FROELICH ENGINEERS

Preliminary Stormwater Drainage Report

Springdale Fire Station Improvements

31727 East Historic Columbia River Highway; Troutdale, OR 97019

For

Corbett Fire District

Regular maintenance and inspection are required on all components of the stormwater system. This plan provides instructions on how to maintain and inspect the system.

Prepared by: Evan Eykelbosch, PE
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Portland, OR 97224
Froelich Project Number: 23-C021
Date: October 11, 2024

Contents

I. Project Overview and Description

Existing Conditions

The existing site is located at 31727 East Historic Columbia River Highway (See Appendix A: Vicinity Map). The site is partially developed with a single fire truck garage and parking lot on the southern end of the site and a large undeveloped grass field on the northern half of the site. A retailing wall and a sloped hillside separate the north and south ends of the site. The site drains to the south. Along the southern property line is the East Historic Columbia River Highway, owned by ODOT. Within the street is a public stormwater system. This stormwater main crosses the road just west of our site and discharges into Springdale Creek.

Proposed Conditions

The proposed development includes a new fire truck garage and parking lot. A new retaining wall will be constructed that pushes into the hillside to create sufficient space for the development of the site. Site improvements will include new concrete and asphalt pavements as well as a ramp to allow vehicular access between the upper and lower portions of the site. See Table 1 and Appendix B: Basin Maps.

II. Methodology

Stormwater Requirements

Multnomah County dictates the stormwater requirements for the project site. Multnomah County Code Section 39.6235 requires the Engineer of Record to complete the Stormwater Drainage Control Certificate, which states a design be provided such that “the rate of stormwater runoff attributed to the new/replaced development for a 10-year/24-hour storm event will be no greater than that which existed prior to any development as measured from the property line or from the point of discharge into a water body with the use of the designated system” (See Table 2 below).

In addition, the Multnomah County Design Standards Chapter 5.1.3 states that “the quality of stormwater entering or leaving the ROW after a project shall be equal to or better than the quality of stormwater entering or leaving the ROW before the project.” Water Quality Treatment should be designed per the City of Portland’s Stormwater Management Manual.

Due to the stormwater system being located within the ODOT right-of-way, ODOT has additional detention requirements for the site. ODOT requires that the post-development 50-year storm peak runoff not exceed the existing 50-year storm peak runoff (See Table 2 below)

Proposed Stormwater System

The proposed development will include a new fire truck garage, a courtyard, and a paved service/parking area. These areas will be collected within a series of trench drains and downspouts. The runoff will be conveyed into a stormwater lift station, where it will be routed into a bioswale for treatment and then into a below-grade detention pipe. Discharge from the pipe will be routed into the public catch basin. The site improvements are limited to Basin A. However, existing runoff from Basin B will also be collected, treated, and detained. See Appendix D: Water Quality Treatment and Appendix E: Detention System Sizing Calculations and Appendix H: Utility Plan/Details.

Stormwater conveyance is designed to accommodate the 50-year stormwater event. See Appendix F: Conveyance Calculations.

Columbia West completed infiltration testing, and it was determined that, due to high groundwater and poor infiltration, infiltration for disposal would not be acceptable. See Appendix G: Geotechnical Report.

III. Analysis

Table 1a:
Pre-Developed Basin

Basins	Areas				Total	
	Pervious		Impervious			
	sf	ac	sf	ac	sf	ac
Basin A	1,327	0.030	0	0.000	1,327	0.030
Basin B	6,802	0.156	0	0.000	6,802	0.156

Table 1b:
Existing Conditions Basin

Basins	Areas				Total	
	Pervious		Impervious			
	sf	ac	sf	ac	sf	ac
Basin A	0	0.000	1,327	0.030	1,327	0.030
Basin B	2,097	0.048	4,705	0.108	6,802	0.156

Table 1c:
Post-Developed Basin

Basins	Areas				Total	
	Pervious		Impervious			
	sf	ac	sf	ac	sf	ac
Basin A	0	0.00	1,327	0.030	1,327	0.030
Basin B	0	0.00	6,802	0.156	6,802	0.156

Table 2: Stormwater Flow Rate Table

Catchment/ Facility ID	Peak Flow Rate (cfs) for a 24-hour Storm Event			
	10-yr		50-yr	
	Pre	Post	Existing	Post
Basin A and Basin B	0.09	0.08	0.19	0.12

