REQUIRED STORAGE VOLUME (ha.m.)= .0101
01833> TOTAL HYDROGRAPH VOLUME (ha.m.)= .0101
01834> % OF HYDROGRAPH TO STORE = 99.9997
01835>
01836> NOTE: Storage was computed to reduce the Inflow
01837>
-----
01838>
01839> 001:0084-----
01840>
01841> | CALIB STANDHYD | Area (ha)= 1.48
01842> | 04:C203 DT= 1.00 | Total Imp(%)= 66.00 Dir. Conn.(%)= 52.00
01843> -----
01844> IMPERVIOUS PERVIOUS (i)
01845> Surface Area (ha)= .98 .50
01846> Dep. Storage (mm)= 2.00 5.00
01847> Average Slope (%)= .60 2.00
01848> Length (m)= 8.00 25.00
01849> Mannings n = .013 .240
01850>
01851> Max.eff.Inten.(mm/hr)= 274.73 62.54
01852> over (min) 1.00 7.00
01853> Storage Coeff. (min)= .44 (ii) 6.70 (ii)
01854> Unit Hyd. Tpeak (min)= 1.00 7.00
01855> Unit Hyd. peak (cms)= 1.53 .17
01856>
01857> PEAK FLOW (cms)= .59 .06 *TOTALS*
01858> TIME TO PEAK (hrs)= 1.00 1.13 1.000
01859> RUNOFF VOLUME (mm)= 84.60 18.93 53.077
01860> TOTAL RAINFALL (mm)= 86.60 86.60 86.599
01861> RUNOFF COEFFICIENT = .98 .22 .613
01862>
01863> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01864> CN* = 39.0 Ia = Dep. Storage (Above)
01865> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01866> THAN THE STORAGE COEFFICIENT.
01867> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01868>
-----
01869>
01870> 001:0085-----
01871>
01872> | COMPUTE VOLUME |
01873> | ID:04 (C203 ) | DISCHARGE TIME
01874> ----- (cms) (hrs)
01875> START CONTROLLING AT .000 .317
01876> INFLOW HYD. PEAKS AT .614 1.000
01877> STOP CONTROLLING AT .000 .000
01878>
01879> REQUIRED STORAGE VOLUME (ha.m.)= .0786
01880> TOTAL HYDROGRAPH VOLUME (ha.m.)= .0786
01881> % OF HYDROGRAPH TO STORE = 99.9996
01882>
01883> NOTE: Storage was computed to reduce the Inflow
01884>
-----
01885>
01886> 001:0086-----
01887> FINISH
01888> -----
01889> *****
01890> WARNINGS / ERRORS / NOTES
01891> -----
01892> Simulation ended on 2022-11-08 at 14:11:41
01893> =====
01894>
01895>

```

APPENDIX C
WATER QUALITY PRODUCT SELL SHEETS

FlexStorm Catch-It™

Inlet Filters

FlexStorm Catch-It inlet filters are the temporary and reusable solution for storm sewer inlet protection. They comply with ASTM D8057 and are the preferred choice for storm water runoff control. FlexStorm Catch-It inlet filters are configured to fit any drainage structure, are equipped with a high-efficiency filter bag and allow builders to keep their job sites SWPPP compliant during construction.

Applications

- Residential developments
- Commercial developments
- Roadway construction

Features

- Configured to fit any storm drainage structure
- Geotextile bag is easily replaced
- Bypass feature allows streets to drain if bag is full
- Installs quickly, easy maintenance

Benefits

- Prevents hazardous road conditions by eliminating ponding at curb inlets
- Prevents pollution of rivers, lakes and ponds
- Reduces job site flooding
- Significantly reduces clean-up costs



FlexStorm Catch-It Inlet Filters Specification

Material and Performance

The filter is comprised of a corrosion resistant steel frame and a replaceable geotextile filter bag attached to the frame with a stainless steel locking band. The filter bag hangs suspended below the grate that shall allow full water flow into the drainage structure if the bag is completely filled with sediment. The standard woven "FX" filter bags are rated for 200 gpm/sqft with a removal efficiency of 82% when filtering a USDA Sandy Loam sediment load. The filters are certified to meet ASTM D8057.

Installation

1. Remove the grate from the inlet.
2. Clean debris from the ledges of the inlet.
3. Place the inlet filter onto the load bearing ledges of the structure.
4. Replace the grate and confirm it is not elevated more than 1/8" (3 mm).

Frequency of Inspections

Inspection should occur every three months and following rain events greater than 1/2" (13 mm). Sites with greater runoff conditions may need to be inspected more frequently.

