

Stormwater Management Facilities  
DR Stormwater Report  
Milwaukie Cottages

HDG Job #: KOB004

Prepared For: Ethos Development LLC  
2222 NE Oregon St. Suite 208  
Portland, OR 97232

Prepared By:



**Humber  
Design  
Group, Inc.**

110 SE Main St. Suite 200  
Portland, OR 97214  
(P) 503 946 6690

I hereby certify that this Stormwater Management Report for the Milwaukie Cottages project has been prepared by me or under my supervision and meets minimum standards of City of Milwaukee and normal standards of engineering practice.

I hereby acknowledge and agree that the jurisdiction does not and will not assume liability for the sufficiency, suitability, or performance of drainage facilities designed by me.

Date: September 8, 2023



EXPIRES 12-31-2024

# Table of Contents

<b>Project Overview and Description</b>	<b>2</b>
<b>Vicinity Map</b>	<b>3</b>
<b>Methodology</b>	<b>4</b>
<b>Analysis</b>	<b>5</b>
<b>Engineering Conclusions</b>	<b>6</b>

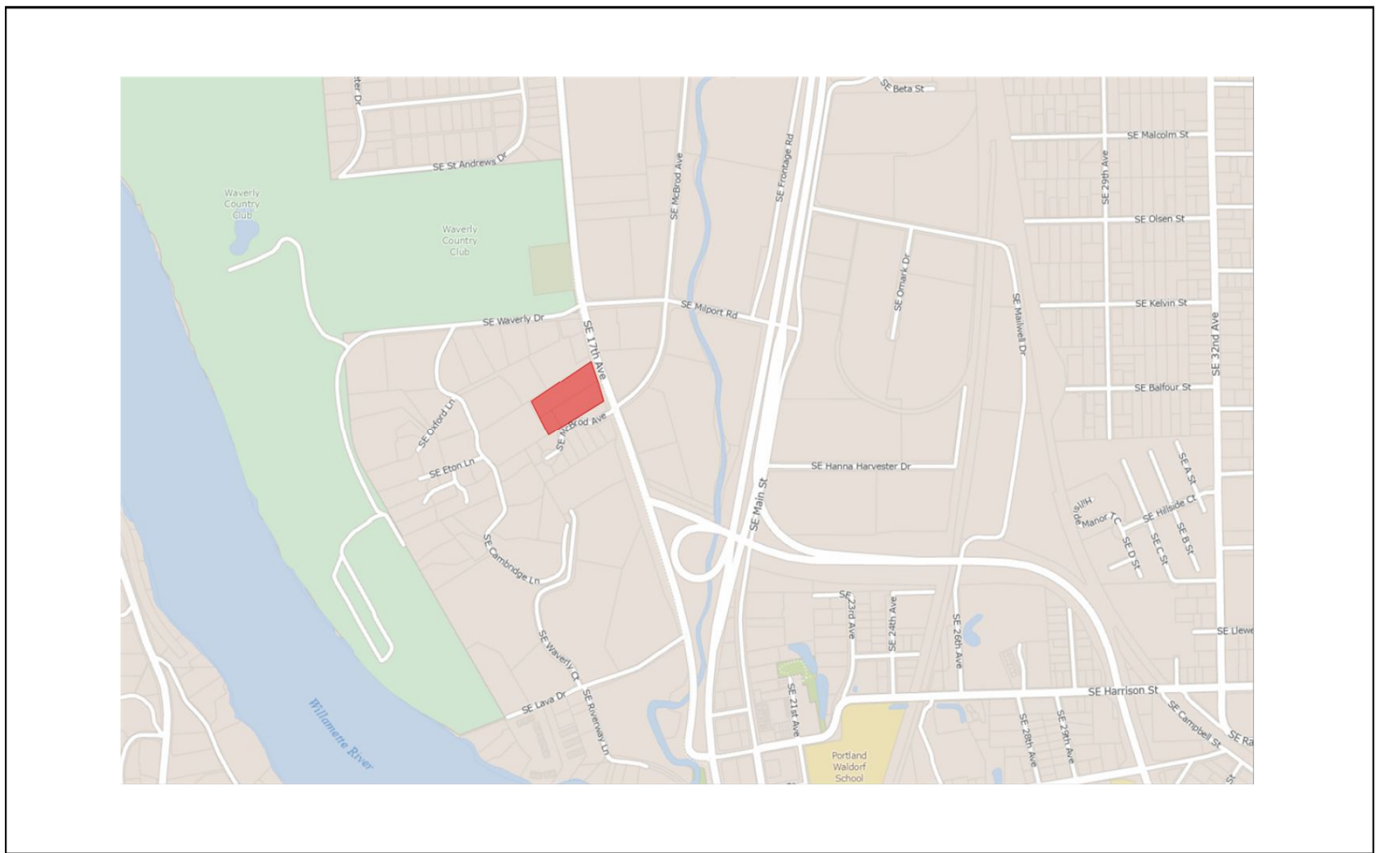
## APPENDICES

<b>Appendix A Stormwater Facility Details / Exhibits</b>	<b>A</b>
Catchment Map	
DR Utility Plan	
Details	
<b>Appendix B Support Calculations</b>	<b>B</b>
PAC Report	
Bayfilter Sizing	
Detention Sizing	
<b>Appendix C Operations and Maintenance Plan</b>	<b>C</b>
To be provided at time of building permit	

## **Project Overview and Description**

<b>Location of Project</b>	9815 & 9833 SE 17th Avenue
<b>Site Area/Acreage</b> <b>Proposed Impervious Area</b>	2.51 ac
<b>Nearest Cross Street</b>	SE McBrod Avenue
<b>Property Zoning</b>	R-MD
<b>Existing Conditions</b>	The existing site consists of a residential building with landscaping including trees and bushes.
<b>Proposed Development</b>	The project proposed 16 new multi family buildings and a private parking lot.
<b>Watershed Description</b> <b>Subwatershed</b>	Johnson Creek Milwaukie
<b>Tax Map</b> <b>Tax Lot</b>	11E26DB 1000 & 1200 & 1201
<b>Flood Zone</b>	
<b>Permits Required</b>	Building Permit 1200C Erosion Control Permit

# Vicinity Map



Site Location

## Methodology

### **Existing Drainage**

Stormwater appears to be unmanaged at the existing site. There are no outfalls from the existing site to a public sewer

### **Infiltration Results**

Infiltration testing has not occurred at the site.

### **PRIVATE Proposed Stormwater Management Techniques**

Per City of Milwaukie standards, stormwater management will fall under the 2016 Portland SWMM. Stormwater runoff from the 1.34 acres of proposed impervious area will be managed by flow-through planters sized to manage water quality and quantity as well as a filter cartridge system and detention system. Stormwater will outfall to the East of the project site to a new storm-only sewer main extension located in the public right-of-way in SE 17th Ave.

### **PUBLIC Proposed Stormwater Management Techniques**

The curb alignments along SE McBrod Ave and SE 17th Ave will remain unchanged; therefore, no stormwater management is required in the public right-of-way. A new storm-only sewer main extension is being proposed in SE 17th Ave to allow the project site to connect into the public sewer system.

### **Discharge Point Receiving Body**

Drainage Way, River, Storm Only Pipe  
Johnson Creek

### **Stormwater Hierarchy Justification**

Infiltration rate is unknown and the site topography is steep so it is assumed that infiltration is not feasible at this site. There is a proposed storm-only sewer extension located in SE 17th Ave that the project is proposing to tie into; therefore this project will fall under category 3 of the stormwater hierarchy.

# Analysis

**Computational Method Used** HydroCAD models of a SBUH Type 1A Storm were used to calculate the stormwater management facility sizes for the catchment areas. See attached calculations. Below is a summary of the results.

**Hydrologic Soil Group** D

**Table 1 – Curve Numbers**

<b>Predeveloped Pervious CN</b>	89
<b>Predeveloped Impervious CN</b>	98
<b>Post-Developed Pervious CN</b>	89
<b>Post-Developed Impervious CN</b>	98

**Table 2 – Design Storms**

<b>WQ Storm</b>	0.83 inches
<b>2-year</b>	2.40 inches
<b>10-year</b>	3.40 inches
<b>25-year</b>	3.90 inches
<b>100-year</b>	4.40 inches

**Table 3 – Time of Concentration**

<b>Predeveloped TOC</b>	5 min
<b>Post-Developed TOC</b>	5 min

**Stormwater Management Narrative** The project proposes 58,249 sf of new impervious area. The drainage basins are divided into (5) typical residential structures (Triplex A-B, Duplex A-C), a parking lot, a covered bike parking area, and sidewalks. See table 4 for a breakdown of the drainage basin areas. The PAC was used to size flow-through stormwater planters for each of the typical building types. These planters will treat roof areas only. The parking lot and covered bike parking area will be treated for water quality through the use of a filter cartridge system and water quantity through the use of a CMP detention system. The detention system flow controls were sized using HydroCAD to match the predeveloped and postdeveloped 2-yr, 5-yr, and 10-yr storm events. All sidewalks have been graded to surface flow off to adjacent landscaped areas.

**Table 4 – Catchment Areas and Facility Table**

Catchment/ Facility ID	Source (roof, road, etc.)	Treatment Area (sf)	Ownership (private/ public)	Facility Type/ Function	Facility Size (sf)
Triplex A*	Roof	2100	Private	Flow-through Planter	156
Duplex A*	Roof	1350	Private	Flow-through Planter	101
Duplex B*	Roof	1500	Private	Flow-through Planter	112
Triplex B*	Roof	1800	Private	Flow-through Planter	134
Duplex C*	Roof	1200	Private	Flow-through Planter	90
Parking Lot/Bike Parking	Road/Roof	22,054	Private	Filter Cartridge	(1) 545 Bayfiler Cartridge

\*All flow-through planters sized using PAC to meet water quality and flow control requirements

**Table 5 - Flow Rates**

Catchment/ Facility ID	2-Year		5-Year		10-Year	
	Pre	Post	Pre	Post	Pre	Post
Parking Lot/Bike Parking	0.17 cfs	0.17 cfs	0.23 cfs	0.23 cfs	0.29 cfs	0.28 cfs

## **Engineering Conclusions**

The preceding methodologies and calculations presented indicate compliance with the current jurisdictional stormwater management codes and requirements. A summarized breakdown is presented below:

### **Water Quality**

The proposed development will meet the provisions for water quality per the 2016 Portland Stormwater Management Manual.

### **Water Quantity**

The proposed development will meet the provisions for water quantity per the 2016 Portland Stormwater Management Manual.

### **Downstream / Upstream Impacts**

There are no upstream or downstream impacts created by this proposed development.

### **100 year storm**

The 100 year storm will be safely conveyed away from structures and will be internally bypassed in the proposed detention system before heading to the storm-only main located in SE 17th Ave.



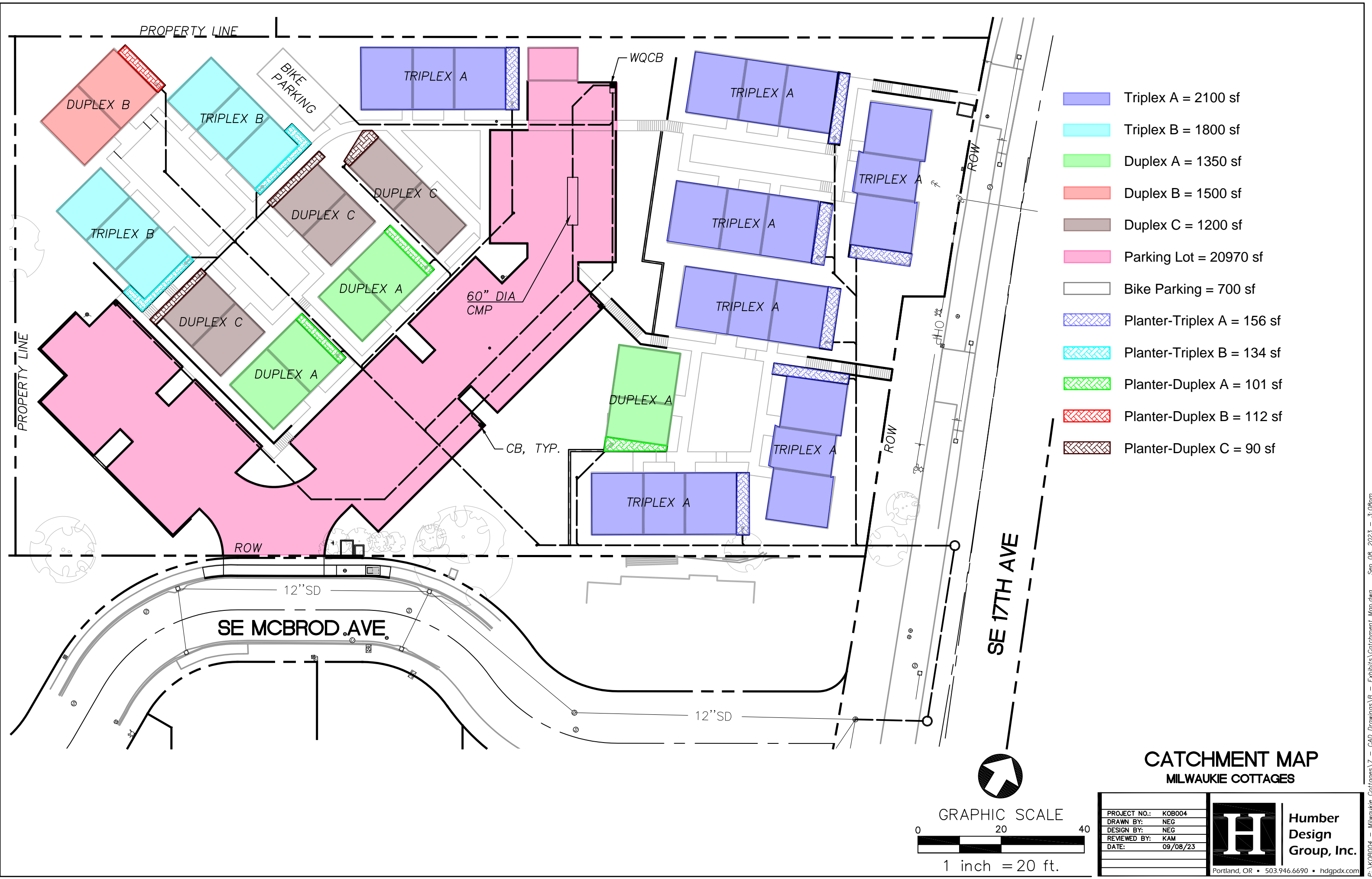
## **Appendix A**

### **Stormwater Facility Details / Exhibits**

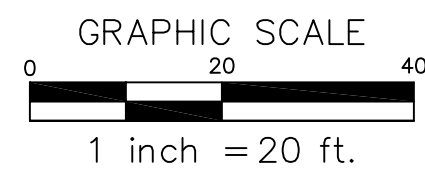
Catchment Map

DR Utility Plan

Details



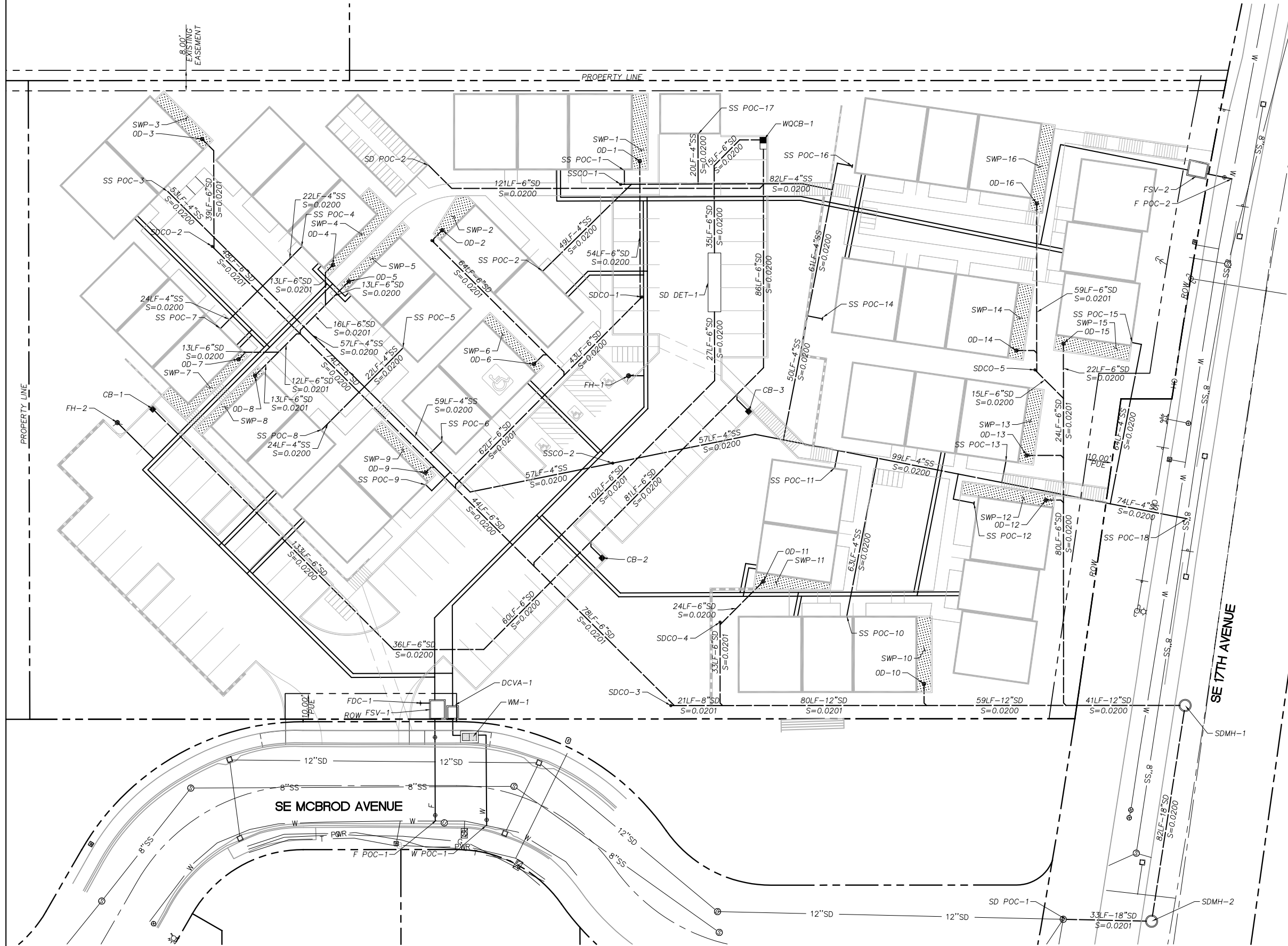
- Triplex A = 2100 sf
- Triplex B = 1800 sf
- Duplex A = 1350 sf
- Duplex B = 1500 sf
- Duplex C = 1200 sf
- Parking Lot = 20970 sf
- Bike Parking = 700 sf
- Planter-Triplex A = 156 sf
- Planter-Triplex B = 134 sf
- Planter-Duplex A = 101 sf
- Planter-Duplex B = 112 sf
- Planter-Duplex C = 90 sf



PROJECT NO.:	KOB004
DRAWN BY:	NEG
DESIGN BY:	NEG
REVIEWED BY:	KAM
DATE:	09/08/23

**Humber  
Design  
Group, Inc.**

Portland, OR • 503.946.6690 • hdgpdx.com



SHEET LEGEND		
ITEM	DESCRIPTION	DETAIL
SD	STORM	
SS	SANITARY	
W	WATER	
F	FIRE SERVICE	
---	PERFORATED PIPE	
■	CATCH BASIN	
●	CLENAOUT	
●	OVERFLOW DRAIN	
▨	STORMWATER PLANTER	

**/Köblö/CREATIVE**

REGISTERED PROFESSIONAL ENGINEER  
OREGON  
NO. 78335PE  
PRELIMINARY  
SEPT. 12, 2017  
KRISTIAN ANN MCCORMICK  
EXPIRES 12-31-2024