Table 3: Stormwater Conveyance

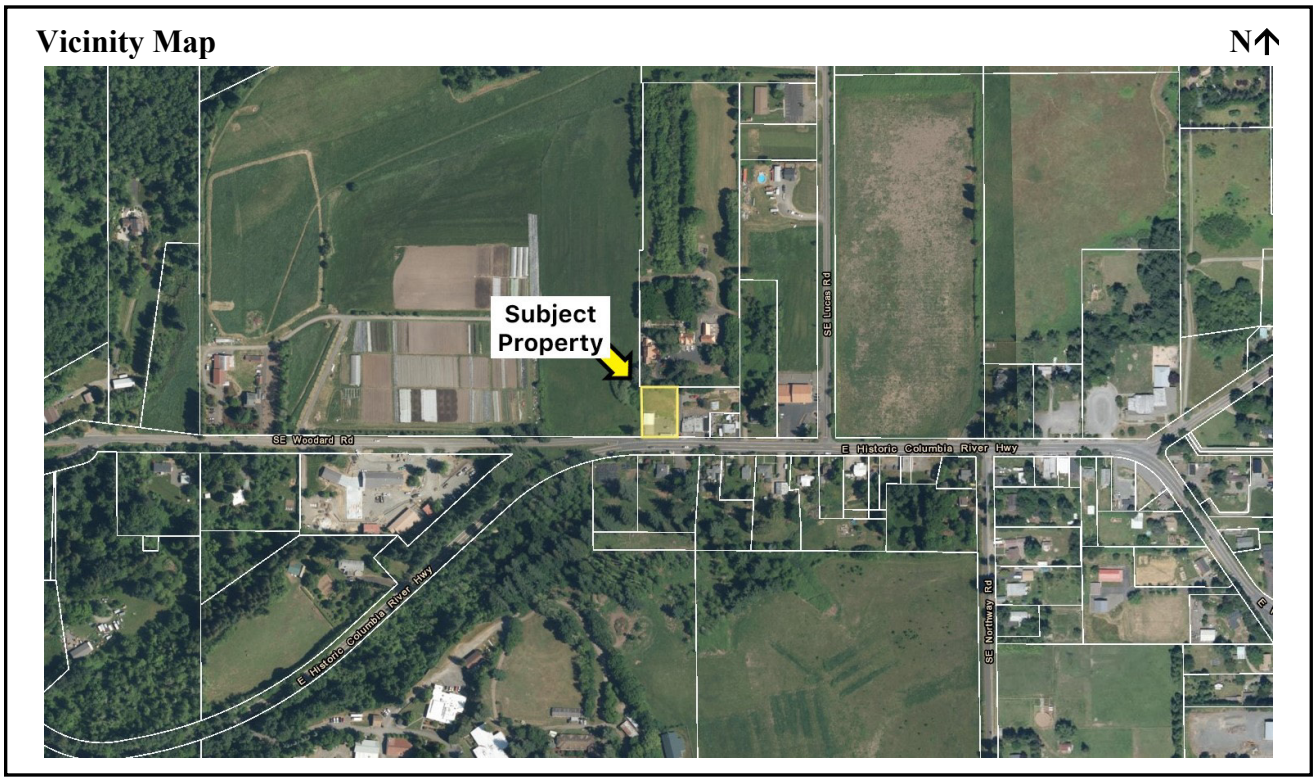
Peak Flow Rate (cfs) for a 24-hour Storm Event	
10-yr	50-yr
0.17 cfs	0.22 cfs

IV. Engineering Conclusion

The proposed design meets and exceeds the requirements for stormwater management set forth by Multnomah County.