Maintenance Guidelines

1. Empty the filter bag manually or by industrial vacuum taking care not to damage the geotextile bag when more than half filled or during scheduled inspection period.
2. Remove compacted silt from sediment bag and flush with medium spray.
3. Inspect and replace bag if torn or punctured.

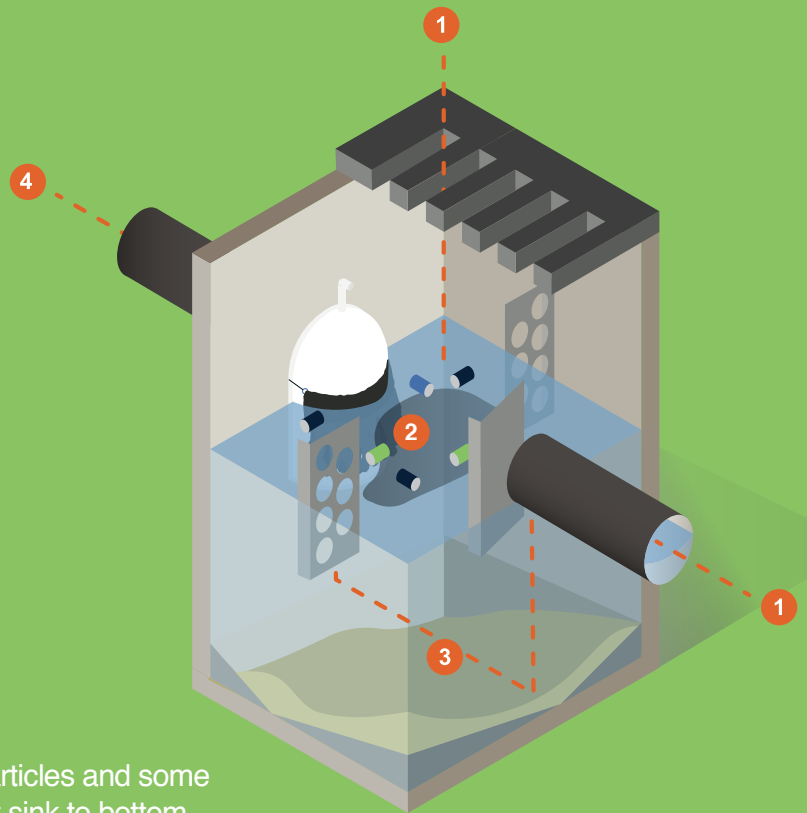
Filter Bag Replacement

1. Remove the bag by loosening or cutting off clamping band.
2. Take the new, correctly sized sediment bag and secure hose clamping band to the frame channel as previously removed.
3. Ensure bag is secure and there is no slack around perimeter.



The Quality Stormwater Management System

Helping you do more water quality improvement with less budget.



- 1 Stormwater and trash enter through grate or pipe.
- 2 Oil and floatable debris on surface cannot exit pipe.
- 3 Gross particles and some sediment sink to bottom.
- 4 Cleaner water exits from under SNOUT®.

Make the most of your stormwater dollars with the SNOUT® system.

We have stormwater quality experts on staff to help you with our wide range of products, including the SNOUT®, Bio-Skirt®, Stainless Steel TrashScreen™, and our new Turbo Plate® to reduce turbulence and increase sediment capture.

Whether it is for highway or municipal drainage, governmental, educational, or residential facilities, we have the experience for your stormwater quality improvement needs.



Products for a better environment.



**Best
Management
Products**

The Stormwater Quality Experts

More than 80,000 SNOUTs® installed. Made in the USA since 1999.

For more information on how our systems can solve any stormwater situation, contact us at [800.504.8008](tel:800.504.8008) or visit us at bmpinc.com



Design and Maintenance Considerations for SNOUT[®] Stormwater Quality Systems

Background:

The SNOUT system from Best Management Products, Inc. (BMP, Inc.) is based on a vented hood that can reduce floatable trash and debris, free oils, and other solids from stormwater discharges. In its most basic application, a SNOUT hood is installed over the outlet pipe of a catch basin or other stormwater quality structure with a deep sump (see Installation Drawing). The SNOUT forms a baffle that traps floatable debris and free oils on the surface, while permitting heavier solids to sink to the bottom of the sump. The clarified intermediate layer is forced out of the structure through the open bottom of the SNOUT by displacement from incoming flow. The resultant discharge contains considerably less unsightly trash and other gross pollutants, and can also offer reductions of free-oils and finer solids.