Humber Design Group, Inc.  
Civil Engineering • 503.946.4650 • hdsgrp.com

**Milwaukie Cottages**  
9815 & 9833 SE 17th Ave.  
Milwaukie, OR 97222

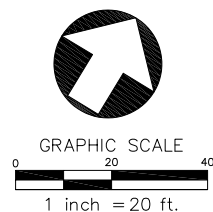
DATE: 09/08/2023  
DRAWN BY: NEG  
JOB NO: 22-042  
REV NO:

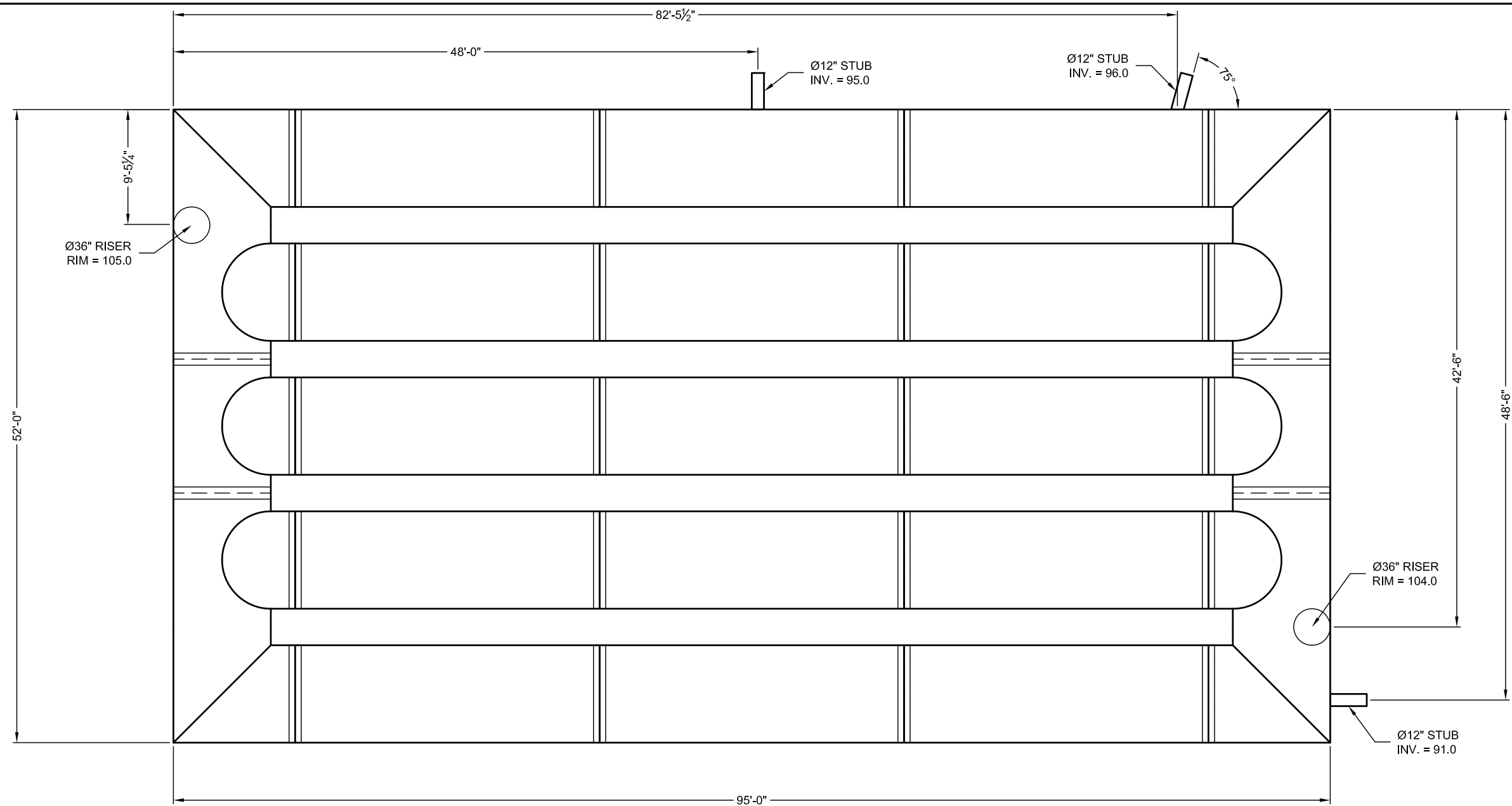
UTILITY PLAN

**C200**

Land-Use App  
© 2023

**UTILITY PLAN**  
SCALE: 1"=20'





THE UNDERSIGNED HEREBY APPROVES THE ATTACHED (4) PAGES INCLUDING THE FOLLOWING:

- **VOLUME = 25,082 C.F.**
- **MAINLINE PIPE GAUGE = 16**
- **WALL TYPE = SOLID**
- **DIAMETER = 96"**
- **FINISH = ALT2**

\_\_\_\_\_  
CUSTOMER

\_\_\_\_\_  
DATE

**ASSEMBLY**  
SCALE: 1" = 10'  
VOLUME: 25,082 C.F.  
LOADING: H20/H25  
SYSTEM INV = 91.0

**NOTES**

- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE.
- ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE 2 3/8" x 1/2" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE.
- QUANTITY OF PIPE SHOWN DOES NOT PROVIDE EXTRA PIPE FOR CONNECTING THE SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES. OUR SYSTEM AS DETAILED PROVIDES NOMINAL INLET AND/OR OUTLET PIPE STUB FOR CONNECTION TO EXISTING DRAINAGE FACILITIES. IF ADDITIONAL PIPE IS NEEDED IT IS THE RESPONSIBILITY OF THE CONTRACTOR.

C:\USERS\FOWLER\DESKTOP\PROJECT - SOLIDWALL.DWG 1/13/2014 4:32 PM

The design and information shown on this drawing is provided as a service to the project owner, engineer and contractor by Contech Engineered Solutions LLC ("Contech"). Neither this drawing, nor any part thereof, may be used, reproduced or modified in any manner without the prior written consent of Contech. Failure to comply is done at the user's own risk and Contech expressly disclaims any liability or responsibility for such use.

If discrepancies between the supplied information upon which the drawing is based and actual field conditions are encountered as site work progresses, these discrepancies must be reported to Contech immediately for re-evaluation of the design. Contech accepts no liability for designs based on missing, incomplete or inaccurate information supplied by others.

MARK	DATE	REVISION DESCRIPTION	BY

**CONTECH**  
ENGINEERED SOLUTIONS LLC  
www.ContechES.com

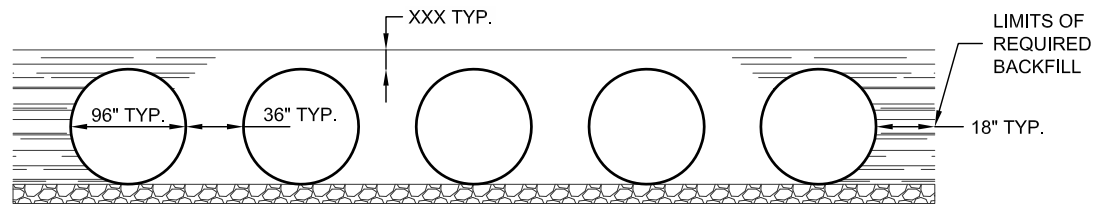
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069  
800-338-1122 513-645-7000 513-645-7993 FAX

**CONTECH**  
CMP DETENTION SYSTEMS

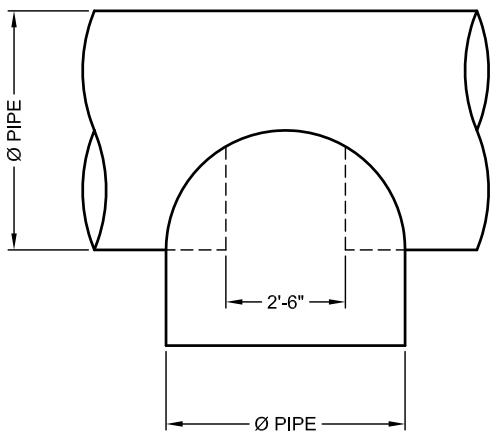
CONTECH  
CONTRACT  
DRAWING

**Ø96" UNDERGROUND DETENTION SYSTEM - 000000-001**  
SAMPLE PROJECT  
ANYTOWN, USA  
SITE DESIGNATION: UDS

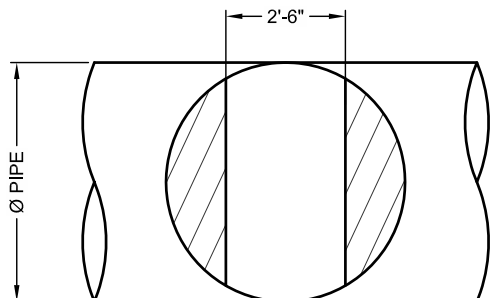
PROJECT No.: XXXXX	SEQ. No.: 001	DATE: 1/13/2014
DESIGNED: XXX	DRAWN: RTF	
CHECKED:	APPROVED:	
SHEET NO.: <b>C1</b> OF <b>4</b>		



**TYPICAL SECTION VIEW**  
SCALE: N.T.S.



**PLAN**



**FRONT**

**TYPICAL MANWAY DETAIL**  
SCALE: N.T.S.

**FABRICATION BoM**

FITTING	TYPE	QTY	Ø	CORRUGATION	GAGE	FINISH	WALL TYPE	LENGTH	TOTAL
BAND FASTENER	12" HUGGER		96	w/BAR BOLT & STRAP	16	ALT2			
GASKETS	FLAT		96	12" WIDE					

PROJECT SPECIFIC BILL OF MATERIALS  
TO BE COMPLETED AT TIME OF CONTRACT  
DRAWINGS

C:\USERS\FOWLER\DESKTOP\SAMPLE PROJECT - SOLIDWALL.DWG 1/13/2014 4:32 PM

The design and information shown on this drawing is provided as a service to the project owner, engineer and contractor by Contech Engineered Solutions LLC ("Contech"). Neither this drawing, nor any part thereof, may be used, reproduced or modified in any manner without the prior written consent of Contech. Failure to comply is done at the user's own risk and Contech expressly disclaims any liability or responsibility for such use.

If discrepancies between the supplied information upon which the drawing is based and actual field conditions are encountered as site work progresses, these discrepancies must be reported to Contech immediately for re-evaluation of the design. Contech accepts no liability for designs based on missing, incomplete or inaccurate information supplied by others.

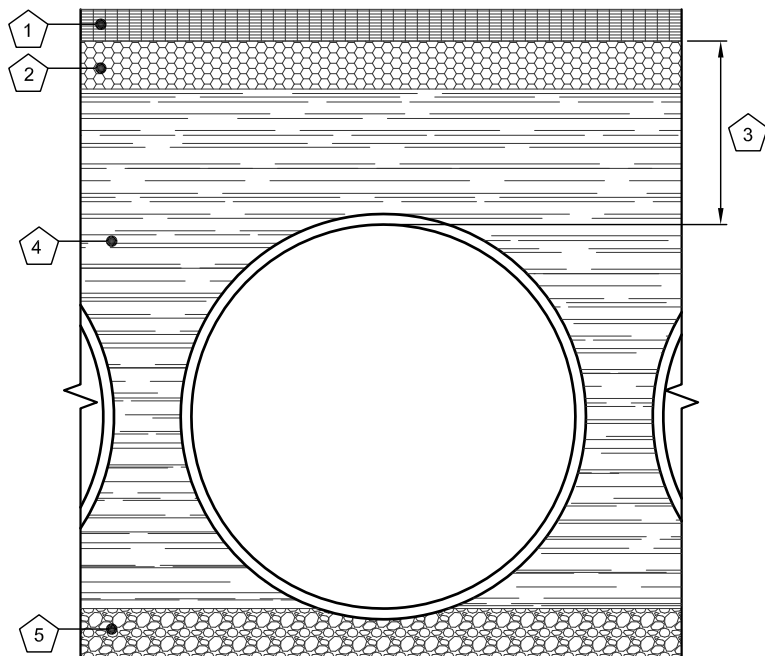
MARK	DATE	REVISION DESCRIPTION	BY

**CONTECH**  
ENGINEERED SOLUTIONS LLC  
www.ContechES.com  
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069  
800-338-1122 513-645-7000 513-645-7993 FAX

**CONTECH**  
CMP DETENTION SYSTEMS  
CONTECH  
CONTRACT  
DRAWING

Ø96" UNDERGROUND DETENTION SYSTEM - 000000-001  
SAMPLE PROJECT  
ANYTOWN, USA  
SITE DESIGNATION: UDS

PROJECT No.: XXXXX	SEQ. No.: 001	DATE: 1/13/2014
DESIGNED: XXX	DRAWN: RTF	
CHECKED:	APPROVED:	
SHEET NO.: C2 OF 4		



**KEY**

1. RIGID OR FLEXIBLE PAVEMENT
2. GRANULAR ROAD BASE
3. 12" MIN. FOR DIAMETERS THROUGH 96"  
18" MIN. FOR DIAMETERS FROM 102"  
AND LARGER MEASURED TO TOP OF RIGID  
OR BOTTOM OF FLEXIBLE PAVEMENT.
4. SELECT GRANULAR FILL PER AASHTO M145  
A1, A2 OR A3, OR APPROVED EQUAL.  
PLACED IN 8" LIFTS (COMPACTED TO MIN.  
90% STANDARD DENSITY PER AASHTO T99.)
5. GRANULAR BEDDING, ROUGHLY SHAPED TO  
FIT THE BOTTOM OF PIPE, 4" TO 6" IN DEPTH

**FOUNDATION/BEDDING PREPARATION**

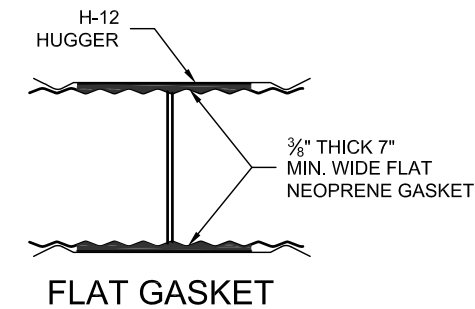
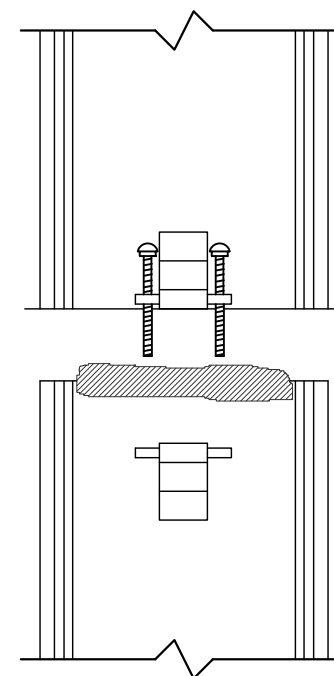
PRIOR TO PLACING THE BEDDING, THE FOUNDATION MUST BE CONSTRUCTED TO A UNIFORM AND STABLE GRADE. IN THE EVENT THAT UNSUITABLE FOUNDATION MATERIALS ARE ENCOUNTERED DURING EXCAVATION, THEY SHALL BE REMOVED AND BROUGHT BACK TO THE GRADE WITH A FILL MATERIAL AS APPROVED BY THE ENGINEER. ONCE THE FOUNDATION PREPARATION IS COMPLETE, 4" - 6" OF A WELL-GRADED GRANULAR MATERIAL SHALL BE PLACED AS THE BEDDING.

**BACKFILL**

THE BACKFILL SHALL BE AN A1, A2 OR A3 GRANULAR FILL PER AASHTO M145, OR A WELL-GRADED GRANULAR FILL AS APPROVED BY THE SITE ENGINEER (SEE INSTALLATION GUIDELINES). THE MATERIAL SHALL BE PLACED IN 8" LOOSE LIFTS AND COMPACTED TO 90% AASHTO T99 STANDARD PROCTOR DENSITY. WHEN PLACING THE FIRST LIFTS OF BACKFILL IT IS IMPORTANT TO MAKE SURE THAT THE BACKFILL IS PROPERLY COMPACTED UNDER AND AROUND THE PIPE HAUNCHES. BACKFILL SHALL BE PLACED SUCH THAT THERE IS NO MORE THAN A TWO LIFT (16") DIFFERENTIAL BETWEEN ANY OF THE PIPES AT ANY TIME DURING THE BACKFILL PROCESS. THE BACKFILL SHALL BE ADVANCED ALONG THE LENGTH OF THE DETENTION SYSTEM AT THE SAME RATE TO AVOID DIFFERENTIAL LOADING ON THE PIPE.

OTHER ALTERNATE BACKFILL MATERIAL MAY BE ALLOWED DEPENDING ON SITE SPECIFIC CONDITIONS, AS APPROVED BY SITE ENGINEER.

**1** BACKFILL DETAIL  
C3 SCALE: N.T.S.



**CONNECTION DETAIL  
SINGLE BOLT, BAR AND STRAP**

**GENERAL NOTES**

1. BANDS ARE NORMALLY FURNISHED AS FOLLOWS:  
12" THRU 48", 1-PIECE  
54" THRU 96", 2-PIECE  
102" THRU 144", 3-PIECES
2. BAND FASTENERS ARE ATTACHED WITH SPOT WELDS, RIVETS OR HAND WELDS
3. REROLLED ANNULAR END CORRUGATIONS ARE NORMALLY 2 3/8" x 1/2". DIMENSIONS ARE SUBJECT TO MANUFACTURING TOLERANCES

**2** H-12 HUGGER BAND DETAIL  
C3 SCALE: N.T.S.

C:\USERS\FOWLER\DESKTOP\SAMPLE PROJECT - SOLIDWALL.DWG 1/13/2014 4:32 PM

The design and information shown on this drawing is provided as a service to the project owner, engineer and contractor by Contech Engineered Solutions LLC ("Contech"). Neither this drawing, nor any part thereof, may be used, reproduced or modified in any manner without the prior written consent of Contech. Failure to comply is done at the user's own risk and Contech expressly disclaims any liability or responsibility for such use.

If discrepancies between the supplied information upon which the drawing is based and actual field conditions are encountered as site work progresses, these discrepancies must be reported to Contech immediately for re-evaluation of the design. Contech accepts no liability for designs based on missing, incomplete or inaccurate information supplied by others.