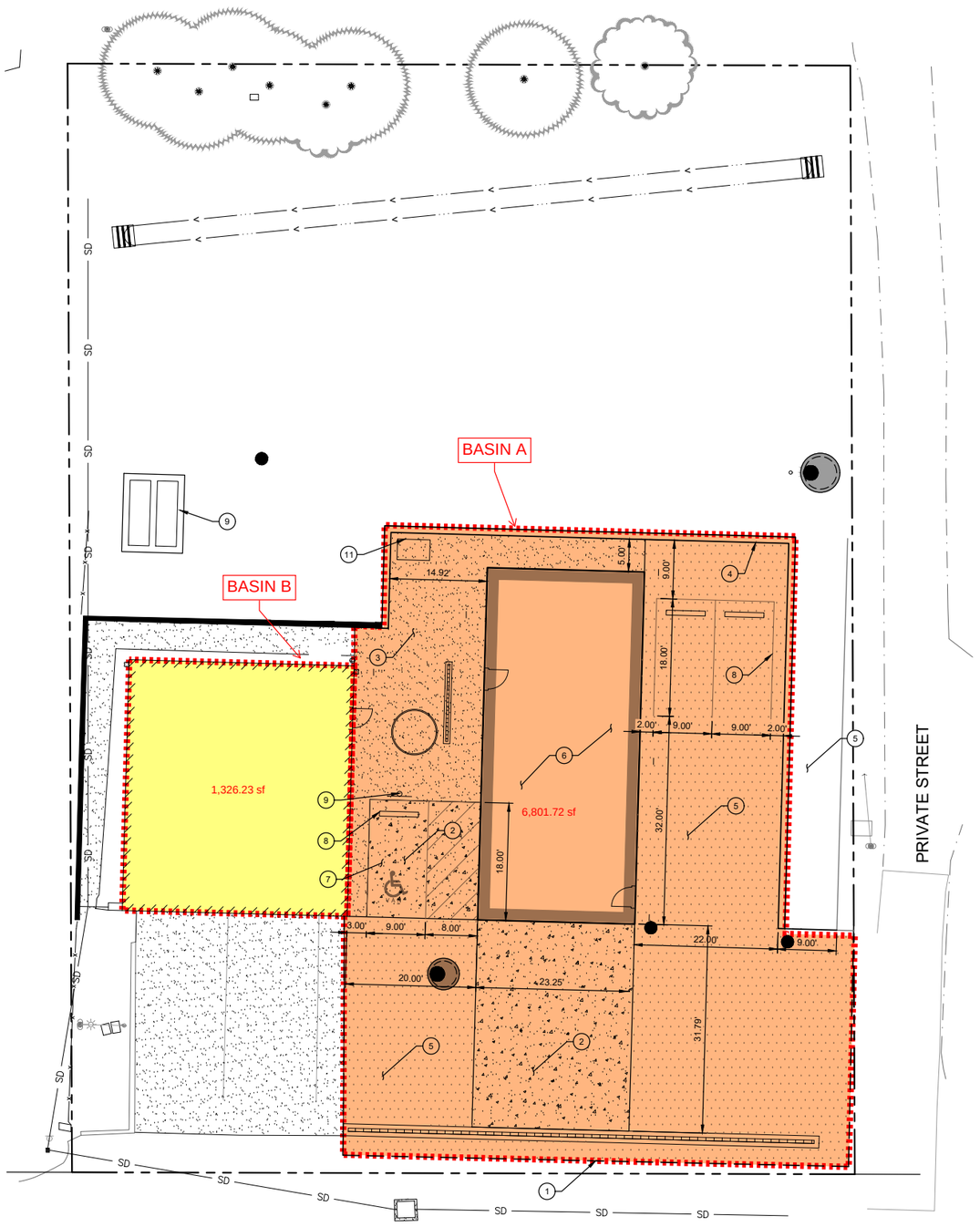
V. Appendices

Appendix A: Vicinity Map



Appendix B: Basin Map

POST DEVELOPED



EAST HISTORIC COLUMBIA RIVER HIGHWAY (ODOT)

SHEET NOTES

1. XXX

KEY NOTES

1 SAWCUT LINE
2 HEAVY CONCRETE
3 STANDARD CONCRETE
4 RETAINING WALL, PER STRUCTURAL PLANS
5 ASPHALT PAVEMENT
6 PROPOSED BUILDING PER ARCHITECTURAL PLANS
7 ADA PARKING STALL
8 WHEEL STOP
9 ADA SIGN
10 PARKING STALL STRIPING
11 GENERATOR, BY OTHERS
12 PROPANE TANKS, BY OTHERS

SHEET LEGEND

PROPERTY LINE
CONCRETE SIDEWALK
STANDARD ASPHALT PAVEMENT
HEAVY CONCRETE

SCALE 1 INCH = 10 FEET
10 0 10 20

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SPRINGDALE FIRE STATION IMPROVEMENTS
31727 EAST HISTORIC COLUMBIA RIVER HWY
TROUTDALE, OR. 97019

LAND USE SET

REV	DATE	ISSUE TITLE

PROJECT MANAGER:	EME
DESIGNER:	EME
DRAWN BY:	EEYKELBOSCH
PROJECT NO:	----
DATE:	10/11/24
SCALE:	AS SHOWN

SHEET TITLE:
SITE PLAN

SHEET NUMBER:
C2.00
LAND USE SET

File: P:\2023\23-C021\Springdale Fire Station Improvements\300 Document Development - Froelich\302 CAD\PLOT\23_C021_C2.00_SITE.dwg TAB:C2.00
Plotted: 10/9/24 at 9:34pm By: eeykelbosch