As with any structural stormwater quality design, maintenance considerations will have a dramatic impact on SNOUT system performance over the life of the facility. The most important factor to consider when designing structures with a SNOUT is the depth of the sump. Sump is defined as the depth from the invert of the outlet pipe to the bottom of the structure. *Simply put, the deeper the sump, the more effective the unit will be both in terms of pollutant removals and reducing frequency of maintenance.* More volume in a structure means more quiescence, thus allowing the pollutants a better chance to separate out. Secondly, more volume means fewer cycles between maintenance, because the structure has a greater capacity. Of equal importance to good performance is putting SNOUTs in multiple structures. The closer one captures pollution to where it enters the infrastructure (e.g. at the inlet), the less mixing of runoff there is, and the easier it will be to separate out pollutants. Putting SNOUTs and deep sumps in all inlets that can be easily maintained develops a powerful structural treatment train with a great deal of effective storage volume, where even finer particles may have chance to settle out.

Design Notes:

- The SNOUT size is ALWAYS greater than the nominal pipe size. The SNOUT should cover the pipe OD and optimally the grouted area around the pipe (e.g. for a 12" pipe, an 18" SNOUT is the correct choice).
- As a rule of thumb, BMP, Inc. recommends *minimum* sump depths based on outlet pipe inside diameters of 2.5 to 3 times the outlet pipe size.
- For best performance, the inlet pipe and outlet pipe should have inverts close to the same elevation (a six inch or less deviation is optimal).
- Special note for smaller pipes: A minimum sump depth of 36 inches for all

pipe sizes 12 inches ID or less, and 48 inches for pipe 15-18 inches ID is required if collection of finer solids is desired.

- The plan dimension of the structure should be up to 6 to 7 times the flow area of the outlet pipe. Increasing area beyond that has a minimal impact on performance. However, the structure wall where the SNOUT is mounted must accommodate the size of the SNOUT (either the correct diameter or enough width).
- To optimize pollutant removals establish a “treatment train” with SNOUTs placed in as many inlets where it is feasible to do so (this protocol applies to most commercial, institutional or municipal applications and any application with direct discharge to surface waters).
- At a minimum, SNOUTs should be used in every third structure for less critical applications (less critical areas might include flow over grassy surfaces, very low traffic areas in private, non-commercial or non-institutional settings, single family residential sites).
- Use Bio-Skirts® for increased hydrocarbon reduction. Bio-Skirts are highly recommended for fueling or vehicle service stations, convenience stores, restaurants, loading docks, marinas, beaches, schools or high traffic applications. Each Bio-Skirt can retain about one gallon of oils.
- Use the Stainless TrashScreen for “Full Trash Capture” requirements.
- Use BMP Turbo Plates™ for increased sediment capture.
- The “R” series SNOUTs (12R, 18R, 24R, 30R, 30R/96, 42RTB/60, 52RTB/72, 52RTB/84 and 72RTB/96) are available for round manhole type structures of up to 96” ID; the “F” series SNOUTs (LP318F, 12F, 18F, 24F, 30F, 36F, 48F, 72F and 96F) are available for flat walled structures; the “NP” series SNOUTs (NP1218R, NP1524R, NP1830R, and NP2430R) are available for smaller diameter structures up to 30” ID.

Example Structure Sizing Calculation:

A SNOUT equipped structure with a 15 inch ID outlet pipe (1.23 sqft. flow area) will offer best performance with a minimum plan area of 7.4 sqft. and 48 inch sump. Thus, a readily available 48 inch diameter manhole-type structure, or a rectangular structure of 2 feet x 4 feet will offer sufficient size when combined with a sump depth of 48 inches or greater.

Maintenance Recommendations:

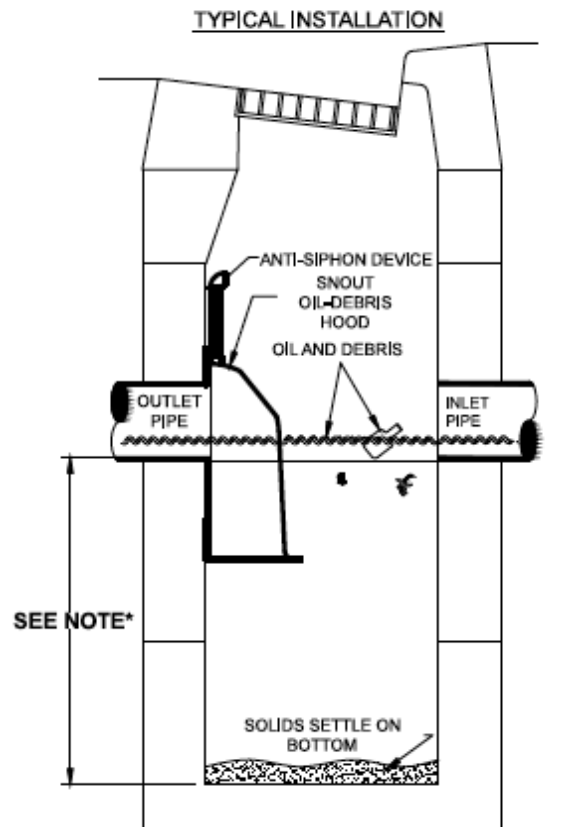
- Monthly monitoring for the first year of a new installation after the site has been stabilized is a recommended practice.