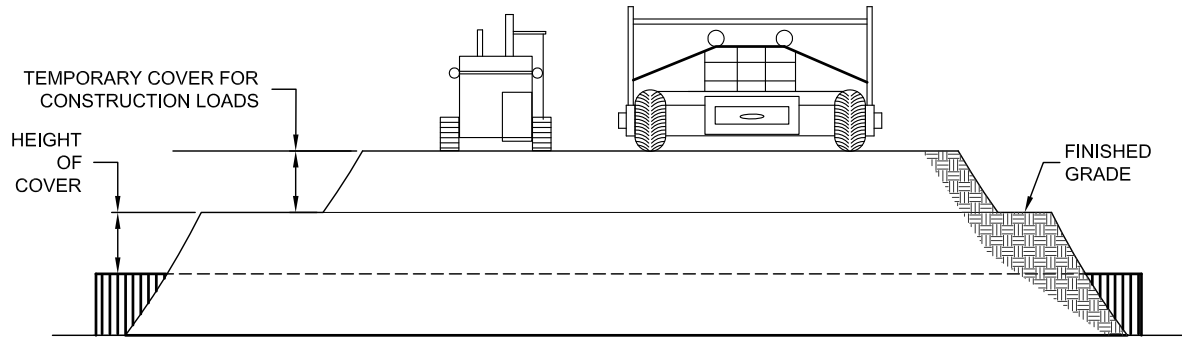
MARK	DATE	REVISION DESCRIPTION	BY

**CONTECH**  
ENGINEERED SOLUTIONS LLC  
www.ContechES.com  
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069  
800-338-1122 513-645-7000 513-645-7993 FAX

**CONTECH**  
CMP DETENTION SYSTEMS  
CONTECH  
CONTRACT  
DRAWING

Ø96" UNDERGROUND DETENTION SYSTEM - 000000-001  
SAMPLE PROJECT  
ANYTOWN, USA  
SITE DESIGNATION: UDS

PROJECT No.: XXXXX	SEQ. No.: 001	DATE: 1/13/2014
DESIGNED: XXX	DRAWN: RTF	
CHECKED:	APPROVED:	
SHEET NO.: C3 OF 4		



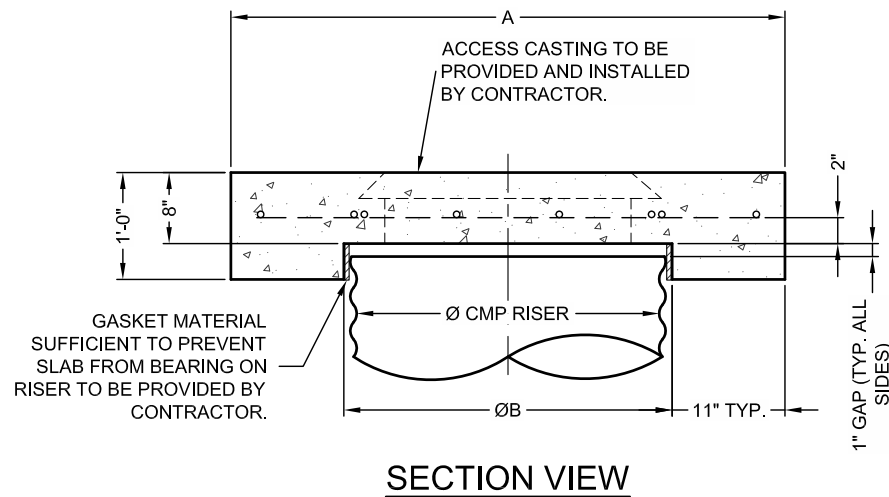
**CONSTRUCTION LOADS**

FOR TEMPORARY CONSTRUCTION VEHICLE LOADS, AN EXTRA AMOUNT OF COMPACTED COVER MAY BE REQUIRED OVER THE TOP OF THE PIPE. THE HEIGHT-OF-COVER SHALL MEET THE MINIMUM REQUIREMENTS SHOWN IN THE TABLE BELOW. THE USE OF HEAVY CONSTRUCTION EQUIPMENT NECESSITATES GREATER PROTECTION FOR THE PIPE THAN FINISHED GRADE COVER MINIMUMS FOR NORMAL HIGHWAY TRAFFIC.

PIPE SPAN, INCHES	AXLE LOADS (kips)			
	18-50	50-75	75-110	110-150
	MINIMUM COVER (FT)			
12-42	2.0	2.5	3.0	3.0
48-72	3.0	3.0	3.5	4.0
78-120	3.0	3.5	4.0	4.0
126-144	3.5	4.0	4.5	4.5

\*MINIMUM COVER MAY VARY, DEPENDING ON LOCAL CONDITIONS. THE CONTRACTOR MUST PROVIDE THE ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE PIPE. MINIMUM COVER IS MEASURED FROM THE TOP OF THE PIPE TO THE TOP OF THE MAINTAINED CONSTRUCTION ROADWAY SURFACE.

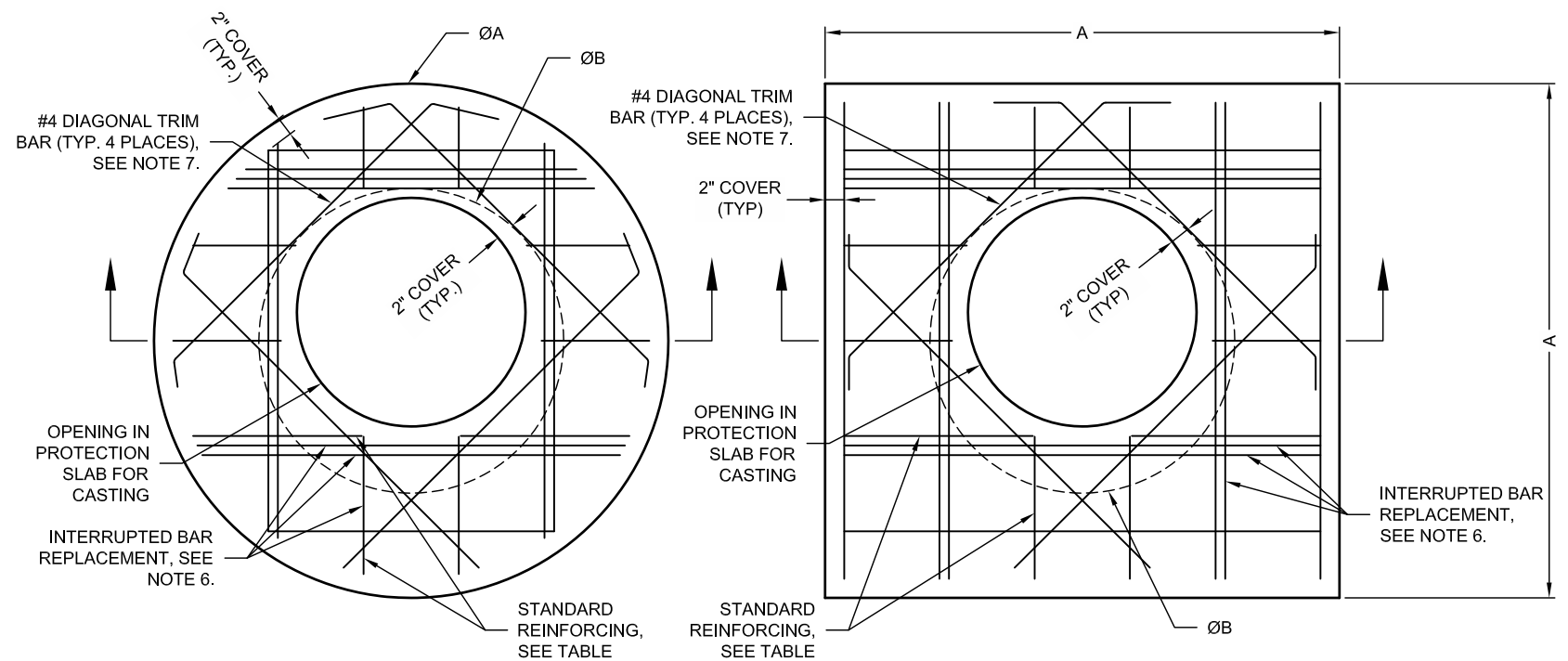
**3 CONSTRUCTION LOADING DIAGRAM**  
C4 SCALE: N.T.S.



**SECTION VIEW**

REINFORCING TABLE				
Ø CMP RISER	A	Ø B	REINFORCING	**BEARING PRESSURE (PSF)
24"	Ø 4' 4'X4'	26"	#5 @ 12" OCEW #5 @ 12" OCEW	2,410 1,780
30"	Ø 4'-6" 4'-6" X 4'-6"	32"	#5 @ 12" OCEW #5 @ 12" OCEW	2,120 1,530
36"	Ø 5' 5' X 5'	38"	#5 @ 10" OCEW #5 @ 10" OCEW	1,890 1,350
42"	Ø 5'-6" 5'-6" X 5'-6"	44"	#5 @ 10" OCEW #5 @ 9" OCEW	1,720 1,210
48"	Ø 6' 6' X 6'	50"	#5 @ 9" OCEW #5 @ 8" OCEW	1,600 1,100

\*\* ASSUMED SOIL BEARING CAPACITY



**ROUND OPTION PLAN VIEW**

**SQUARE OPTION PLAN VIEW**

**NOTES:**

- DESIGN IN ACCORDANCE WITH AASHTO, 17th EDITION.
- DESIGN LOAD HS25.
- EARTH COVER = 1' MAX.
- CONCRETE STRENGTH = 3,500 psi
- REINFORCING STEEL = ASTM A615, GRADE 60.
- PROVIDE ADDITIONAL REINFORCING AROUND OPENINGS EQUAL TO THE BARS INTERRUPTED, HALF EACH SIDE. ADDITIONAL BARS TO BE IN THE SAME PLANE.
- TRIM OPENING WITH DIAGONAL #4 BARS, EXTEND BARS A MINIMUM OF 12" BEYOND OPENING, BEND BARS AS REQUIRED TO MAINTAIN BAR COVER.
- PROTECTION SLAB AND ALL MATERIALS TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
- DETAIL DESIGN BY DELTA ENGINEERING, BINGHAMTON, NY.

**4 MANHOLE CAP DETAIL**  
C4 SCALE: N.T.S.

**SPECIFICATION FOR CORRUGATED STEEL PIPE-ALUMINIZED TYPE 2 STEEL**

**SCOPE**

THIS SPECIFICATION COVERS THE MANUFACTURE AND INSTALLATION OF THE CORRUGATED STEEL PIPE (CSP) DETAILED IN THE PROJECT PLANS.

**MATERIAL**

THE ALUMINIZED TYPE 2 STEEL COILS SHALL CONFORM TO THE APPLICABLE REQUIREMENTS OF AASHTO M274 OR ASTM A929.

**PIPE**

THE CSP SHALL BE MANUFACTURED IN ACCORDANCE WITH THE APPLICABLE REQUIREMENTS OF AASHTO M36 OR ASTM A760. THE PIPE SIZES, GAGES AND CORRUGATIONS SHALL BE AS SHOWN ON THE PROJECT PLANS.

ALL FABRICATION OF THE PRODUCT SHALL OCCUR WITHIN THE UNITED STATES.

**HANDLING AND ASSEMBLY**

SHALL BE IN ACCORDANCE WITH RECOMMENDATIONS OF THE NATIONAL CORRUGATED STEEL PIPE ASSOCIATION (NCSPPA)

**INSTALLATION**

SHALL BE IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SECTION 26, DIVISION II OR ASTM A798 AND IN CONFORMANCE WITH THE PROJECT PLANS AND SPECIFICATIONS. IF THERE ARE ANY INCONSISTENCIES OR CONFLICTS THE CONTRACTOR SHOULD DISCUSS AND RESOLVE WITH THE SITE ENGINEER.

IT IS ALWAYS THE RESPONSIBILITY OF THE CONTRACTOR TO FOLLOW OSHA GUIDELINES FOR SAFE PRACTICES.

C:\USERS\FOWLER\DESKTOP\SAMPLE PROJECT - SOLIDWALL.DWG 1/13/2014 4:32 PM

The design and information shown on this drawing is provided as a service to the project owner, engineer and contractor by Contech Engineered Solutions LLC ("Contech"). Neither this drawing, nor any part thereof, may be used, reproduced or modified in any manner without the prior written consent of Contech. Failure to comply is done at the user's own risk and Contech expressly disclaims any liability or responsibility for such use.

If discrepancies between the supplied information upon which the drawing is based and actual field conditions are encountered as site work progresses, these discrepancies must be reported to Contech immediately for re-evaluation of the design. Contech accepts no liability for designs based on missing, incomplete or inaccurate information supplied by others.

MARK	DATE	REVISION DESCRIPTION	BY

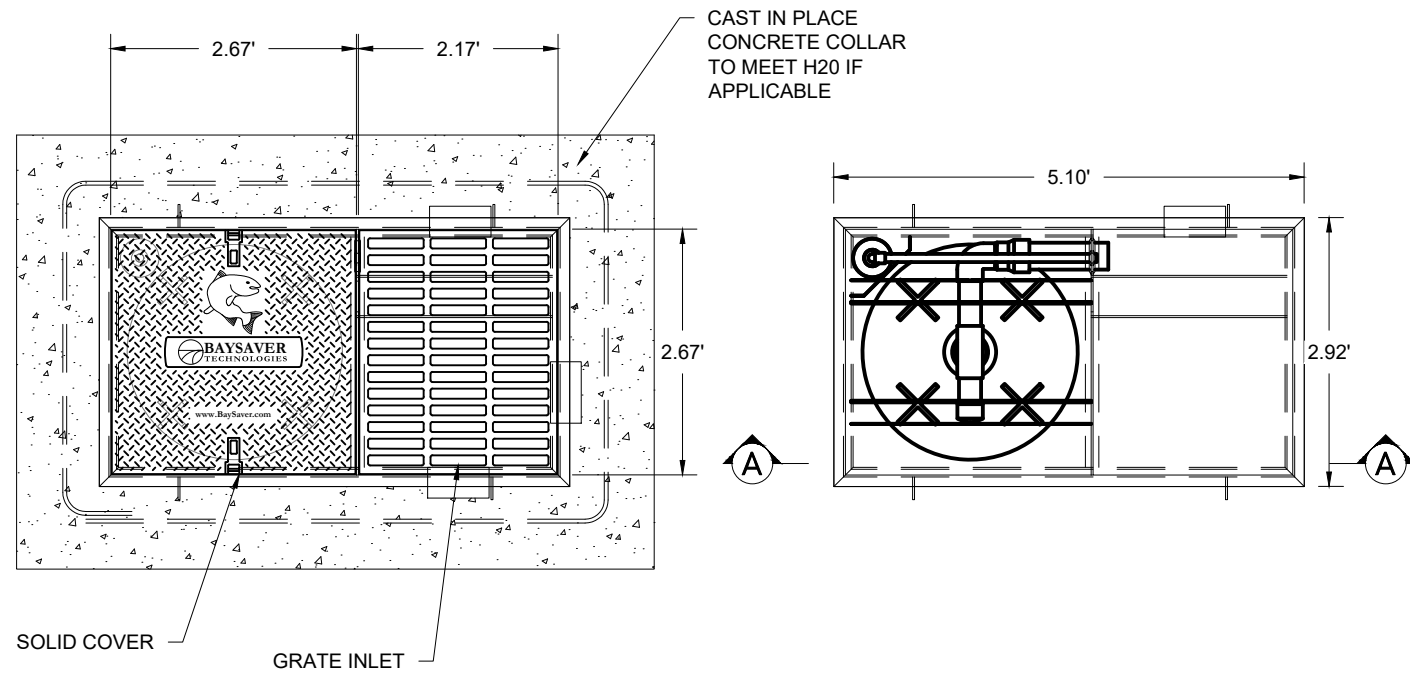
**CONTECH**  
ENGINEERED SOLUTIONS LLC  
www.ContechES.com  
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069  
800-338-1122 513-645-7000 513-645-7993 FAX

**CONTECH**  
CMP DETENTION SYSTEMS  
CONTECH CONTRACT DRAWING

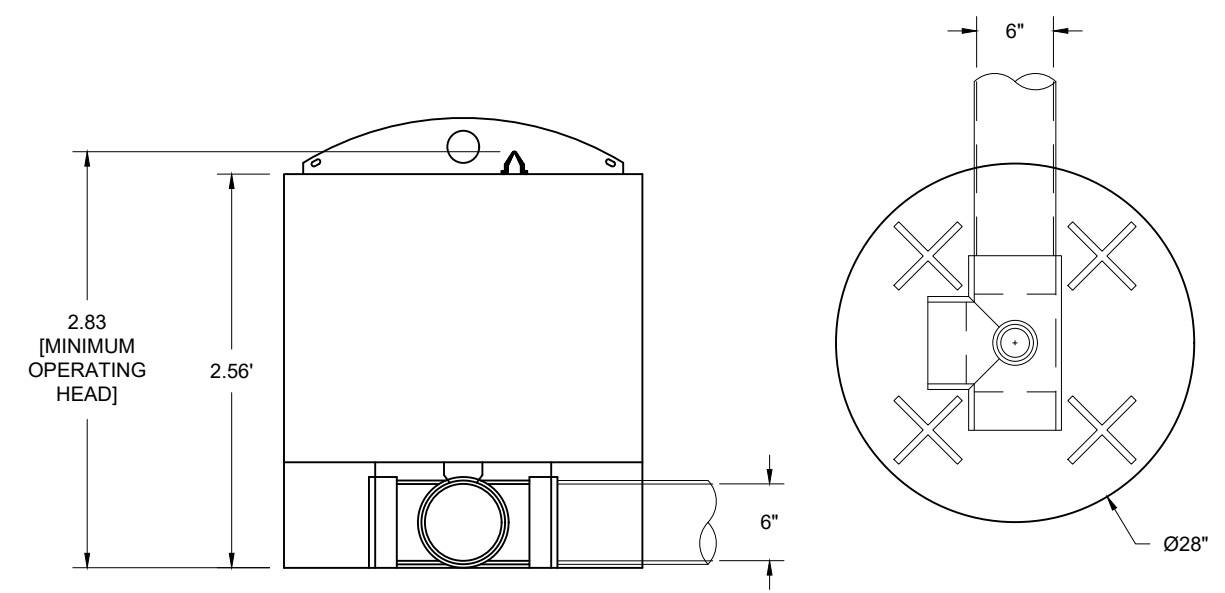
Ø96" UNDERGROUND DETENTION SYSTEM - 000000-001  
SAMPLE PROJECT  
ANYTOWN, USA  
SITE DESIGNATION: UDS

PROJECT No.: XXXXX	SEQ. No.: 001	DATE: 1/13/2014
DESIGNED: XXX	DRAWN: RTF	
CHECKED:	APPROVED:	
SHEET NO.: C4 OF 4		



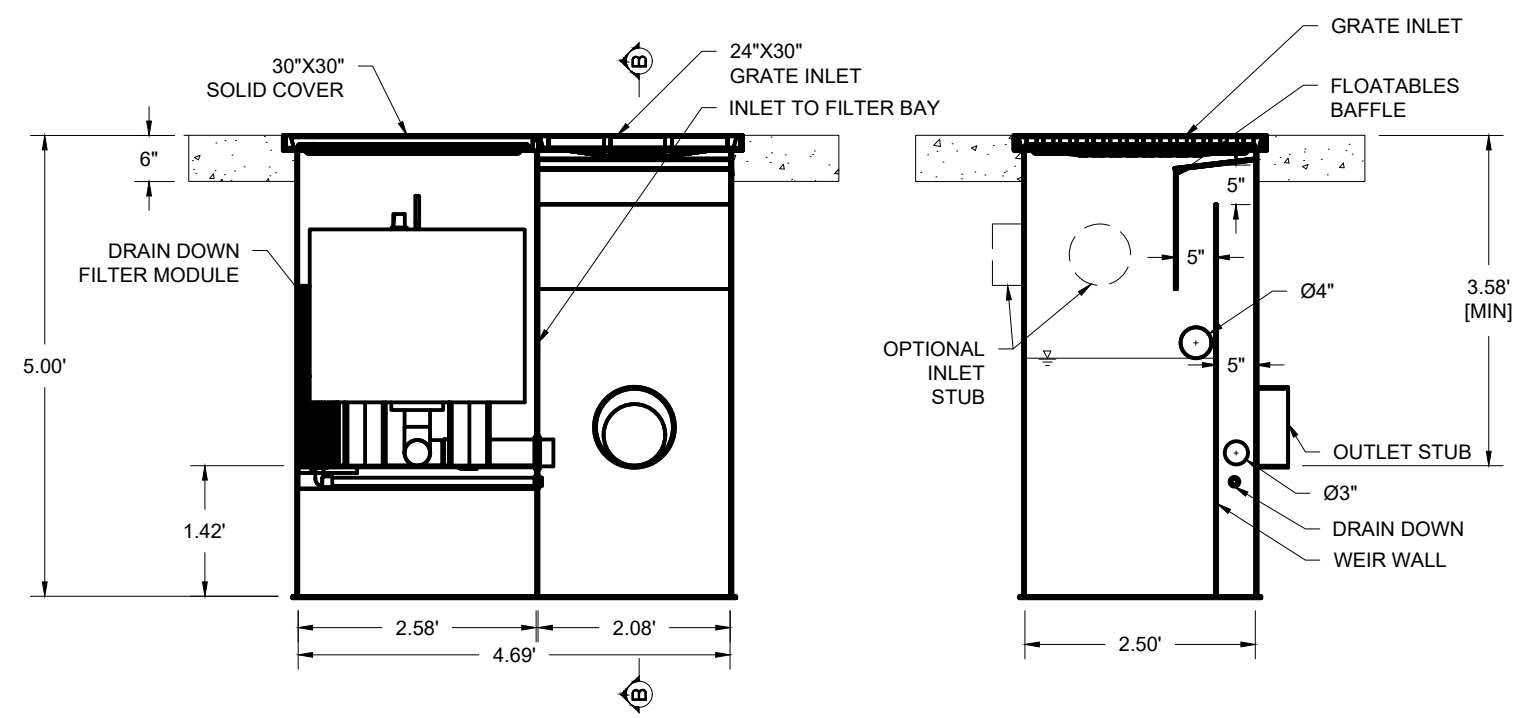


PLAN VIEW



BF545 CARTRIDGE

BAYFILTER CARTRIDGE DETAILS



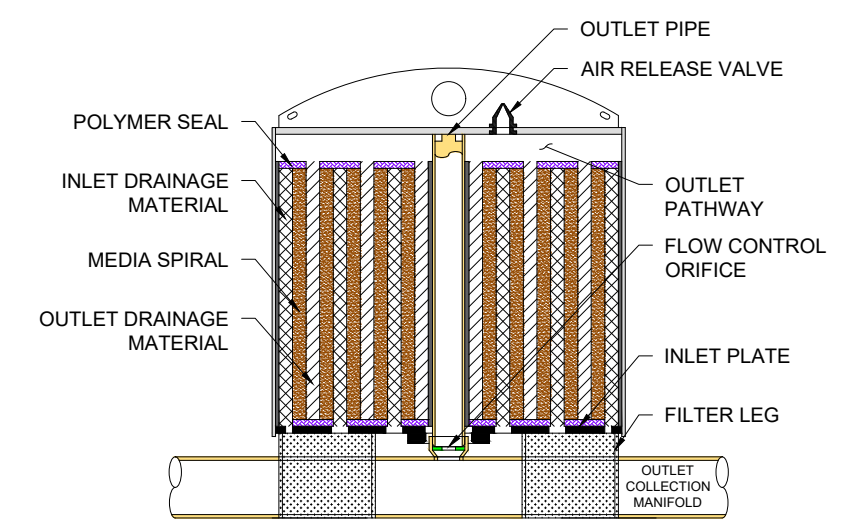
SECTION A-A

SECTION B-B

**STREAMFILTER CATCHBASIN 545-1**

# BAYFILTER CARTRIDGES	(1) - BF545 CARTRIDGE
CARTRIDGE DESIGN FLOW RATE	0.1 cfs
SYSTEM TREATMENT CAPACITY	0.1 cfs
PEAK BYPASS CAPACITY	1.8 cfs

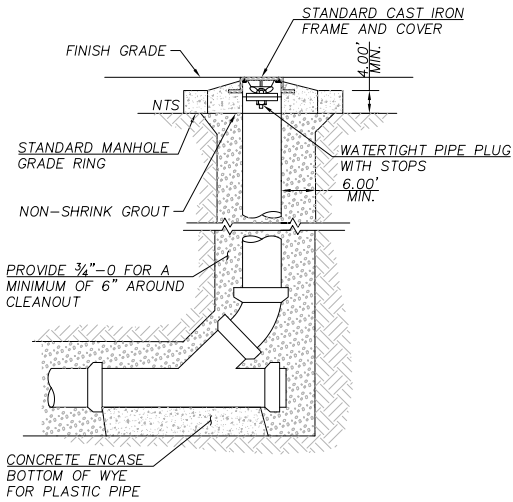
THE BAYFILTER STORMWATER MANAGEMENT SYSTEM IS A STORMWATER FILTRATION DEVICE DESIGNED TO REMOVE FINE SEDIMENTS, HEAVY METALS, AND PHOSPHORUS. THE BAYFILTER SYSTEM RELIES ON A SPIRAL WOUND MEDIA FILTER CARTRIDGE WITH APPROXIMATELY 45 SQUARE FEET OF FILTRATION AREA. THE FILTER CARTRIDGES REMOVE POLLUTANTS FROM RUNOFF BY FILTRATION (INTERCEPTION/ATTACHMENT) AND ADSORPTION.



**STREAMFILTER CATCH BASIN 545-1 STANDARD DETAIL**

THIS DRAWING HAS BEEN PREPARED BASED ON INFORMATION PROVIDED TO ADS UNDER THE DIRECTION OF THE SITE DESIGN ENGINEER OR OTHER PROJECT REPRESENTATIVE. THE SITE DESIGN ENGINEER SHALL REVIEW THIS DRAWING PRIOR TO CONSTRUCTION. IT IS THE ULTIMATE RESPONSIBILITY OF THE SITE DESIGN ENGINEER TO ENSURE THAT THE PRODUCT(S) DEPICTED AND ALL ASSOCIATED DETAILS MEET ALL APPLICABLE LAWS, REGULATIONS, AND PROJECT REQUIREMENTS.



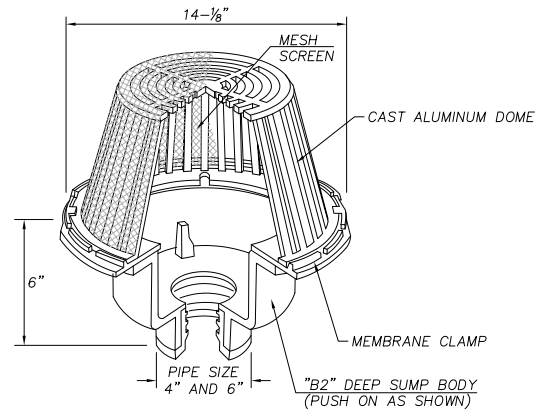


NOTE:

1. CONCRETE ENCASE ENTIRE WYE SECTION AND 45° BEND FOR CONCRETE PIPE.

### 3 CLEAN OUT

NTS

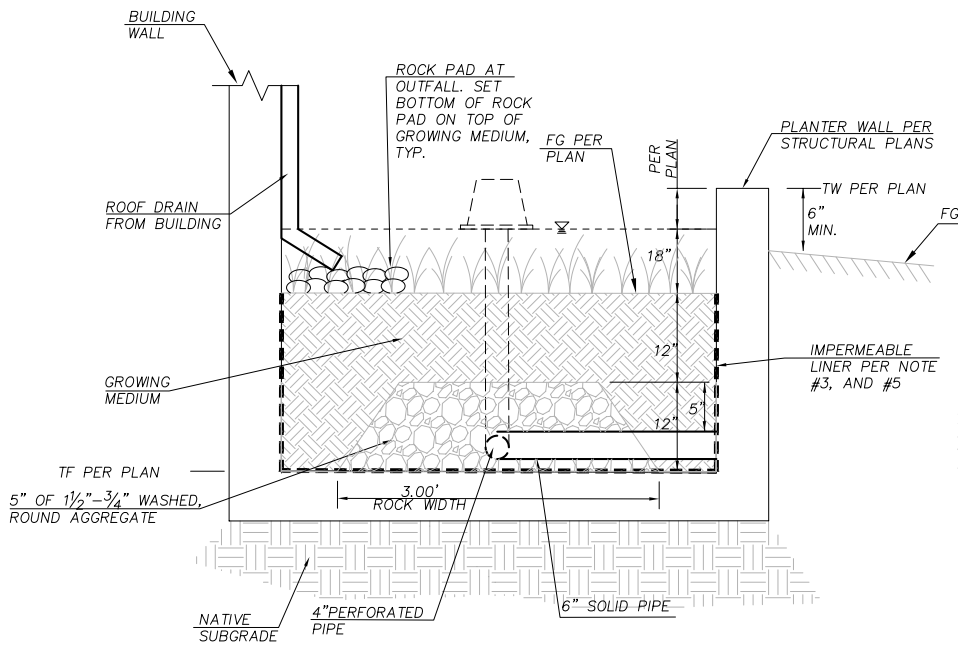


NOTES:

1. MODEL NO. FD-870 AS MANUFACTURED BY WATTS DRAINAGE, OR APPROVED EQUAL.
2. PIPE SIZE TO MATCH DRAINAGE PIPE SIZE.

### 7 OVERFLOW DRAIN

NTS

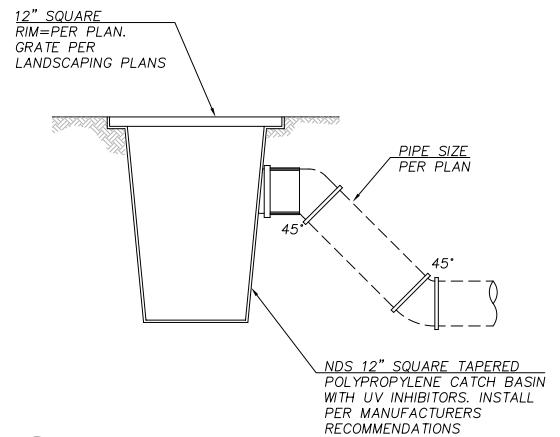


NOTES:

1. PLANTING PER LANDSCAPING PLANS.
2. GROWING MEDIUM PER SPECIFICATIONS.
3. FLUID APPLIED IMPERMEABLE LINER SHALL BE 30 MIL MINIMUM.
4. PROVIDE WATERTIGHT PENETRATION THROUGH IMPERMEABLE LINER FOR OUTFLOW FROM OVERFLOW DRAIN.
5. CONCRETE PLANTER BOX SHALL BE POURED MONOLITHICALLY WITH NO COLD JOINTS
6. CONNECT PERFORATED PIPE TO SOLID PIPE DOWNSTREAM OF AREA DRAIN.
7. CONSTRUCT ROCK PAD AT OUTFALLS.

### 2 STORMWATER FLOW-THROUGH PLANTER

NTS



### 5 AREA DRAIN

NTS

## **Appendix B**

### **Support Calculations**

PAC Report

Bayfilter Sizing

Detention Sizing

# PAC Report



Project Name KOB004	Permit No.	Created 3/21/23 12:31 PM
Project Address 9833 SE 17th Ave Milwaukie, OR 97222	Designer Nick Geiger	Last Modified 9/7/23 10:00 AM
	Company Humber Design Group	Report Generated 9/7/23 10:00 AM


## Project Summary

New townhomes

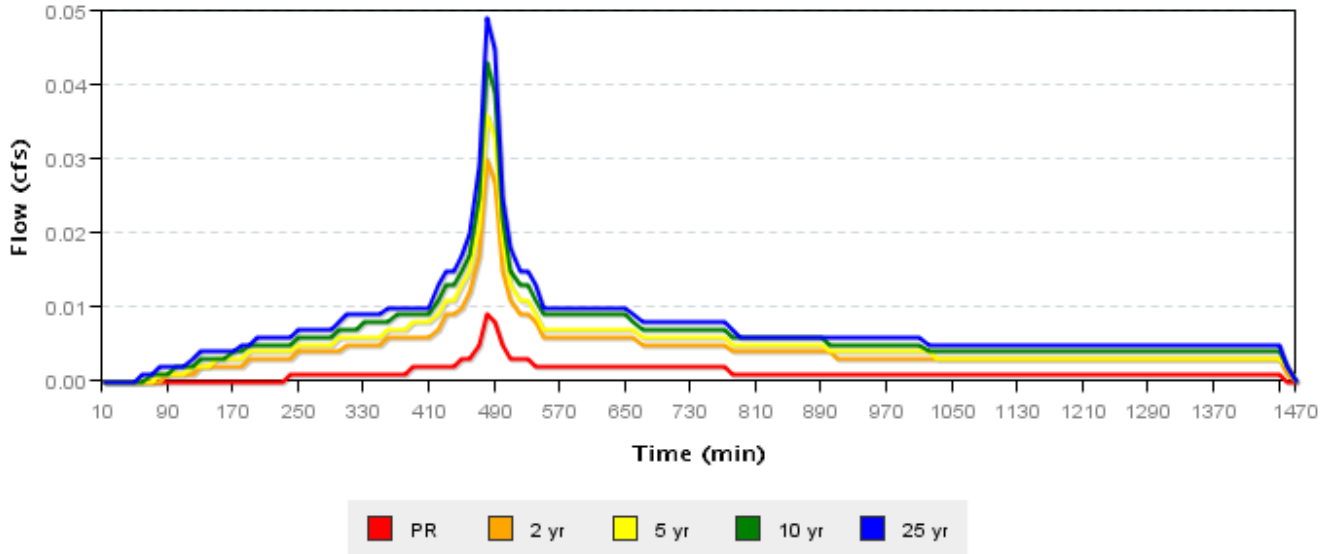
Catchment Name	Impervious Area (sq ft)	Native Soil Design Infiltration Rate	Hierarchy Category	Facility Type	Facility Config	Facility Size (sq ft)	Facility Sizing Ratio	PR Results	Flow Control Results
Triplex A	2100	0.01	3	Planter (Flat)	D	156	7.4%	Pass	Pass
Duplex A	1350	0.01	3	Planter (Flat)	D	101	7.5%	Pass	Pass
Duplex B	1500	0.01	3	Planter (Flat)	D	112	7.5%	Pass	Pass
Triplex B	1800	0.01	3	Planter (Flat)	D	134	7.4%	Pass	Pass
Duplex C	1200	0.01	3	Planter (Flat)	D	90	7.5%	Pass	Pass

## Catchment Triplex A

Site Soils & Infiltration Testing Data	Infiltration Testing Procedure	Open Pit Falling Head
	Native Soil Infiltration Rate ( $I_{test}$ )	<b>0.01</b> 
<b>Correction Factor</b>	$CF_{test}$	<b>2</b>
<b>Design Infiltration Rates</b>	Native Soil ( $I_{dsgn}$ )	<b>0.01 in/hr</b> 
	Imported Growing Medium	<b>2.00 in/hr</b>
<b>Catchment Information</b>	Hierarchy Category	<b>3</b>
	Disposal Point	<b>C</b>
	Hierarchy Description	<b>Off-site flow to drainageway, river, or storm-only pipe system</b>
	Pollution Reduction Requirement	<b>Pass</b>
	10-year Storm Requirement	<b>N/A</b>
	Flow Control Requirement	<b>The post-development peak rates for the 2, 5 and 10-year design storms must be equal or less than the pre-development rates.</b>
	Impervious Area	<b>2100 sq ft</b> <b>0.048 acre</b>
	Time of Concentration ( $T_c$ )	<b>5</b>
	Pre-Development Curve Number ( $CN_{pre}$ )	<b>89</b>
	Post-Development Curve Number ( $CN_{post}$ )	<b>98</b>

 Indicates value is outside of recommended range

# SBUH Results



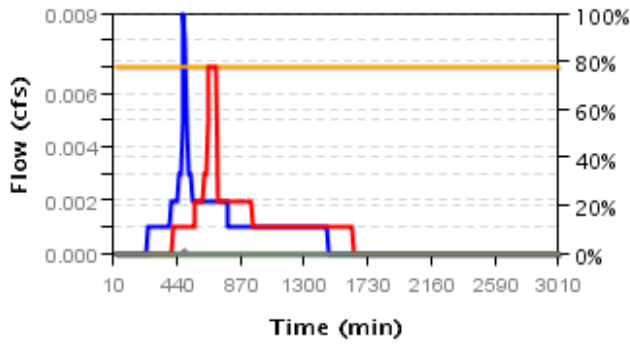
	Pre-Development Rate and Volume		Post-Development Rate and Volume	
	Peak Rate (cfs)	Volume (cf)	Peak Rate (cfs)	Volume (cf)
PR	0.001	32.682	0.009	109.731
2 yr	0.018	239.336	0.03	379.986
5 yr	0.024	316.693	0.036	467.022
10 yr	0.031	396.361	0.043	554.188
25 yr	0.037	477.631	0.049	641.437

# Facility Triplex A

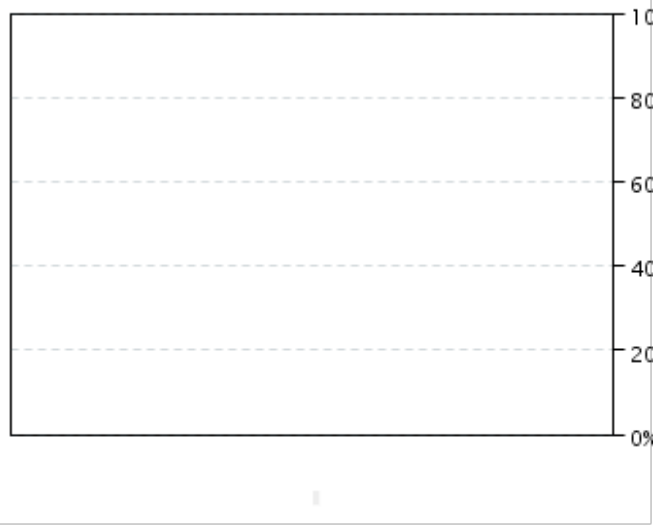
<b>Facility Details</b>	Facility Type	<b>Planter (Flat)</b>
	Facility Configuration	<b>D: Lined Facility with RS and Ud</b>
	Facility Shape	<b>Planter</b>
<b>Above Grade Storage Data</b>		
	Bottom Area	<b>156 sq ft</b>
	Bottom Width	<b>5.00 ft</b>
	Storage Depth 1	<b>6.0 in</b>
	Growing Medium Depth	<b>18 in</b>
	Surface Capacity at Depth 1	<b>78.0 cu ft</b>
	Design Infiltration Rate for Native Soil	<b>0.000 in/hr</b>
	Infiltration Capacity	<b>0.007 cfs</b>
<b>Facility Facts</b>	Total Facility Area Including Freeboard	<b>156.00 sq ft</b>
	Sizing Ratio	<b>7.4%</b>
<b>Pollution Reduction Results</b>	Pollution Reduction Score	<b>Pass</b>
	Overflow Volume	<b>117.509 cf</b>
	Surface Capacity Used	<b>2%</b>
<b>Flow Control Results</b>	Flow Control Score	<b>Pass</b>
	Overflow Volume	<b>553.347 cf</b>
	Surface Capacity Used	<b>100%</b>

	<b>Post-development outflow (cfs)</b>		<b>Pre-development inflow (cfs)</b>	
<b>2 year</b>	0.007	≤	0.018	<b>Pass</b>
<b>5 year</b>	0.007	≤	0.024	<b>Pass</b>
<b>10 year</b>	0.022	≤	0.031	<b>Pass</b>

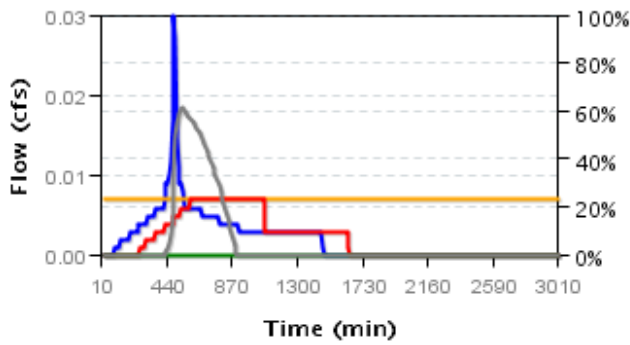
**Pollution Reduction Event Surface Facility Modeling**



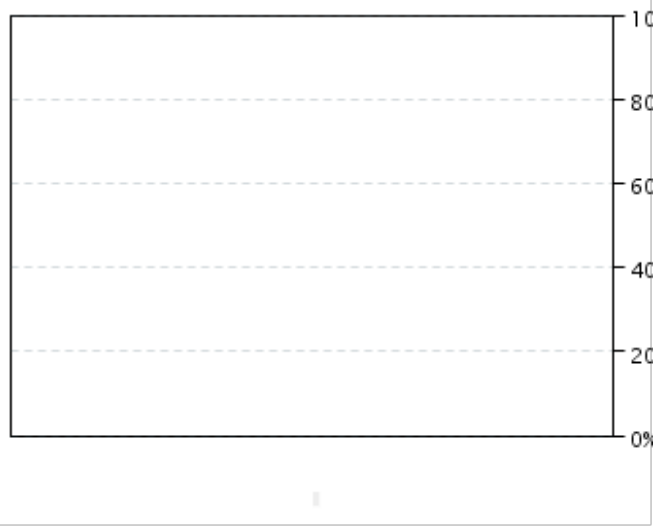
**Pollution Reduction Event Below Grade Modeling**