- Measurements should be taken after each rain event of .5 inches or more, or monthly, as determined by local weather conditions.
- Checking sediment depth and noting the surface pollutants in the structure will be helpful in planning maintenance.
- The pollutants collected in SNOUT equipped structures will consist of floatable debris and oils on the surface of the captured water, and grit and sediment on the bottom of the structure.
- It is best to schedule maintenance based on the solids collected in the sump.
- Optimally, the structure should be cleaned when the sump is half full (e.g. when 2 feet of material collects in a 4 foot sump, clean it out).
- Structures should also be cleaned if a spill or other incident causes a larger

than normal accumulation of pollutants in a structure.

- Maintenance is best done with a vacuum truck.
- If Bio-Skirts are being used in the structure to enhance hydrocarbon capture, they should be checked on a monthly basis for the first year, and serviced or replaced when more than 2/3 of the boom is submerged, indicating a nearly saturated state. Assuming a typical pollutant-loading environment exists, Bio-Skirts should be serviced* annually or replaced as necessary.
- In the case of an oil spill, the structure should be checked and serviced and Bio-Skirts (if present) replaced or serviced immediately.
- All collected wastes must be handled and disposed of according to local environmental requirements.
- To maintain the SNOUT hoods, an annual inspection of the anti-siphon vent and access hatch are recommended. A simple flushing of the vent, or a gentle rodding with a flexible wire are all that's typically needed to maintain the anti-siphon properties. Opening and closing the access hatch once a year ensures a lifetime of trouble-free service.

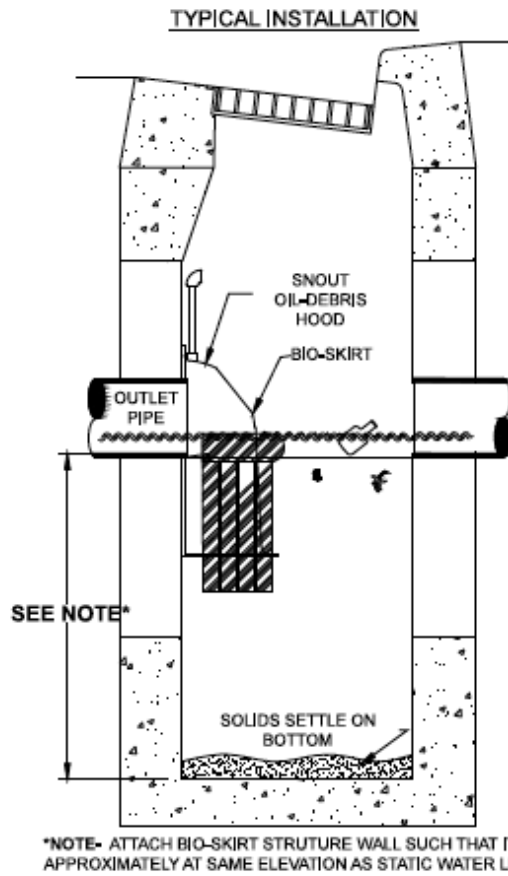
*To extend the service life of a Bio-Skirt, the unit may be "wrung out" to remove oils and washed in an industrial washing machine with warm water. The Bio-Skirt may then be re-deployed if the material maintains it's structural integrity. A maintained Bio-Skirt can last for several years. Each Bio-Skirt can hold about on gallon of oils.