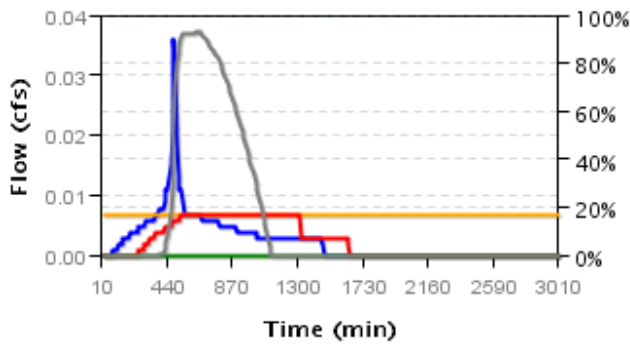
**2 Year Event Surface Facility Modeling**



**2 Year Event Below Grade Modeling**



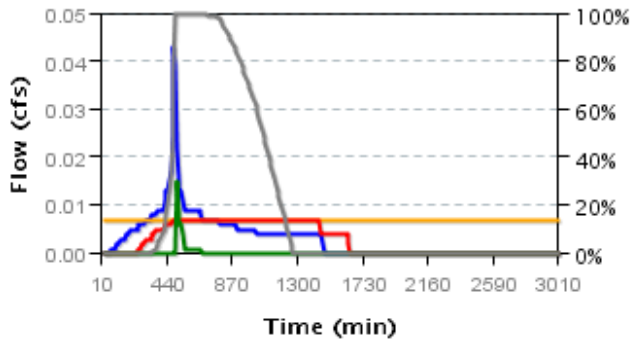
**5 Year Event Surface Facility Modeling**



**5 Year Event Below Grade Modeling**



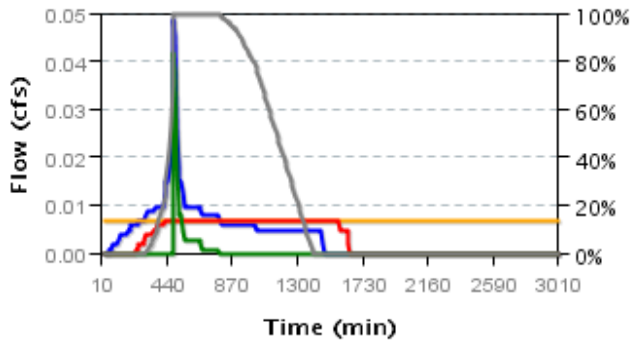
**10 Year Event Surface Facility Modeling**



**10 Year Event Below Grade Modeling**



**25 Year Event Surface Facility Modeling**



**25 Year Event Below Grade Modeling**



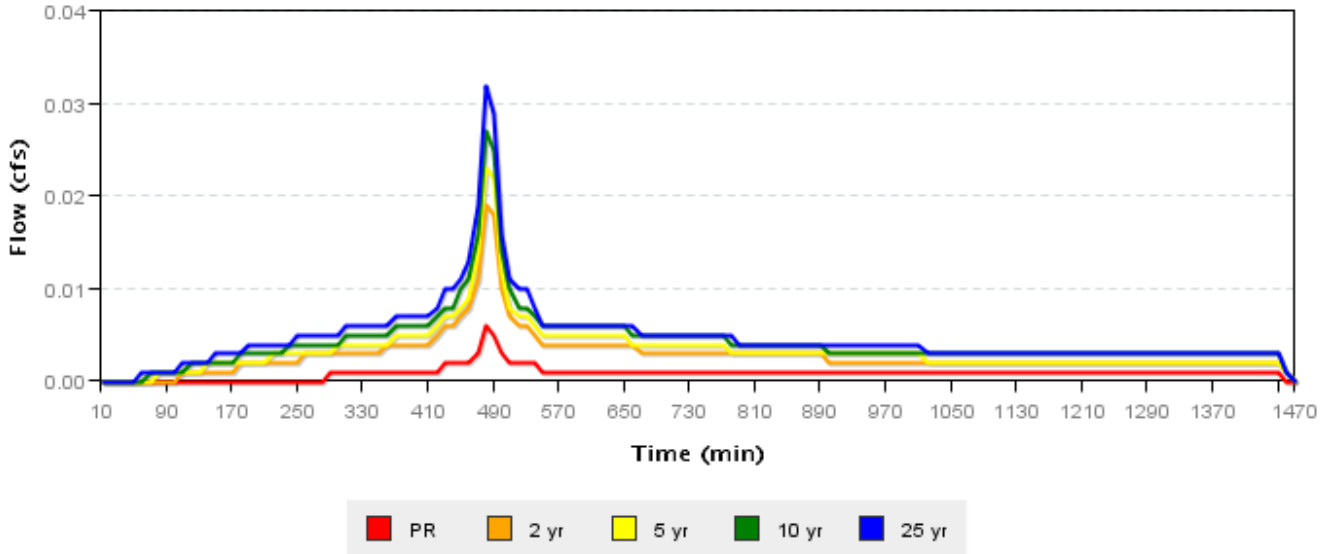


## Catchment Duplex A

Site Soils & Infiltration Testing Data	Infiltration Testing Procedure	Encased Falling Head
	Native Soil Infiltration Rate ( $I_{test}$ )	<b>0.01</b> ⚠
<b>Correction Factor</b>	$CF_{test}$	<b>2</b>
<b>Design Infiltration Rates</b>	Native Soil ( $I_{dsgn}$ )	<b>0.01 in/hr</b> ⚠
	Imported Growing Medium	<b>2.00 in/hr</b>
<b>Catchment Information</b>	Hierarchy Category	<b>3</b>
	Disposal Point	<b>C</b>
	Hierarchy Description	<b>Off-site flow to drainageway, river, or storm-only pipe system</b>
	Pollution Reduction Requirement	<b>Pass</b>
	10-year Storm Requirement	<b>N/A</b>
	Flow Control Requirement	<b>The post-development peak rates for the 2, 5 and 10-year design storms must be equal or less than the pre-development rates.</b>
	Impervious Area	<b>1350 sq ft 0.031 acre</b>
	Time of Concentration ( $T_c$ )	<b>5</b>
	Pre-Development Curve Number ( $CN_{pre}$ )	<b>89</b>
	Post-Development Curve Number ( $CN_{post}$ )	<b>98</b>

⚠ Indicates value is outside of recommended range

# SBUH Results



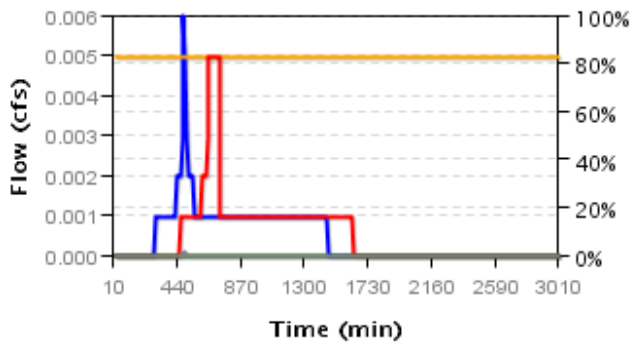
	Pre-Development Rate and Volume		Post-Development Rate and Volume	
	Peak Rate (cfs)	Volume (cf)	Peak Rate (cfs)	Volume (cf)
<b>PR</b>	0.001	21.01	0.006	70.541
<b>2 yr</b>	0.011	153.859	0.019	244.277
<b>5 yr</b>	0.015	203.588	0.023	300.229
<b>10 yr</b>	0.02	254.804	0.027	356.264
<b>25 yr</b>	0.024	307.049	0.032	412.352

# Facility Duplex A

<b>Facility Details</b>	Facility Type	<b>Planter (Flat)</b>
	Facility Configuration	<b>D: Lined Facility with RS and Ud</b>
	Facility Shape	<b>Planter</b>
<b>Above Grade Storage Data</b>		
	Bottom Area	<b>101 sq ft</b>
	Bottom Width	<b>5.00 ft</b>
	Storage Depth 1	<b>6.0 in</b>
	Growing Medium Depth	<b>18 in</b>
	Surface Capacity at Depth 1	<b>50.5 cu ft</b>
	Design Infiltration Rate for Native Soil	<b>0.000 in/hr</b>
	Infiltration Capacity	<b>0.005 cfs</b>
<b>Facility Facts</b>	Total Facility Area Including Freeboard	<b>101.00 sq ft</b>
	Sizing Ratio	<b>7.5%</b>
<b>Pollution Reduction Results</b>	Pollution Reduction Score	<b>Pass</b>
	Overflow Volume	<b>79.641 cf</b>
	Surface Capacity Used	<b>2%</b>
<b>Flow Control Results</b>	Flow Control Score	<b>Pass</b>
	Overflow Volume	<b>356.009 cf</b>
	Surface Capacity Used	<b>100%</b>

	<b>Post-development outflow (cfs)</b>		<b>Pre-development inflow (cfs)</b>	
<b>2 year</b>	0.005	≤	0.011	<b>Pass</b>
<b>5 year</b>	0.005	≤	0.015	<b>Pass</b>
<b>10 year</b>	0.014	≤	0.02	<b>Pass</b>

**Pollution Reduction Event Surface Facility Modeling**

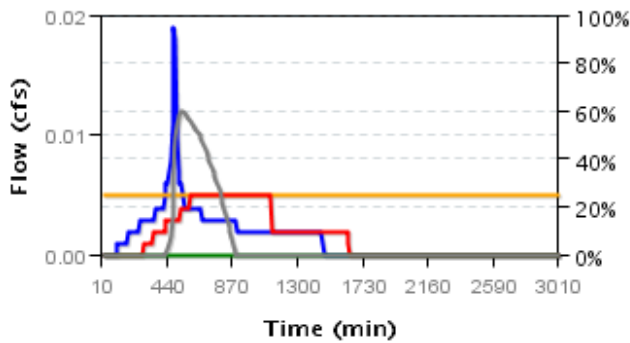


- Inflow from rain
- Total flow to below grade storage
- Percent surface capacity
- Infiltration capacity
- Flow bypassing growing medium

**Pollution Reduction Event Below Grade Modeling**

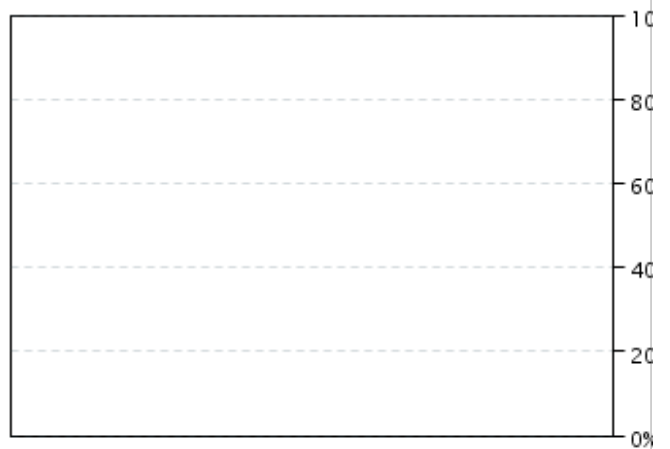


**2 Year Event Surface Facility Modeling**

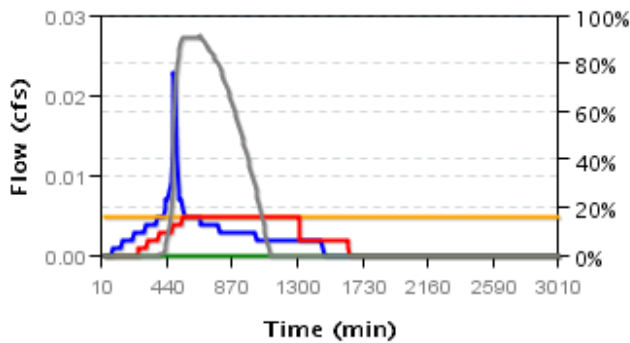


- Inflow from rain
- Total flow to below grade storage
- Percent surface capacity
- Infiltration capacity
- Flow bypassing growing medium

**2 Year Event Below Grade Modeling**



**5 Year Event Surface Facility Modeling**

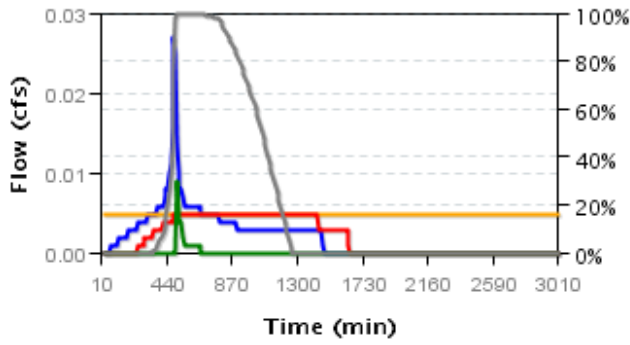


- Inflow from rain
- Total flow to below grade storage
- Percent surface capacity
- Infiltration capacity
- Flow bypassing growing medium

**5 Year Event Below Grade Modeling**



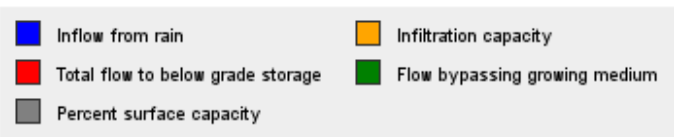
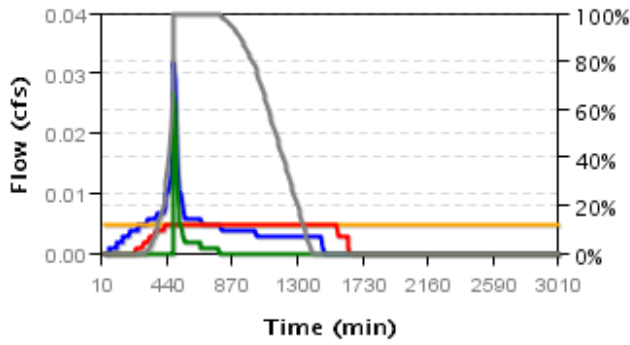
**10 Year Event Surface Facility Modeling**



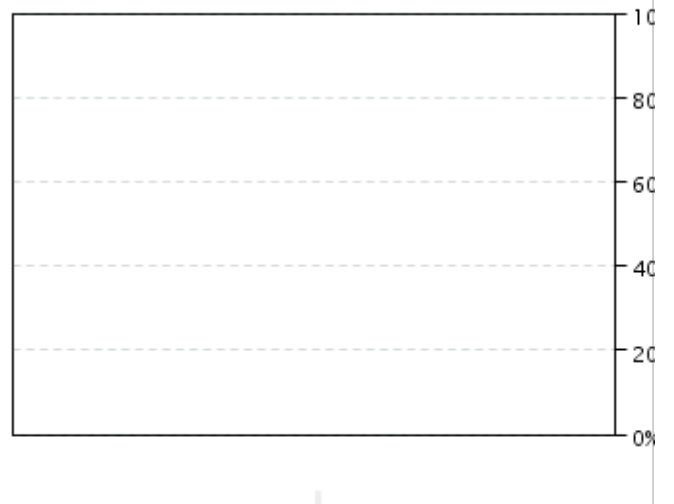
**10 Year Event Below Grade Modeling**



**25 Year Event Surface Facility Modeling**



**25 Year Event Below Grade Modeling**

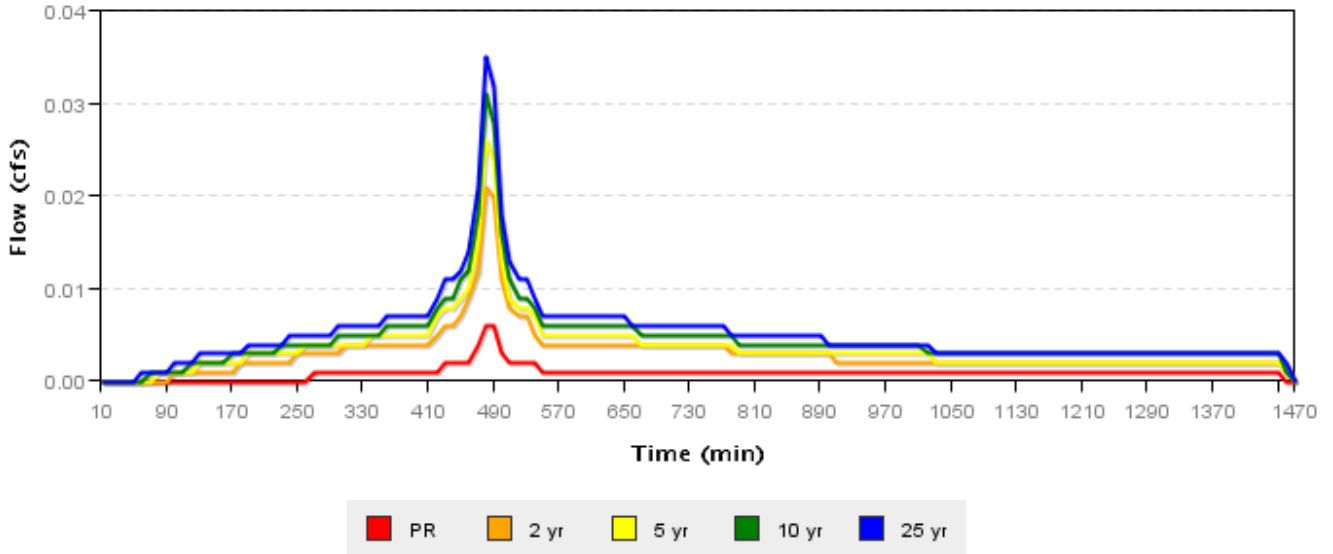


## Catchment Duplex B

Site Soils & Infiltration Testing Data	Infiltration Testing Procedure	Encased Falling Head
	Native Soil Infiltration Rate ( $I_{test}$ )	<b>0.01</b> ⚠️
<b>Correction Factor</b>	$CF_{test}$	<b>2</b>
<b>Design Infiltration Rates</b>	Native Soil ( $I_{dsgn}$ )	<b>0.01 in/hr</b> ⚠️
	Imported Growing Medium	<b>2.00 in/hr</b>
<b>Catchment Information</b>	Hierarchy Category	<b>3</b>
	Disposal Point	<b>C</b>
	Hierarchy Description	<b>Off-site flow to drainageway, river, or storm-only pipe system</b>
	Pollution Reduction Requirement	<b>Pass</b>
	10-year Storm Requirement	<b>N/A</b>
	Flow Control Requirement	<b>The post-development peak rates for the 2, 5 and 10-year design storms must be equal or less than the pre-development rates.</b>
	Impervious Area	<b>1500 sq ft 0.034 acre</b>
	Time of Concentration ( $T_c$ )	<b>5</b>
	Pre-Development Curve Number ( $CN_{pre}$ )	<b>89</b>
	Post-Development Curve Number ( $CN_{post}$ )	<b>98</b>

⚠️ Indicates value is outside of recommended range

# SBUH Results



	Pre-Development Rate and Volume		Post-Development Rate and Volume	
	Peak Rate (cfs)	Volume (cf)	Peak Rate (cfs)	Volume (cf)
PR	0.001	23.345	0.006	78.379
2 yr	0.013	170.954	0.021	271.419
5 yr	0.017	226.209	0.026	333.587
10 yr	0.022	283.115	0.031	395.849
25 yr	0.027	341.165	0.035	458.169

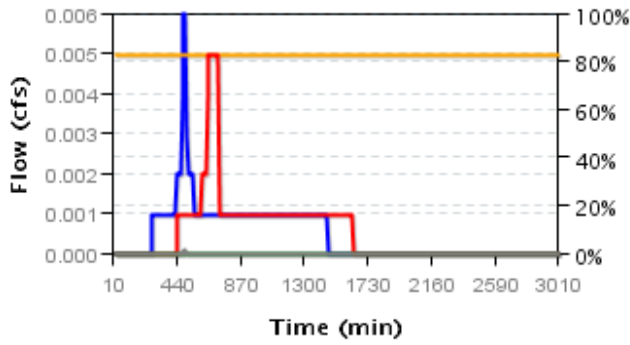
## Facility Duplex B

<b>Facility Details</b>	Facility Type	<b>Planter (Flat)</b>
	Facility Configuration	<b>D: Lined Facility with RS and Ud</b>
	Facility Shape	<b>Planter</b>
<b>Above Grade Storage Data</b>		
	Bottom Area	<b>112 sq ft</b>
	Bottom Width	<b>5.00 ft</b>
	Storage Depth 1	<b>6.0 in</b>
	Growing Medium Depth	<b>18 in</b>
	Surface Capacity at Depth 1	<b>56.0 cu ft</b>
	Design Infiltration Rate for Native Soil	<b>0.000 in/hr</b>
	Infiltration Capacity	<b>0.005 cfs</b>
<b>Facility Facts</b>	Total Facility Area Including Freeboard	<b>112.00 sq ft</b>
	Sizing Ratio	<b>7.5%</b>
<b>Pollution Reduction Results</b>	Pollution Reduction Score	<b>Pass</b>
	Overflow Volume	<b>86.133 cf</b>
	Surface Capacity Used	<b>2%</b>
<b>Flow Control Results</b>	Flow Control Score	<b>Pass</b>
	Overflow Volume	<b>396.502 cf</b>
	Surface Capacity Used	<b>100%</b>

	<b>Post-development outflow (cfs)</b>		<b>Pre-development inflow (cfs)</b>	
<b>2 year</b>	0.005	≤	0.013	<b>Pass</b>
<b>5 year</b>	0.005	≤	0.017	<b>Pass</b>
<b>10 year</b>	0.016	≤	0.022	<b>Pass</b>



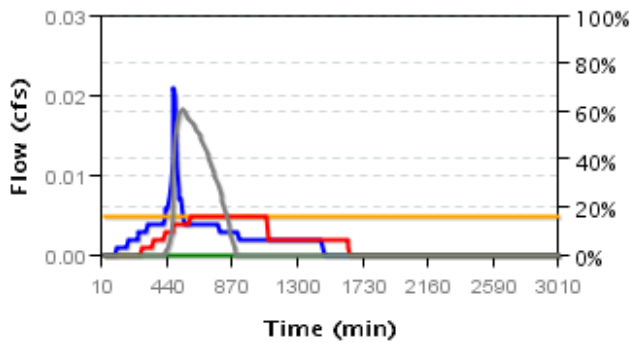
**Pollution Reduction Event Surface Facility Modeling**



**Pollution Reduction Event Below Grade Modeling**



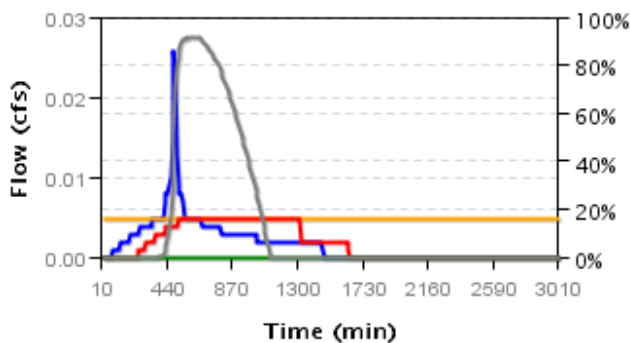
**2 Year Event Surface Facility Modeling**



**2 Year Event Below Grade Modeling**



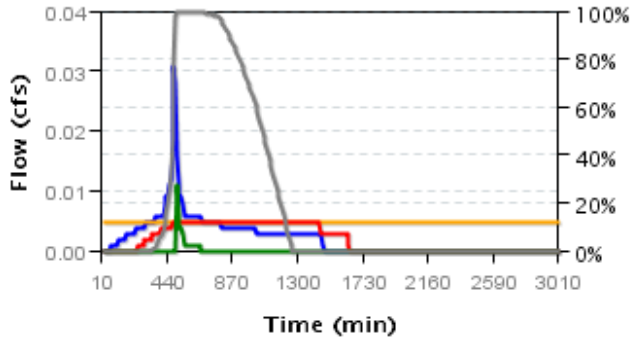
**5 Year Event Surface Facility Modeling**



**5 Year Event Below Grade Modeling**



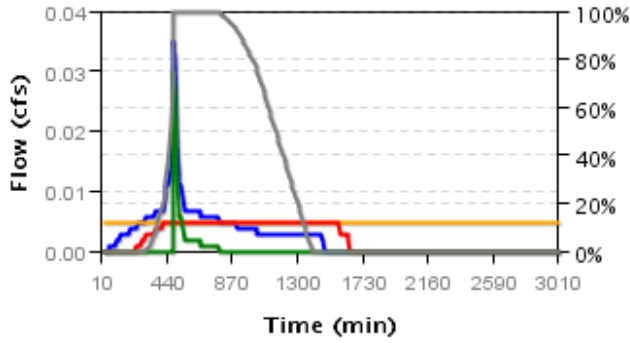
**10 Year Event Surface Facility Modeling**



**10 Year Event Below Grade Modeling**



**25 Year Event Surface Facility Modeling**



**25 Year Event Below Grade Modeling**

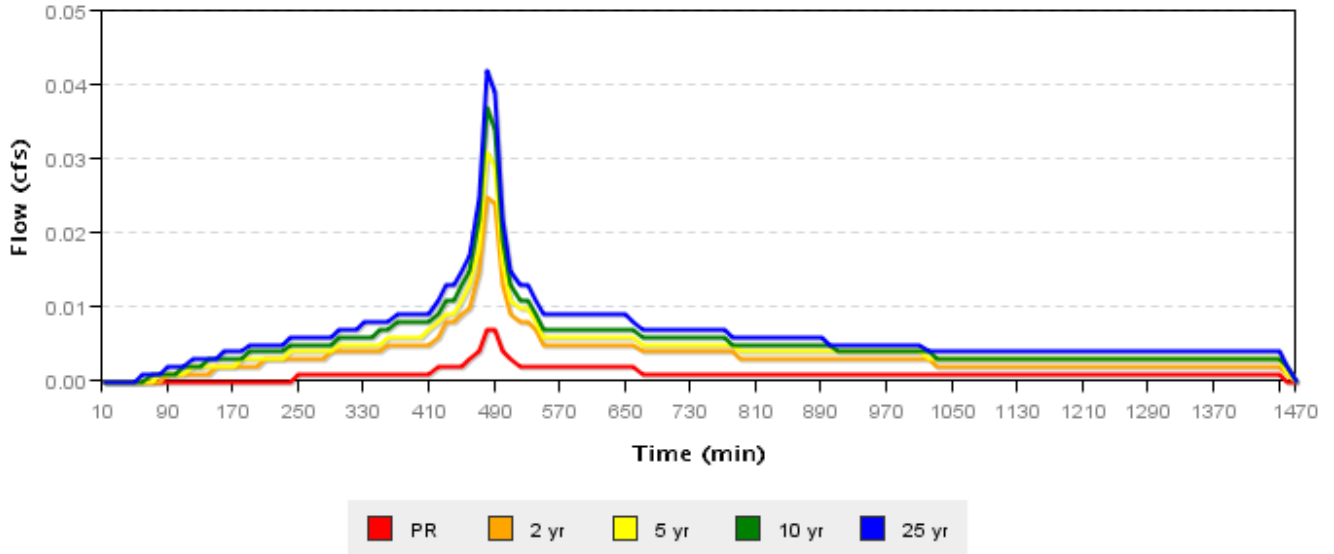


## Catchment Triplex B

Site Soils & Infiltration Testing Data	Infiltration Testing Procedure	Encased Falling Head
	Native Soil Infiltration Rate ( $I_{test}$ )	<b>0.01</b> ⚠️
<b>Correction Factor</b>	$CF_{test}$	<b>2</b>
<b>Design Infiltration Rates</b>	Native Soil ( $I_{dsgn}$ )	<b>0.01 in/hr</b> ⚠️
	Imported Growing Medium	<b>2.00 in/hr</b>
<b>Catchment Information</b>	Hierarchy Category	<b>3</b>
	Disposal Point	<b>C</b>
	Hierarchy Description	<b>Off-site flow to drainageway, river, or storm-only pipe system</b>
	Pollution Reduction Requirement	<b>Pass</b>
	10-year Storm Requirement	<b>N/A</b>
	Flow Control Requirement	<b>The post-development peak rates for the 2, 5 and 10-year design storms must be equal or less than the pre-development rates.</b>
	Impervious Area	<b>1800 sq ft 0.041 acre</b>
	Time of Concentration ( $T_c$ )	<b>5</b>
	Pre-Development Curve Number ( $CN_{pre}$ )	<b>89</b>
	Post-Development Curve Number ( $CN_{post}$ )	<b>98</b>

⚠️ Indicates value is outside of recommended range

# SBUH Results



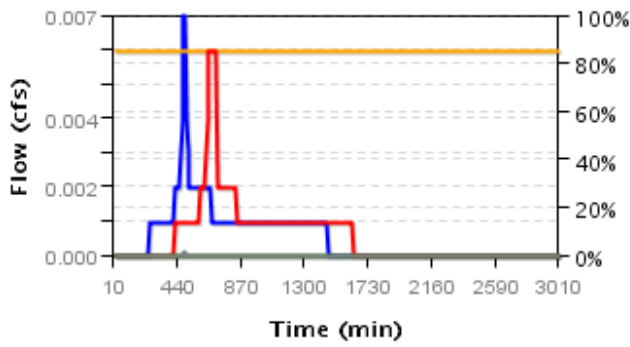
	Pre-Development Rate and Volume		Post-Development Rate and Volume	
	Peak Rate (cfs)	Volume (cf)	Peak Rate (cfs)	Volume (cf)
<b>PR</b>	0.001	28.014	0.007	94.055
<b>2 yr</b>	0.015	205.145	0.025	325.703
<b>5 yr</b>	0.021	271.451	0.031	400.305
<b>10 yr</b>	0.026	339.738	0.037	475.019
<b>25 yr</b>	0.032	409.398	0.042	549.803

## Facility Triplex B

<b>Facility Details</b>	Facility Type	<b>Planter (Flat)</b>
	Facility Configuration	<b>D: Lined Facility with RS and Ud</b>
	Facility Shape	<b>Planter</b>
<b>Above Grade Storage Data</b>		
	Bottom Area	<b>134 sq ft</b>
	Bottom Width	<b>5.00 ft</b>
	Storage Depth 1	<b>6.0 in</b>
	Growing Medium Depth	<b>18 in</b>
	Surface Capacity at Depth 1	<b>67.0 cu ft</b>
	Design Infiltration Rate for Native Soil	<b>0.000 in/hr</b>
	Infiltration Capacity	<b>0.006 cfs</b>
<b>Facility Facts</b>	Total Facility Area Including Freeboard	<b>134.00 sq ft</b>
	Sizing Ratio	<b>7.4%</b>
<b>Pollution Reduction Results</b>	Pollution Reduction Score	<b>Pass</b>
	Overflow Volume	<b>100.770 cf</b>
	Surface Capacity Used	<b>2%</b>
<b>Flow Control Results</b>	Flow Control Score	<b>Pass</b>
	Overflow Volume	<b>474.925 cf</b>
	Surface Capacity Used	<b>100%</b>

	<b>Post-development outflow (cfs)</b>		<b>Pre-development inflow (cfs)</b>	
<b>2 year</b>	0.006	≤	0.015	<b>Pass</b>
<b>5 year</b>	0.006	≤	0.021	<b>Pass</b>
<b>10 year</b>	0.019	≤	0.026	<b>Pass</b>

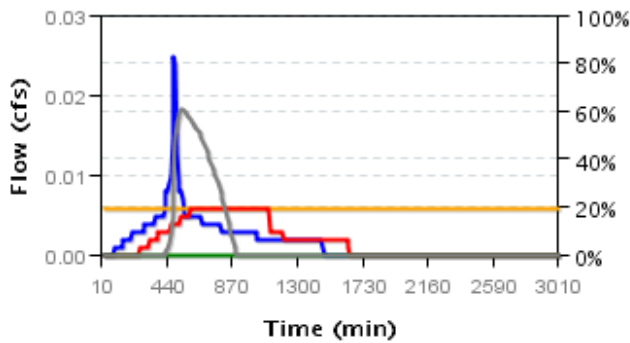
**Pollution Reduction Event Surface Facility Modeling**



**Pollution Reduction Event Below Grade Modeling**



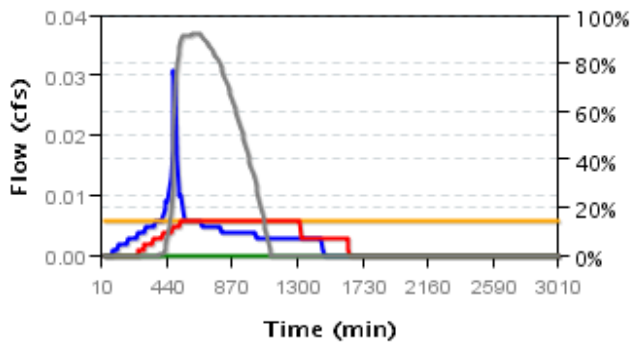
**2 Year Event Surface Facility Modeling**



**2 Year Event Below Grade Modeling**



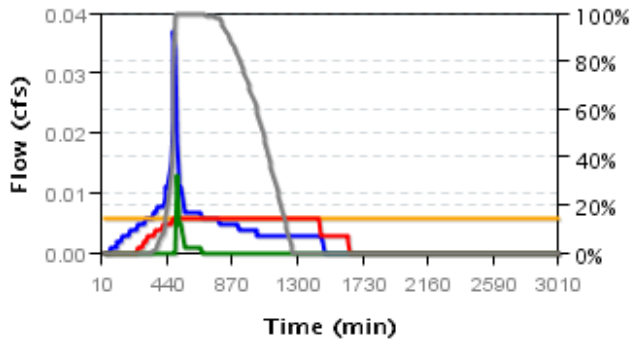
**5 Year Event Surface Facility Modeling**



**5 Year Event Below Grade Modeling**



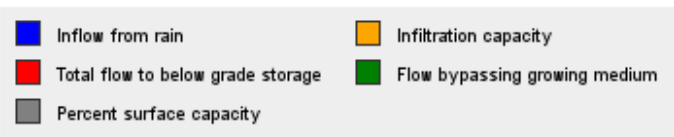
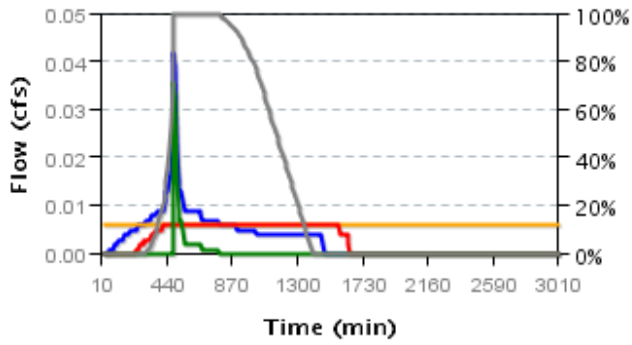
**10 Year Event Surface Facility Modeling**



**10 Year Event Below Grade Modeling**



**25 Year Event Surface Facility Modeling**



**25 Year Event Below Grade Modeling**



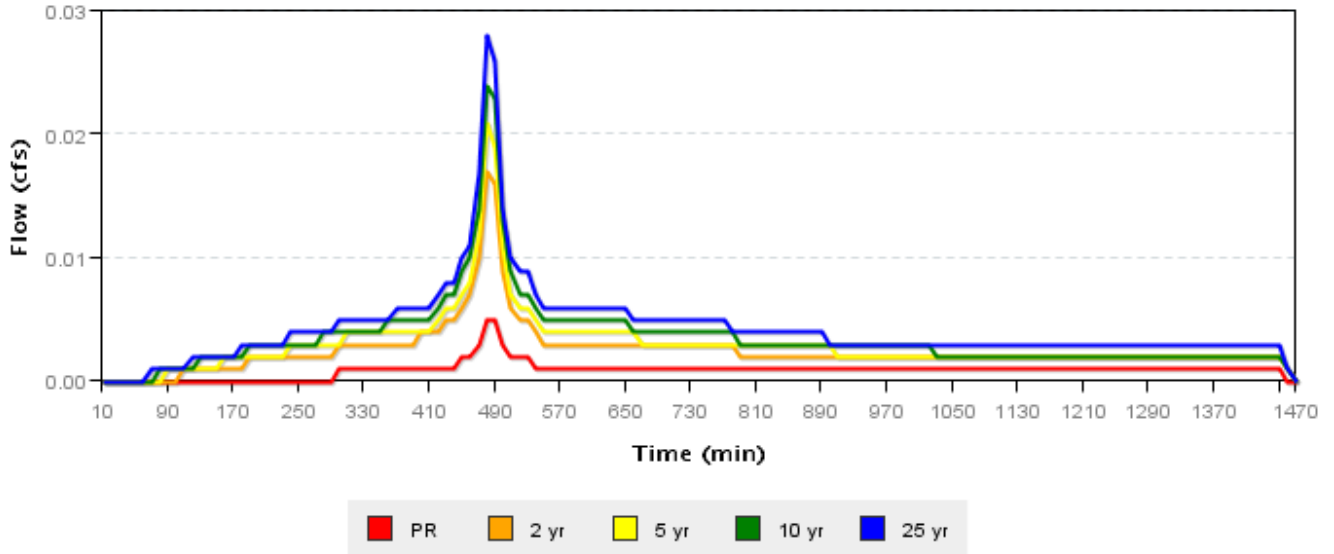
## Catchment Duplex C

Site Soils & Infiltration Testing Data	Infiltration Testing Procedure	Encased Falling Head
	Native Soil Infiltration Rate ( $I_{test}$ )	<b>0.01</b> ⚠️
<b>Correction Factor</b>	$CF_{test}$	<b>2</b>
<b>Design Infiltration Rates</b>	Native Soil ( $I_{dsgn}$ )	<b>0.01 in/hr</b> ⚠️
	Imported Growing Medium	<b>2.00 in/hr</b>
<b>Catchment Information</b>	Hierarchy Category	<b>3</b>
	Disposal Point	<b>C</b>
	Hierarchy Description	<b>Off-site flow to drainageway, river, or storm-only pipe system</b>
	Pollution Reduction Requirement	<b>Pass</b>
	10-year Storm Requirement	<b>N/A</b>
	Flow Control Requirement	<b>The post-development peak rates for the 2, 5 and 10-year design storms must be equal or less than the pre-development rates.</b>
	Impervious Area	<b>1200 sq ft 0.028 acre</b>
	Time of Concentration ( $T_c$ )	<b>5</b>
	Pre-Development Curve Number ( $CN_{pre}$ )	<b>89</b>
	Post-Development Curve Number ( $CN_{post}$ )	<b>98</b>

⚠️ Indicates value is outside of recommended range



# SBUH Results



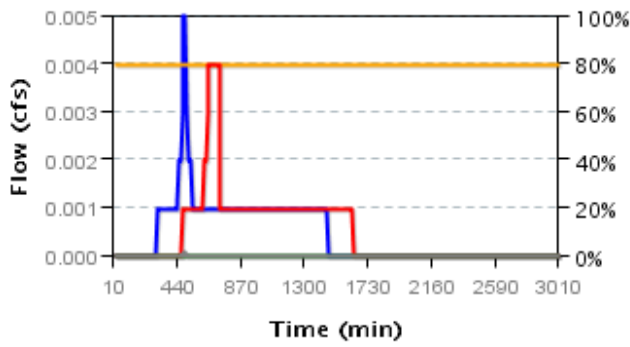
	Pre-Development Rate and Volume		Post-Development Rate and Volume	
	Peak Rate (cfs)	Volume (cf)	Peak Rate (cfs)	Volume (cf)
<b>PR</b>	0.001	18.676	0.005	62.703
<b>2 yr</b>	0.01	136.763	0.017	217.135
<b>5 yr</b>	0.014	180.967	0.021	266.87
<b>10 yr</b>	0.017	226.492	0.024	316.679
<b>25 yr</b>	0.021	272.932	0.028	366.535