SNOUT INSTALLATION:

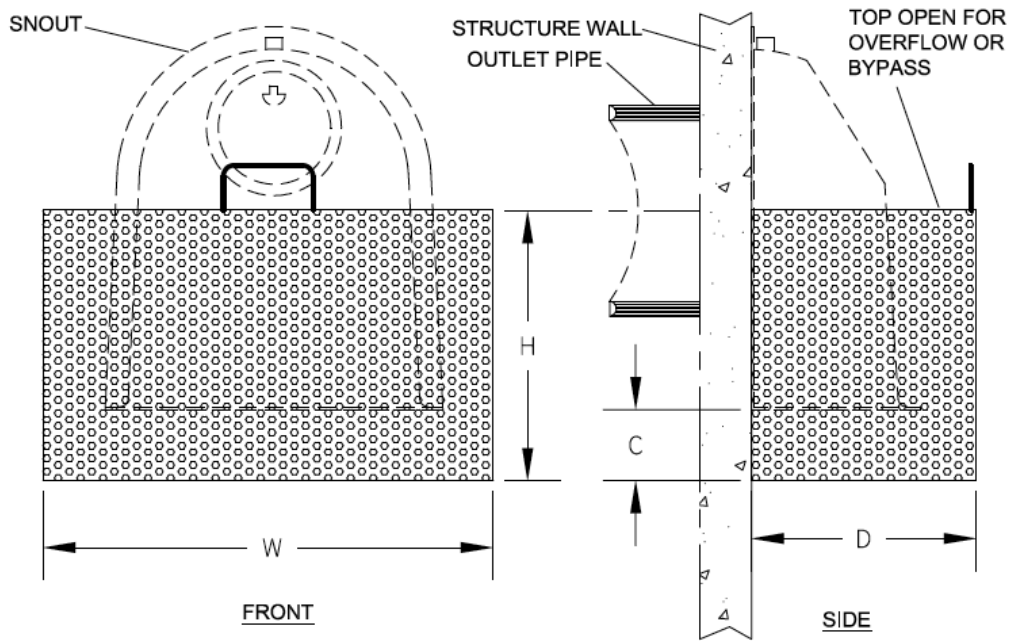


*NOTE- SUMP DEPTH OF 36" MIN. FOR UP TO 12" ID PIPE, OUTLET. FOR PIPES 15" ID AND ABOVE SUMP DEPTH OF 2.5 TO 3 TIMES PIPE ID RECOMMENDED (E.G. 5' DEEP for 24" PIPE)

BIO-SKIRT INSTALLATION:

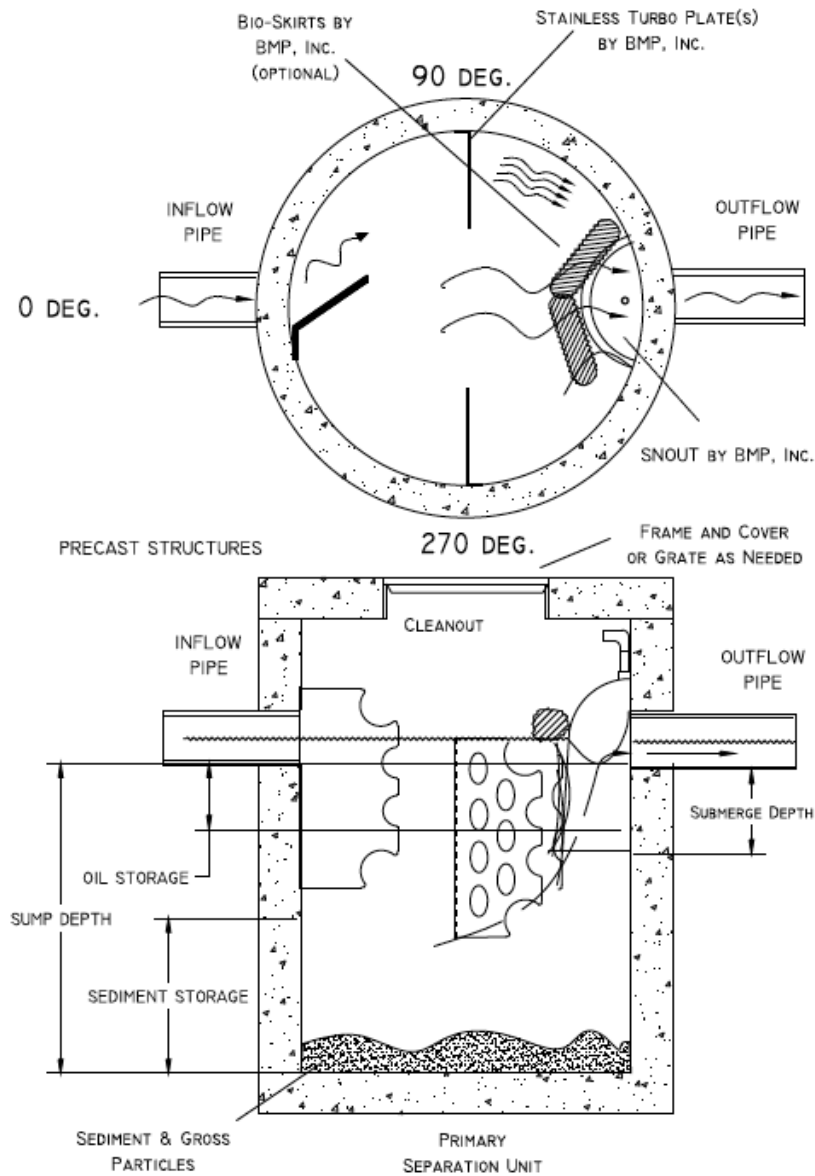