## Facility Duplex C

<b>Facility Details</b>	Facility Type	<b>Planter (Flat)</b>
	Facility Configuration	<b>D: Lined Facility with RS and Ud</b>
	Facility Shape	<b>Planter</b>
<b>Above Grade Storage Data</b>		
	Bottom Area	<b>90 sq ft</b>
	Bottom Width	<b>5.00 ft</b>
	Storage Depth 1	<b>6.0 in</b>
	Growing Medium Depth	<b>18 in</b>
	Surface Capacity at Depth 1	<b>45.0 cu ft</b>
	Design Infiltration Rate for Native Soil	<b>0.000 in/hr</b>
	Infiltration Capacity	<b>0.004 cfs</b>
<b>Facility Facts</b>	Total Facility Area Including Freeboard	<b>90.00 sq ft</b>
	Sizing Ratio	<b>7.5%</b>
<b>Pollution Reduction Results</b>	Pollution Reduction Score	<b>Pass</b>
	Overflow Volume	<b>70.842 cf</b>
	Surface Capacity Used	<b>2%</b>
<b>Flow Control Results</b>	Flow Control Score	<b>Pass</b>
	Overflow Volume	<b>316.934 cf</b>
	Surface Capacity Used	<b>100%</b>

	Post-development outflow (cfs)	≤	Pre-development inflow (cfs)	
<b>2 year</b>	0.004	≤	0.01	<b>Pass</b>
<b>5 year</b>	0.004	≤	0.014	<b>Pass</b>
<b>10 year</b>	0.013	≤	0.017	<b>Pass</b>

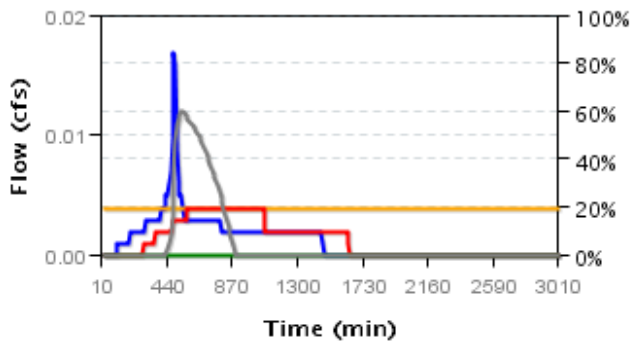
**Pollution Reduction Event Surface Facility Modeling**



**Pollution Reduction Event Below Grade Modeling**



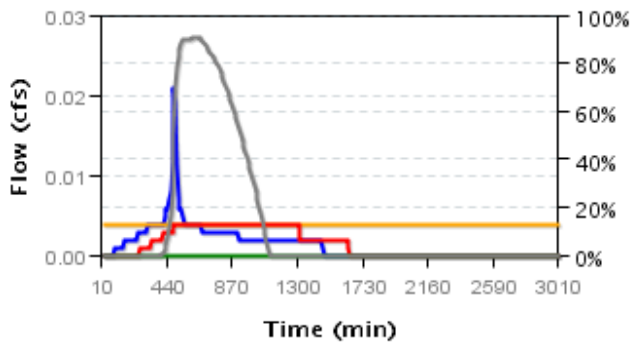
**2 Year Event Surface Facility Modeling**



**2 Year Event Below Grade Modeling**



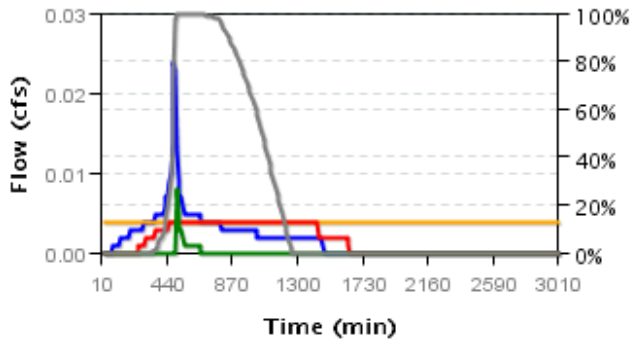
**5 Year Event Surface Facility Modeling**



**5 Year Event Below Grade Modeling**



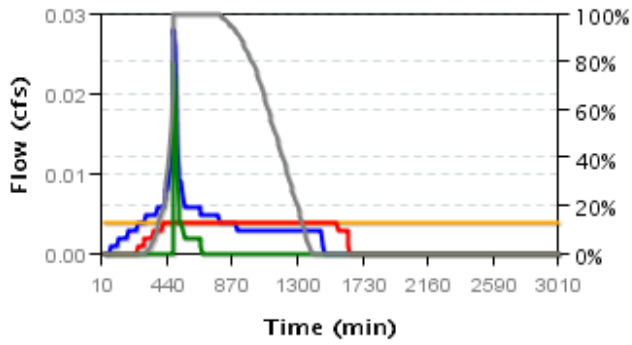
**10 Year Event Surface Facility Modeling**



**10 Year Event Below Grade Modeling**



**25 Year Event Surface Facility Modeling**



**25 Year Event Below Grade Modeling**





## BayFilter Quick Sizing Reference Guide - Oregon

### BayFilter Catch Basins

Steel Catch Basin Size	# of Cartridges	BF522 Cartridge	BF545 Cartridge	Approximate Maximum Treatment Areas*					
		2.33' Drop Required	3.58' Drop Required	(Areas assume <b>BF522</b> cartridges are used)					
		Treatment Capacity (cfs)	Treatment Capacity (cfs)	City of Portland	CWS	WES	City of Beaverton	City of Salem	City of Gresham
3' x 5'	1	0.05	0.10	0.29 ac	0.56 ac	0.24 ac	0.41 ac	0.17 ac	0.21 ac
3' x 8'	2	0.10	0.20	0.58 ac	1.11 ac	0.49 ac	0.83 ac	0.33 ac	0.39 ac

1. Drop Required value = Rim Elevation - Outlet IE.
2. All configurations can internally bypass up to 2.0 cfs.
3. Multiply the Maximum Treatment Area values by 2 if using BF545 cartridges.

### BayFilter Manholes

Precast Manhole Size	# of Cartridges	BF522 Cartridge	BF545 Cartridge	Approximate Maximum Treatment Areas*					
		1.67' Drop Required	2.83' Drop Required	(Areas assume <b>BF545</b> cartridges are used)					
		Treatment Capacity (cfs)	Treatment Capacity (cfs)	City of Portland	CWS	WES	City of Beaverton	City of Salem	City of Gresham
48" MH	1	0.05	0.10	0.58 ac	1.11 ac	0.49 ac	0.83 ac	0.33 ac	0.39 ac
60" MH	2	0.10	0.20	1.17 ac	2.21 ac	0.98 ac	1.65 ac	0.67 ac	0.78 ac
72" MH	3	0.15	0.30	1.75 ac	3.31 ac	1.46 ac	2.48 ac	1.00 ac	1.18 ac
84" MH	4	0.20	0.40	2.34 ac	4.41 ac	1.95 ac	3.31 ac	1.33 ac	1.57 ac
96" MH	5	0.25	0.50	2.92 ac	5.51 ac	2.44 ac	4.13 ac	1.67 ac	1.96 ac
	6	0.30	0.60	3.51 ac	6.61 ac	2.93 ac	4.96 ac	2.00 ac	2.35 ac

1. Drop Required value = Inlet IE - Outlet IE
2. All configurations can internally bypass up to 5.0 cfs
3. Divide the Maximum Treatment Area values by 2 if using BF522 cartridges.

#### General Notes:

\*Maximum Treatment Area values are based on the impervious area required to produce a water quality flow equivalent to the maximum treatment capacity of each BayFilter system. These calculations are meant to be for estimation purposes only and should not be used in lieu of project specific water quality flow calculations.

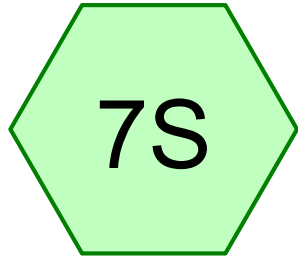
\*\*Contact your local ADS representative for project specific design assistance.

#### Colin Steer

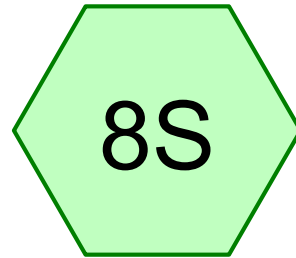
Engineered Products Manager - Oregon, SW Washington, Hawaii  
[colin.steer@adspipe.com](mailto:colin.steer@adspipe.com)

#### Mike Gillette, PE

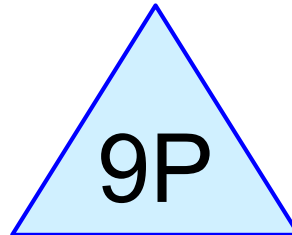
Water Quality Manager - West  
[michael.gillette@adspipe.com](mailto:michael.gillette@adspipe.com)



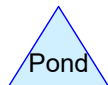
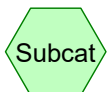
Parking Pre



Parking Post



Parking - Detention



# Detention Sizing

Prepared by Hewlett-Packard Company

HydroCAD® 10.00-15 s/n 09142 © 2015 HydroCAD Software Solutions LLC

Type IA 24-hr 2YR Rainfall=2.40"

Printed 9/7/2023

Page 4

## Summary for Subcatchment 7S: Parking Pre

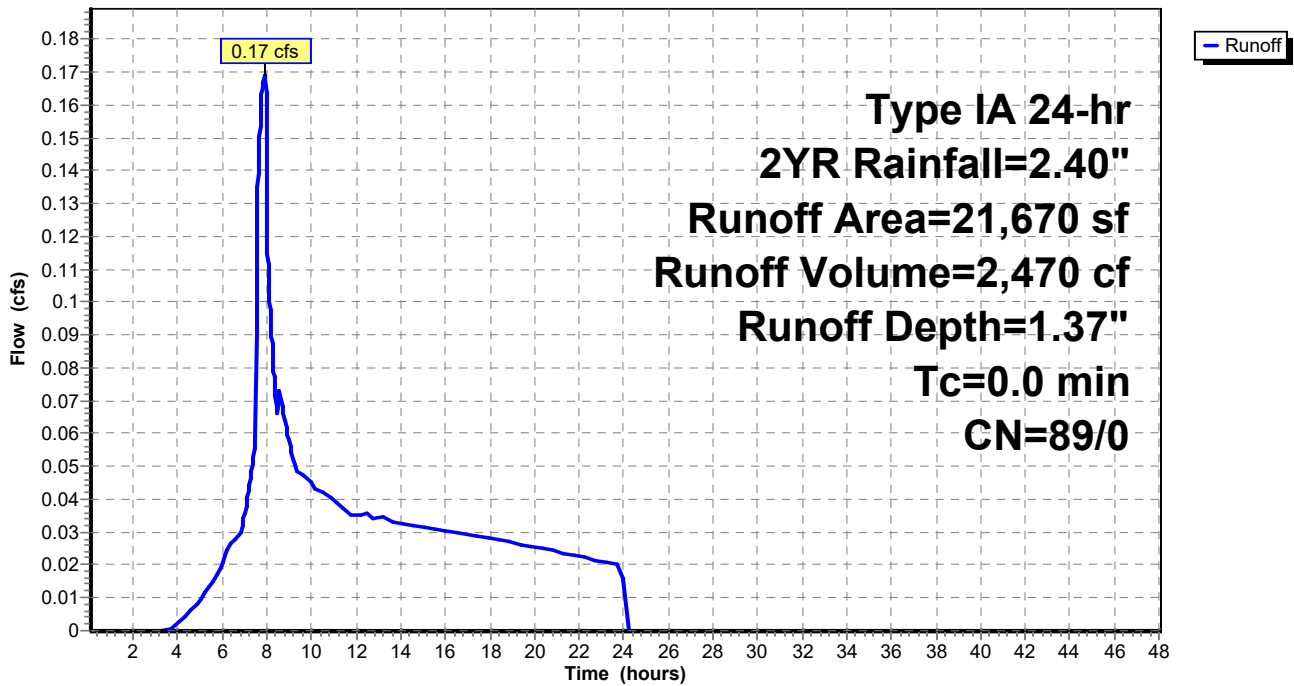
Runoff = 0.17 cfs @ 7.87 hrs, Volume= 2,470 cf, Depth= 1.37"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.10-48.00 hrs, dt= 0.02 hrs  
Type IA 24-hr 2YR Rainfall=2.40"

	Area (sf)	CN	Description
*	21,670	89	
	21,670	89	100.00% Pervious Area

## Subcatchment 7S: Parking Pre

Hydrograph



# Detention Sizing

Prepared by Hewlett-Packard Company

HydroCAD® 10.00-15 s/n 09142 © 2015 HydroCAD Software Solutions LLC

Type IA 24-hr 2YR Rainfall=2.40"

Printed 9/7/2023

Page 6

## Summary for Pond 9P: Parking - Detention

Inflow Area = 21,670 sf, 100.00% Impervious, Inflow Depth = 2.17" for 2YR event  
 Inflow = 0.27 cfs @ 7.89 hrs, Volume= 3,921 cf  
 Outflow = 0.17 cfs @ 8.16 hrs, Volume= 3,921 cf, Atten= 37%, Lag= 16.5 min  
 Primary = 0.17 cfs @ 8.16 hrs, Volume= 3,921 cf

Routing by Stor-Ind method, Time Span= 0.10-48.00 hrs, dt= 0.02 hrs  
 Peak Elev= 102.83' @ 8.16 hrs Surf.Area= 114 sf Storage= 264 cf

Plug-Flow detention time= 7.8 min calculated for 3,921 cf (100% of inflow)  
 Center-of-Mass det. time= 7.8 min ( 682.0 - 674.3 )

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	452 cf	<b>60.0" Round Pipe Storage</b> L= 23.0'

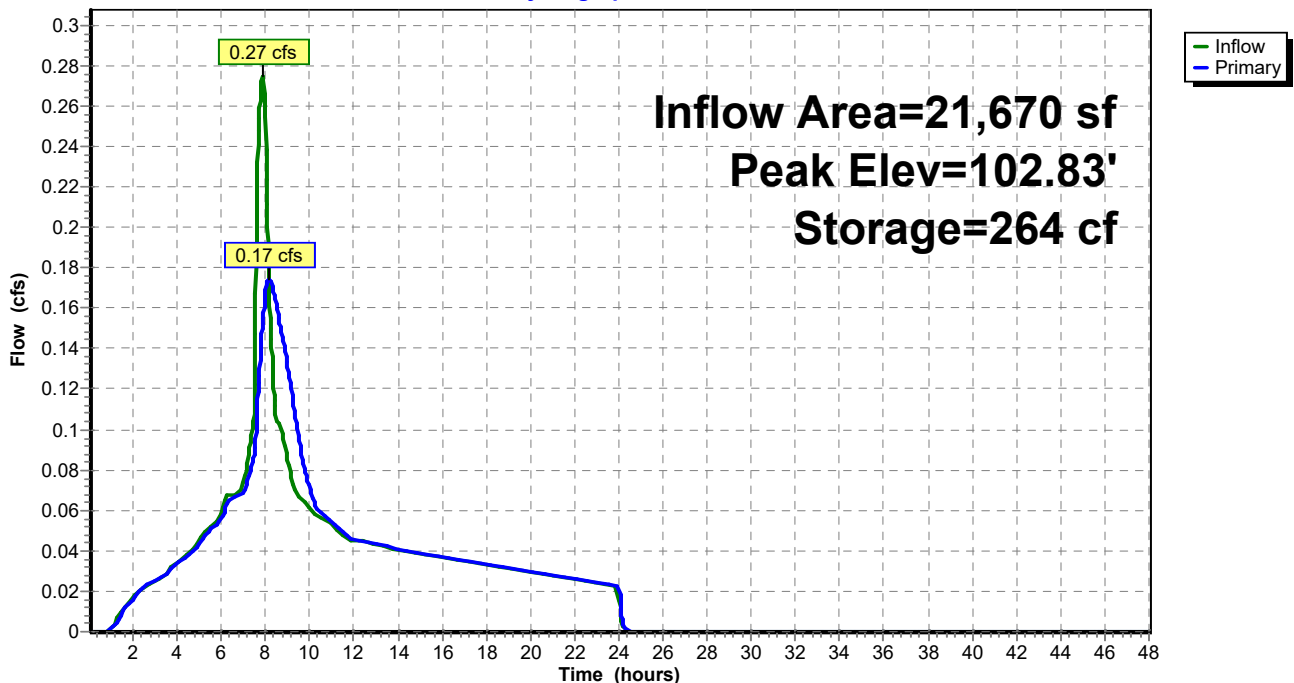
Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	<b>2.0" Vert. Orifice/Grate</b> C= 0.600
#2	Primary	104.30'	<b>12.0" Vert. Orifice/Grate</b> C= 0.600
#3	Primary	102.83'	<b>1.4" Vert. Orifice/Grate</b> C= 0.600

**Primary OutFlow** Max=0.17 cfs @ 8.16 hrs HW=102.83' (Free Discharge)

- 1=Orifice/Grate (Orifice Controls 0.17 cfs @ 7.98 fps)
- 2=Orifice/Grate ( Controls 0.00 cfs)
- 3=Orifice/Grate (Orifice Controls 0.00 cfs @ 0.14 fps)

## Pond 9P: Parking - Detention

Hydrograph





# Detention Sizing

Prepared by Hewlett-Packard Company

HydroCAD® 10.00-15 s/n 09142 © 2015 HydroCAD Software Solutions LLC

Type IA 24-hr 5YR Rainfall=2.90"

Printed 9/7/2023

Page 8

## Summary for Subcatchment 7S: Parking Pre

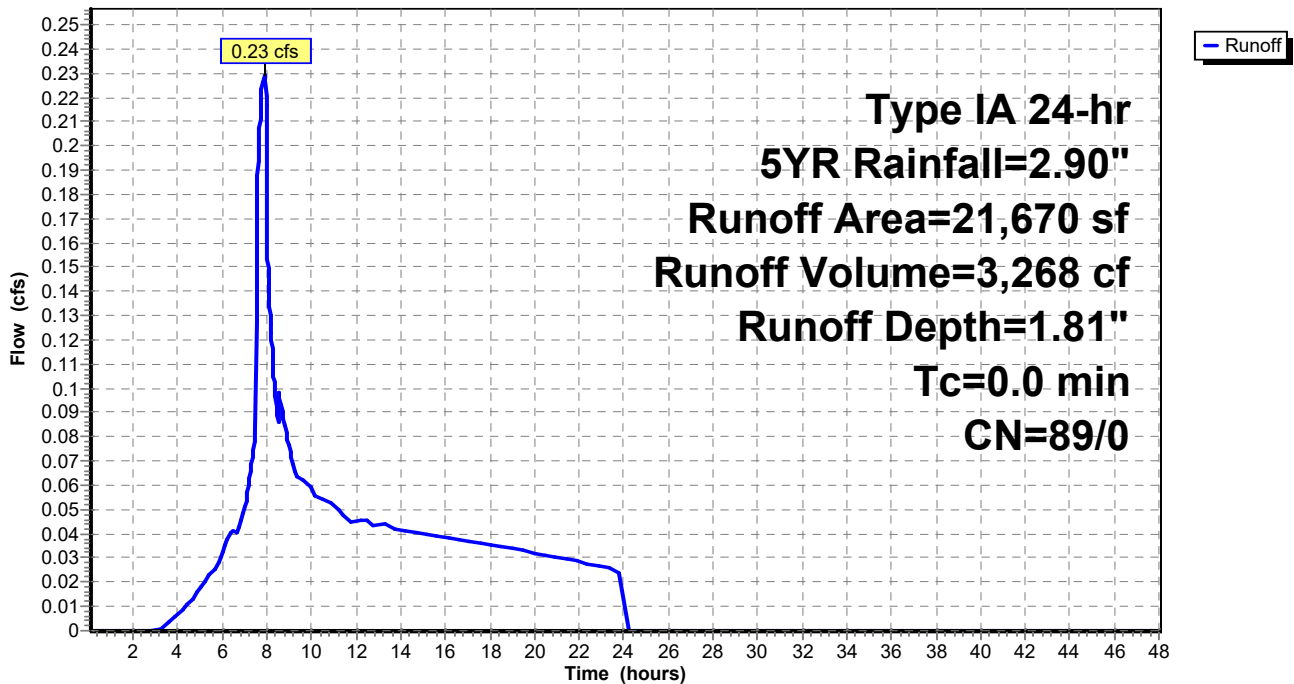
Runoff = 0.23 cfs @ 7.86 hrs, Volume= 3,268 cf, Depth= 1.81"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.10-48.00 hrs, dt= 0.02 hrs  
Type IA 24-hr 5YR Rainfall=2.90"