STAINLESS TRASHSCREEN INSTALLATION:



TURBO PLATE INSTALLATION:

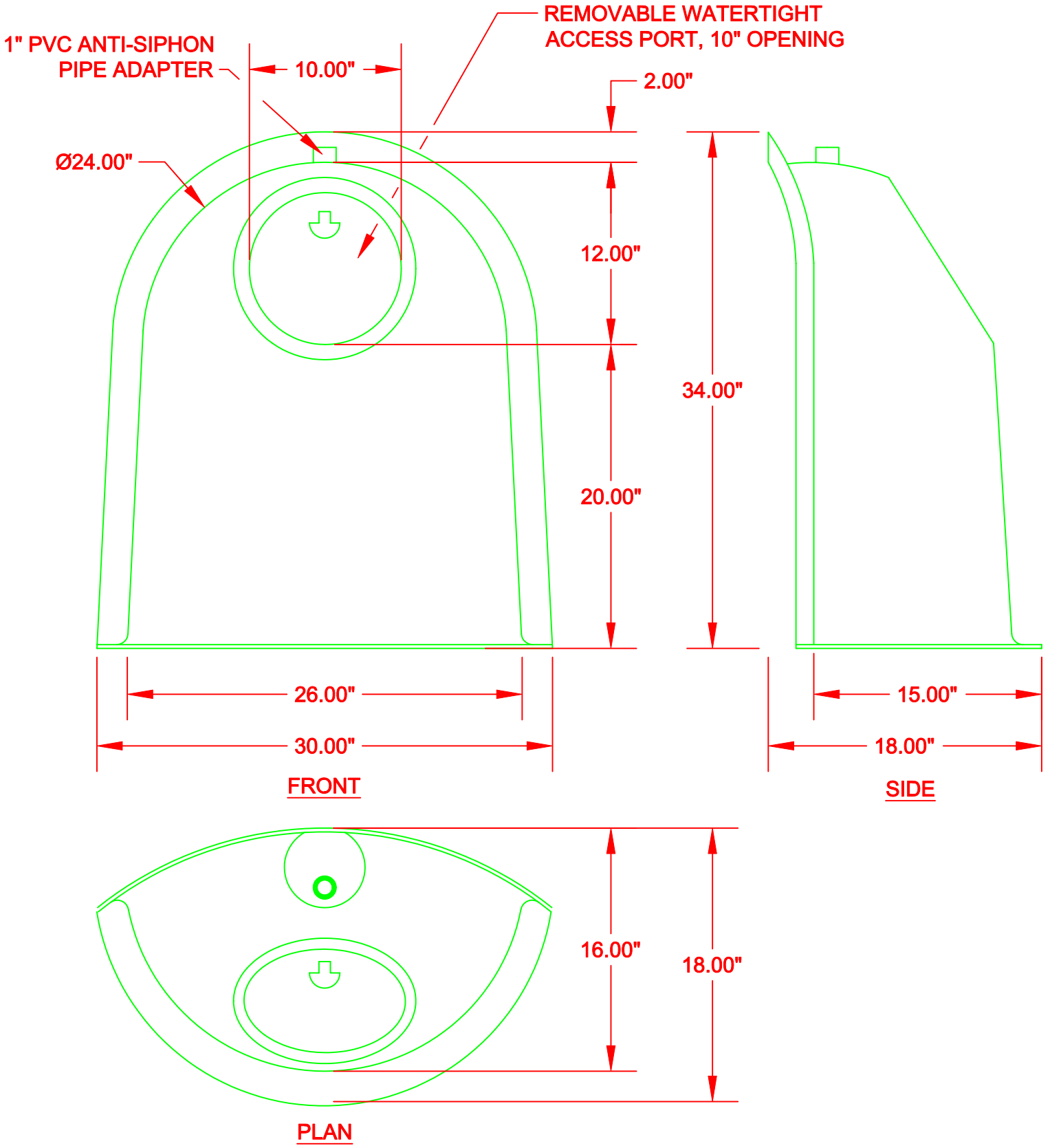
SNOUT TURBO PLATE-OIL-GRIT SEPARATOR



Contact Information: Please contact T. J. Mullen at 800-504-8008, tjm@bmpinc.com or Matt White at 888-434-0277, mwhite@bmpinc.com for design assistance.

Website: www.bmpinc.com

The SNOUT, Bio-Skirt and TrashScreen are protected by: US Patents 6126817, 7857966, 7951294 and 8512556. More US patents are pending and BMP holds Canadian patents for much of the technology patented in the US. Canadian Patents numbers include 2285146, 2688012, 2690156 and 2740678. The SNOUT®, Bio-Skirt® Turbo Plate™ and Stainless TrashScreen™ are trademarks of Best Management Products,



U.S. PATENT #6126817 ADDITIONAL PATENTS PENDING

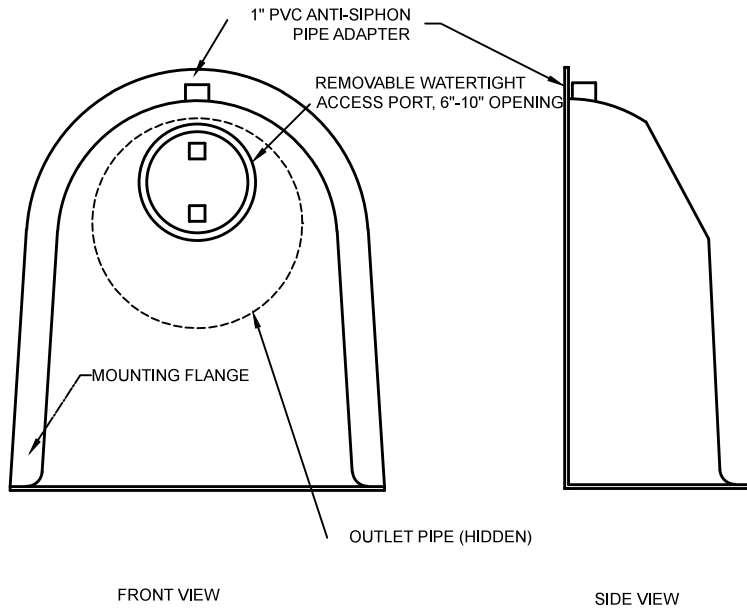
DESIGNED TO FIT
48"-60" DIAM.
STRUCTURES

BMP, INC.

53 MT. ARCHER ROAD, LYME, CT. 06371
(800) 504-8008 FAX: (860)434-3195

DESCRIPTION	DATE	SCALE
24R SNOUT OIL & DEBRIS STOP	09/13/99	NONE
	DRAWING NUMBER 24R	

CONFIGURATION DETAIL

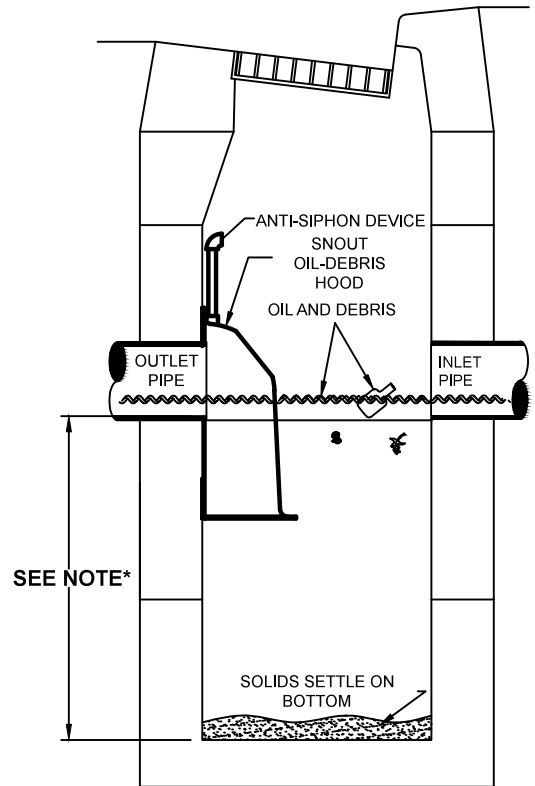


FRONT VIEW

SIDE VIEW

SNOUT OIL-WATER-DEBRIS SEPARATOR

TYPICAL INSTALLATION

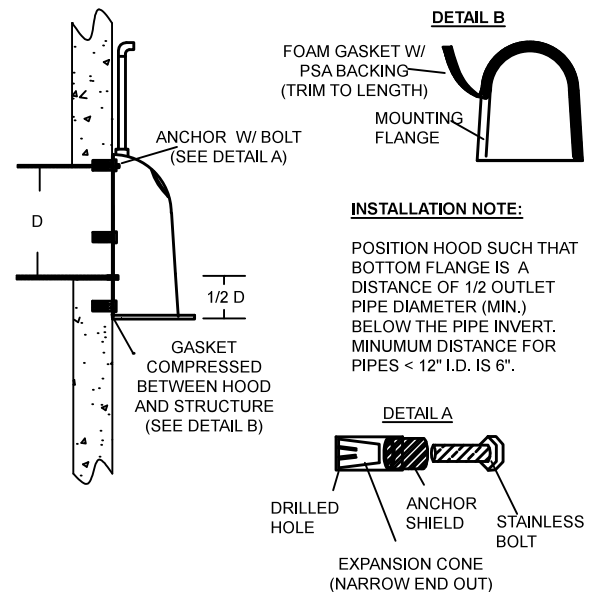


*NOTE- SUMP DEPTH OF 36" MIN. FOR UP TO 12" ID PIPE. OUTLET. FOR PIPES 15" ID AND ABOVE SUMP DEPTH OF 2.5 TO 3 TIMES PIPE ID RECOMMENDED (E.G. 5' DEEP FOR 24" PIPE)

NOTES:

1. ALL HOODS AND TRAPS FOR CATCH BASINS AND WATER QUALITY STRUCTURES SHALL BE AS MANUFACTURED BY:
BEST MANAGEMENT PRODUCTS, INC.