	Area (sf)	CN	Description
*	21,670	89	
	21,670	89	100.00% Pervious Area

## Subcatchment 7S: Parking Pre

### Hydrograph



# Detention Sizing

Prepared by Hewlett-Packard Company

HydroCAD® 10.00-15 s/n 09142 © 2015 HydroCAD Software Solutions LLC

Type IA 24-hr 5YR Rainfall=2.90"

Printed 9/7/2023

Page 10

## Summary for Pond 9P: Parking - Detention

Inflow Area = 21,670 sf, 100.00% Impervious, Inflow Depth = 2.67" for 5YR event  
 Inflow = 0.34 cfs @ 7.88 hrs, Volume= 4,819 cf  
 Outflow = 0.23 cfs @ 8.12 hrs, Volume= 4,819 cf, Atten= 30%, Lag= 14.1 min  
 Primary = 0.23 cfs @ 8.12 hrs, Volume= 4,819 cf

Routing by Stor-Ind method, Time Span= 0.10-48.00 hrs, dt= 0.02 hrs  
 Peak Elev= 103.49' @ 8.12 hrs Surf.Area= 106 sf Storage= 337 cf

Plug-Flow detention time= 9.1 min calculated for 4,817 cf (100% of inflow)  
 Center-of-Mass det. time= 9.1 min ( 677.4 - 668.3 )

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	452 cf	<b>60.0" Round Pipe Storage</b> L= 23.0'

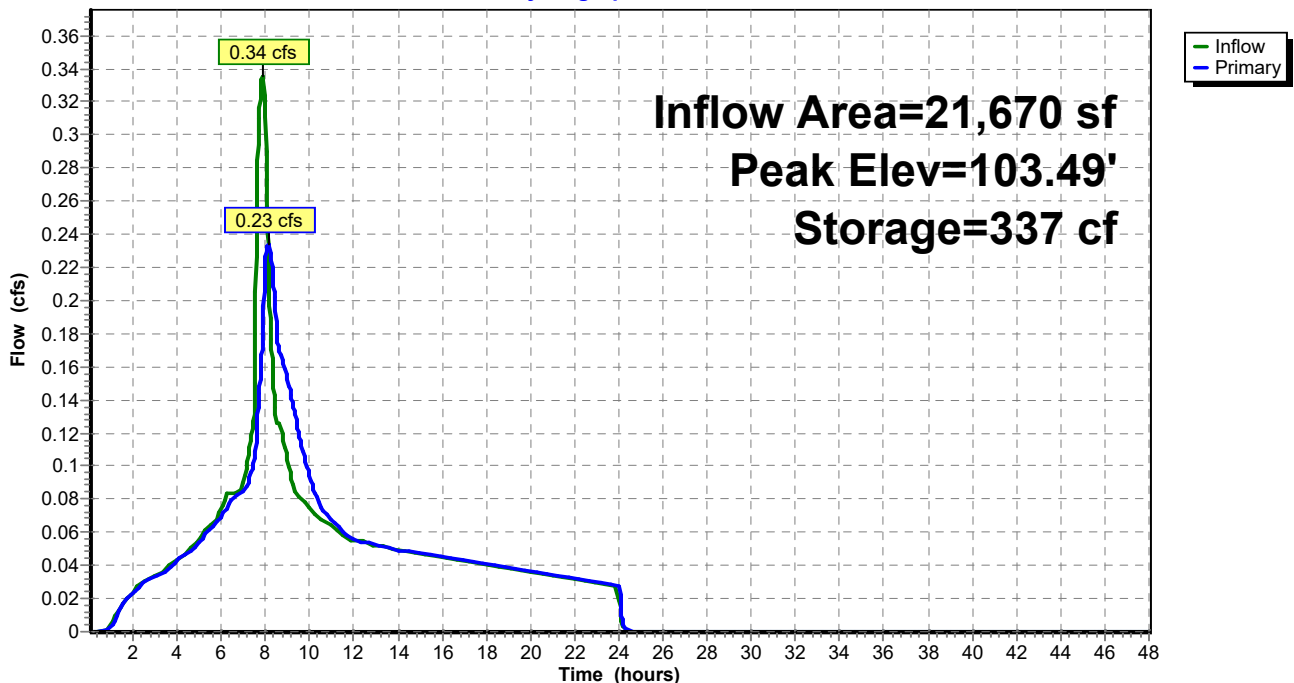
Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	<b>2.0" Vert. Orifice/Grate</b> C= 0.600
#2	Primary	104.30'	<b>12.0" Vert. Orifice/Grate</b> C= 0.600
#3	Primary	102.83'	<b>1.4" Vert. Orifice/Grate</b> C= 0.600

**Primary OutFlow** Max=0.23 cfs @ 8.12 hrs HW=103.49' (Free Discharge)

- 1=Orifice/Grate (Orifice Controls 0.19 cfs @ 8.89 fps)
- 2=Orifice/Grate ( Controls 0.00 cfs)
- 3=Orifice/Grate (Orifice Controls 0.04 cfs @ 3.74 fps)

## Pond 9P: Parking - Detention

Hydrograph



# Detention Sizing

Prepared by Hewlett-Packard Company

HydroCAD® 10.00-15 s/n 09142 © 2015 HydroCAD Software Solutions LLC

Type IA 24-hr 10YR Rainfall=3.40"

Printed 9/7/2023

Page 12

## Summary for Subcatchment 7S: Parking Pre

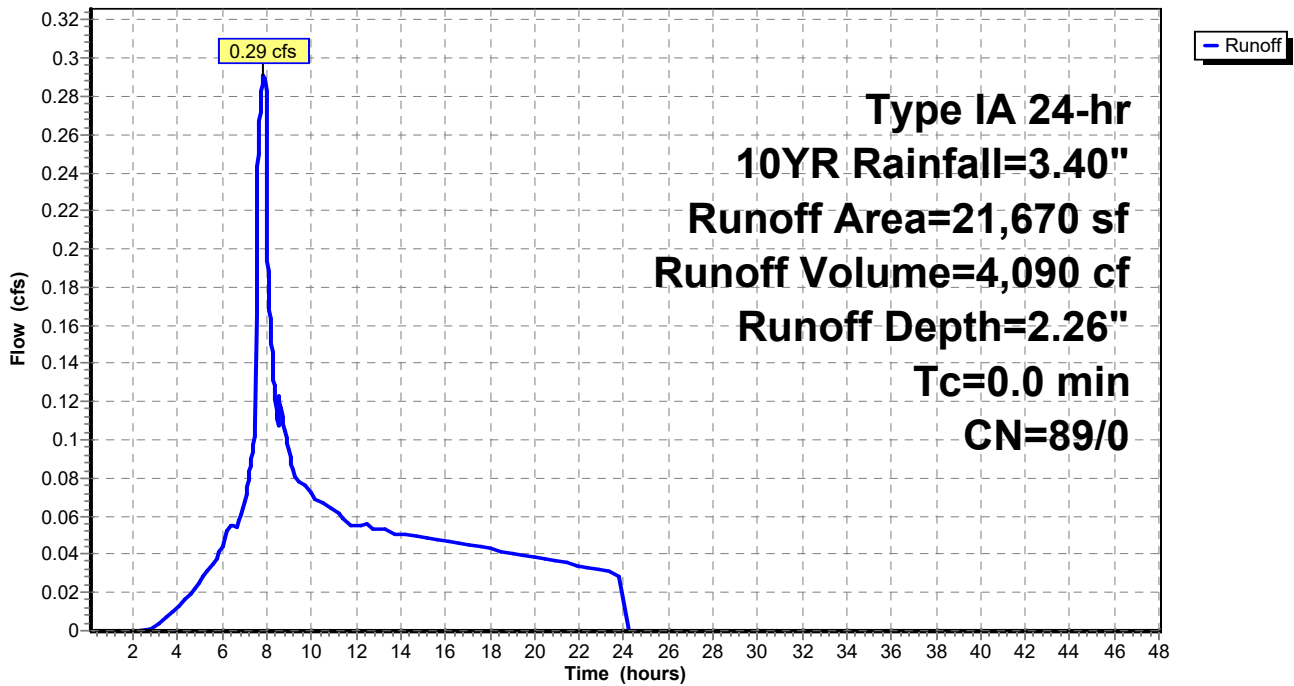
Runoff = 0.29 cfs @ 7.85 hrs, Volume= 4,090 cf, Depth= 2.26"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.10-48.00 hrs, dt= 0.02 hrs  
Type IA 24-hr 10YR Rainfall=3.40"

	Area (sf)	CN	Description
*	21,670	89	
	21,670	89	100.00% Pervious Area

## Subcatchment 7S: Parking Pre

Hydrograph



# Detention Sizing

Prepared by Hewlett-Packard Company

HydroCAD® 10.00-15 s/n 09142 © 2015 HydroCAD Software Solutions LLC

Type IA 24-hr 10YR Rainfall=3.40"

Printed 9/7/2023

Page 14

## Summary for Pond 9P: Parking - Detention

Inflow Area = 21,670 sf, 100.00% Impervious, Inflow Depth = 3.17" for 10YR event  
 Inflow = 0.40 cfs @ 7.88 hrs, Volume= 5,719 cf  
 Outflow = 0.28 cfs @ 8.12 hrs, Volume= 5,719 cf, Atten= 30%, Lag= 14.1 min  
 Primary = 0.28 cfs @ 8.12 hrs, Volume= 5,719 cf

Routing by Stor-Ind method, Time Span= 0.10-48.00 hrs, dt= 0.02 hrs  
 Peak Elev= 104.30' @ 8.12 hrs Surf.Area= 80 sf Storage= 413 cf

Plug-Flow detention time= 10.4 min calculated for 5,716 cf (100% of inflow)  
 Center-of-Mass det. time= 10.4 min ( 674.3 - 663.9 )

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	452 cf	<b>60.0" Round Pipe Storage</b> L= 23.0'

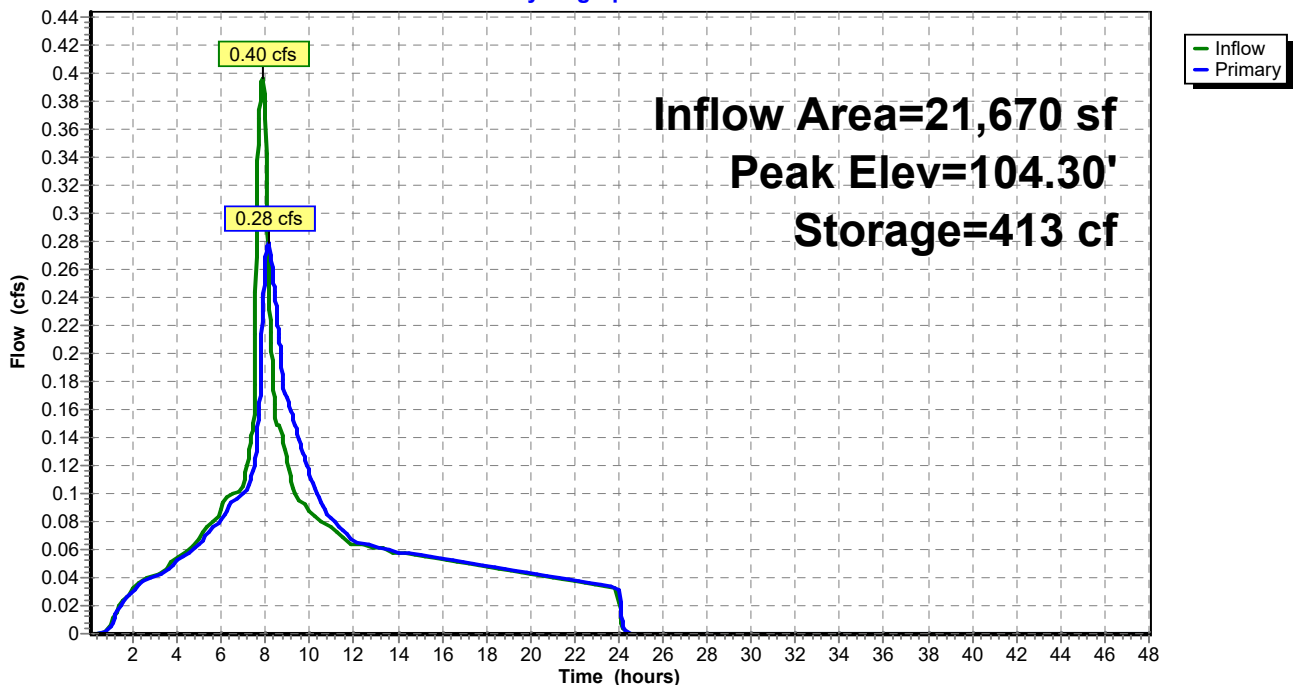
Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	<b>2.0" Vert. Orifice/Grate</b> C= 0.600
#2	Primary	104.30'	<b>12.0" Vert. Orifice/Grate</b> C= 0.600
#3	Primary	102.83'	<b>1.4" Vert. Orifice/Grate</b> C= 0.600

**Primary OutFlow** Max=0.28 cfs @ 8.12 hrs HW=104.30' (Free Discharge)

- 1=Orifice/Grate (Orifice Controls 0.22 cfs @ 9.89 fps)
- 2=Orifice/Grate (Orifice Controls 0.00 cfs @ 0.20 fps)
- 3=Orifice/Grate (Orifice Controls 0.06 cfs @ 5.73 fps)

## Pond 9P: Parking - Detention

Hydrograph



# Detention Sizing

Prepared by Hewlett-Packard Company

HydroCAD® 10.00-15 s/n 09142 © 2015 HydroCAD Software Solutions LLC

Type IA 24-hr **100YR** Rainfall=4.40"

Printed 9/7/2023

Page 16

## Summary for Subcatchment 7S: Parking Pre

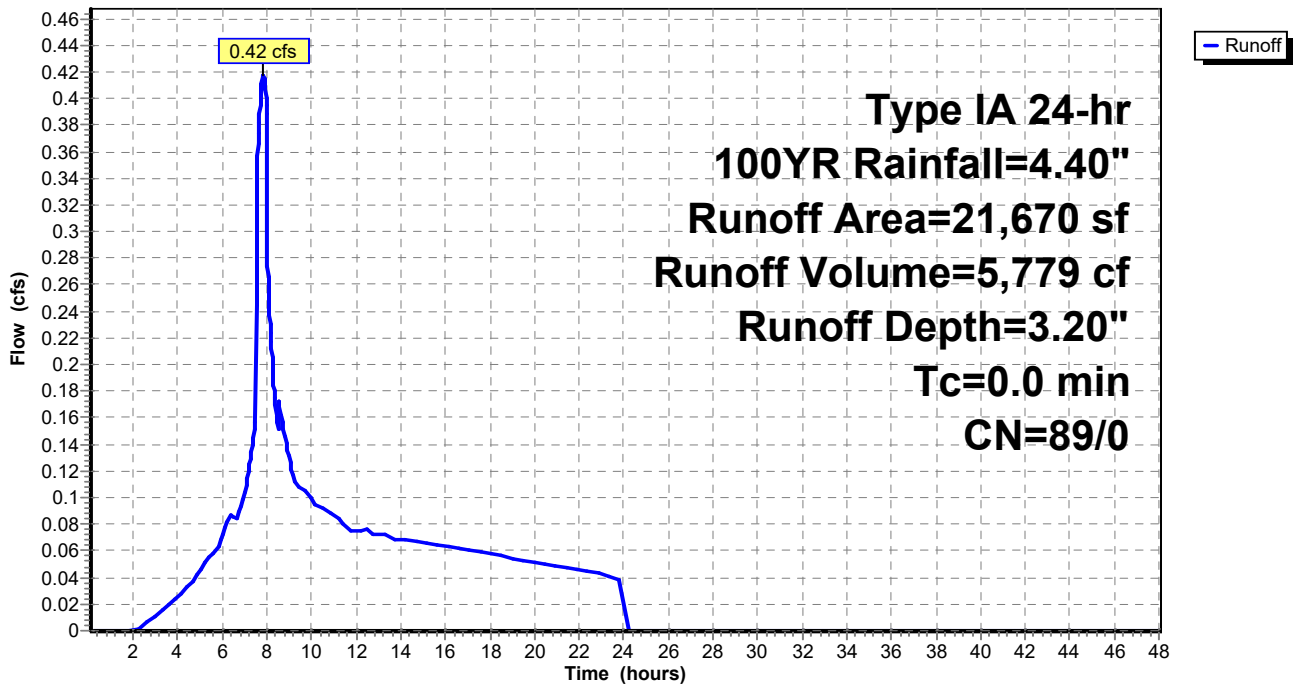
Runoff = 0.42 cfs @ 7.83 hrs, Volume= 5,779 cf, Depth= 3.20"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.10-48.00 hrs, dt= 0.02 hrs  
Type IA 24-hr 100YR Rainfall=4.40"

	Area (sf)	CN	Description
*	21,670	89	
	21,670	89	100.00% Pervious Area

## Subcatchment 7S: Parking Pre

Hydrograph



# Detention Sizing

Prepared by Hewlett-Packard Company

HydroCAD® 10.00-15 s/n 09142 © 2015 HydroCAD Software Solutions LLC

Type IA 24-hr 100YR Rainfall=4.40"

Printed 9/7/2023

Page 18

## Summary for Pond 9P: Parking - Detention

Inflow Area = 21,670 sf, 100.00% Impervious, Inflow Depth = 4.16" for 100YR event  
 Inflow = 0.52 cfs @ 7.88 hrs, Volume= 7,520 cf  
 Outflow = 0.52 cfs @ 7.89 hrs, Volume= 7,520 cf, Atten= 0%, Lag= 0.6 min  
 Primary = 0.52 cfs @ 7.89 hrs, Volume= 7,520 cf

Routing by Stor-Ind method, Time Span= 0.10-48.00 hrs, dt= 0.02 hrs  
 Peak Elev= 104.53' @ 7.89 hrs Surf.Area= 67 sf Storage= 430 cf

Plug-Flow detention time= 11.9 min calculated for 7,517 cf (100% of inflow)  
 Center-of-Mass det. time= 11.9 min ( 669.6 - 657.7 )

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	452 cf	<b>60.0" Round Pipe Storage</b> L= 23.0'

Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	<b>2.0" Vert. Orifice/Grate</b> C= 0.600
#2	Primary	104.30'	<b>12.0" Vert. Orifice/Grate</b> C= 0.600
#3	Primary	102.83'	<b>1.4" Vert. Orifice/Grate</b> C= 0.600

**Primary OutFlow** Max=0.51 cfs @ 7.89 hrs HW=104.53' (Free Discharge)

- 1=Orifice/Grate (Orifice Controls 0.22 cfs @ 10.16 fps)
- 2=Orifice/Grate (Orifice Controls 0.23 cfs @ 1.64 fps)
- 3=Orifice/Grate (Orifice Controls 0.07 cfs @ 6.17 fps)

## Pond 9P: Parking - Detention

Hydrograph