9 MATHEWS DRIVE, UNIT A1-A2.
EAST HADDAM, CT 06423
TOLL FREE: (800) 504-8008 OR (888) 434-0277, FAX: (877) 434-3197
WEB SITE: www.bmpinc.com
OR PRE-APPROVED EQUAL
2. ALL HOODS SHALL BE CONSTRUCTED OF A GLASS REINFORCED RESIN COMPOSITE WITH ISO GEL COAT EXTERIOR FINISH WITH A MINIMUM 0.125" LAMINATE THICKNESS.
3. ALL HOODS SHALL BE EQUIPPED WITH A WATERTIGHT ACCESS PORT, A MOUNTING FLANGE, AND AN ANTI-SIPHON VENT PIPE AND ELBOW AS DRAWN. (SEE CONFIGURATION DETAIL)
4. THE SIZE AND POSITION OF THE HOOD SHALL BE DETERMINED BY OUTLET PIPE SIZE AS PER MANUFACTURER'S RECOMMENDATION (SNOUT SIZE ALWAYS LARGER THAN PIPE SIZE).
5. THE BOTTOM OF THE HOOD SHALL EXTEND DOWNWARD A MINIMUM DISTANCE EQUAL TO 1/2 THE OUTLET PIPE DIAMETER WITH A MINIMUM DISTANCE OF 6" FOR PIPES <12" I.D.
6. THE ANTI-SIPHON VENT SHALL EXTEND ABOVE HOOD BY MINIMUM OF 3" AND A MAXIMUM OF 12" ACCORDING TO STRUCTURE CONFIGURATION.
7. THE SURFACE OF THE STRUCTURE WHERE THE HOOD IS MOUNTED SHALL BE FINISHED SMOOTH AND FREE OF LOOSE MATERIAL AND PIPE SHALL BE FINISHED FLUSH TO WALL.
8. ALL STRUCTURE JOINTS SHALL BE WATERTIGHT.
9. THE HOOD SHALL BE SECURELY ATTACHED TO STRUCTURE WALL WITH 3/8" STAINLESS STEEL BOLTS AND OIL-RESISTANT GASKET AS SUPPLIED BY MANUFACTURER. (SEE INSTALLATION DETAIL)
10. INSTALLATION INSTRUCTIONS SHALL BE FURNISHED WITH MANUFACTURER SUPPLIED INSTALLATION KIT.
INSTALLATION KIT SHALL INCLUDE:
A. INSTALLATION INSTRUCTIONS
B. PVC ANTI-SIPHON VENT PIPE AND ADAPTER
C. OIL-RESISTANT CRUSHED CELL FOAM GASKET WITH PSA BACKING
D. 3/8" STAINLESS STEEL BOLTS
E. ANCHOR SHIELDS

INSTALLATION DETAIL



INSTALLATION NOTE:
POSITION HOOD SUCH THAT BOTTOM FLANGE IS A DISTANCE OF 1/2 OUTLET PIPE DIAMETER (MIN.) BELOW THE PIPE INVERT. MINIMUM DISTANCE FOR PIPES <12" I.D. IS 6".

HOOD SPECIFICATION FOR CATCH BASINS AND WATER QUALITY STRUCTURES

DESCRIPTION	DATE	SCALE
OIL- DEBRIS HOOD SPECIFICATION AND INSTALLATION (TYPICAL)	09/08/18	NONE
DRAWING NUMBER		SP-SN

LDS CONSULTANTS INC.

2323 Trafalgar Street
London, Ontario N5V 0E1

www.LDSconsultants.ca