SHEET NOTES

1. CONTRACTOR MAY STAGE WITHIN LIMITS OF DEMOLITION.
2. REMOVE ALL SITE COMPONENTS AND RECYCLE COMPONENTS AS REQUIRED IN THE SPECIFICATIONS.
3. GENERAL DEMOLITION PERMIT SHALL BE SECURED BY THE CONTRACTOR.
4. ALL TRADE LICENSES AND PERMITS NECESSARY FOR THE PROCUREMENT AND COMPLETION OF THE WORK SHALL BE SECURED BY THE CONTRACTOR PRIOR TO COMMENCING DEMOLITION.
5. THE CONTRACTOR SHALL PRESERVE AND PROTECT FROM DAMAGE ALL EXISTING RIGHT-OF-WAY SURVEY MONUMENTATION DURING DEMOLITION. THE CONTRACTOR IS RESPONSIBLE FOR COORDINATING AND PAYING FOR THE REPLACEMENT BY A LICENSED SURVEYOR OF ANY DAMAGED OR REMOVED MONUMENTS.
6. PROTECT ALL ITEMS ON ADJACENT PROPERTIES AND IN THE RIGHT OF WAY INCLUDING BUT NOT LIMITED TO SIGNAL EQUIPMENT, PARKING METERS, SIDEWALKS, STREET TREES, STREET LIGHTS, CURBS, PAVEMENT AND SIGNS. CONTRACTOR SHALL BE RESPONSIBLE FOR RESTORING ANY DAMAGED ITEMS TO ORIGINAL CONDITION.
7. PROTECT STRUCTURES, UTILITIES, SIDEWALKS, AND OTHER FACILITIES IMMEDIATELY ADJACENT TO EXCAVATIONS FROM DAMAGES CAUSED BY SETTLEMENT, LATERAL MOVEMENT, UNDERMINING, WASHOUT AND OTHER HAZARDS.
8. SAWCUT STRAIGHT LINES IN SIDEWALK, AS NECESSARY.
9. CONTRACTOR IS RESPONSIBLE TO CONTROL DUST AND MUD DURING THE DEMOLITION PERIOD, AND DURING TRANSPORTATION OF DEMOLITION DEBRIS. ALL STREET SURFACES OUTSIDE THE CONSTRUCTION ZONE MUST BE KEPT CLEAN.
10. ALL EXPOSED PORTIONS OF UNDERGROUND UTILITIES TO BE ABANDONED SHALL BE PLUGGED PER DETAIL X/CXXX.

(3) DEMOLITION KEY NOTES

1	SAWCUT
2	REMOVE CONCRETE SIDEWALK
3	REMOVE ASPHALT PAVEMENT
4	REMOVE WHEEL STOP
5	REMOVE CURB
6	REMOVE SEPTIC TANK
7	REMOVE SIGN
8	REMOVE EXISTING UNDERGROUND ELECTRICAL SERVICE.
9	REMOVE FLAGPOLE
10	---

(X) PROTECTION KEY NOTES

30	PROTECT CURB AND SIDEWALK.
31	PROTECT CONCRETE DRIVEWAY
32	PROTECT UTILITY STRUCTURE
33	PROTECT STRUCTURE
34	PROTECT UTILITY POLE
35	PROTECT EXISTING STORM MAIN
36	PROTECT CATCH BASIN
37	PROTECT ROOF DRAIN

SHEET LEGEND

- PROPERTY LINE
- DEMOLITION/WORK LIMITS
- SAWCUT LINE
- REMOVE OR ABANDON UTILITY LINE IN PLACE
- REMOVE TREE
- EXISTING GRADE CONTOUR
- PROPOSED CURB LINE SHOWN FOR REFERENCE

SCALE 1 INCH = 10 FEET (10 0 10 20)

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SPRINGDALE FIRE STATION IMPROVEMENTS

3172? EAST HISTORIC COLUMBIA RIVER HWY
TROUTDALE, OR, 97019

LAND USE SET

REV	DATE	ISSUE TITLE

PROJECT MANAGER:	EME
DESIGNER:	EME
DRAWN BY:	ATOMLINSON
PROJECT NO:	----
DATE:	10/11/24
SCALE:	AS SHOWN

SHEET TITLE:
DEMOLITION PLAN

SHEET NUMBER:
C1.02
LAND USE SET

File: P:\2023\23-C021 (Springdale Fire Station Improvements)\300 Document Development - Froelich\302 CAD\PLOT\23_C021_C1.00_COVR.dwg TAB:C1.02
Plotted: 10/9/24 at 9:34pm By: eeykelbosch

Appendix C: Assumptions

Santa Barbara Unit Hydrograph (SBUH) Assumptions:

(used for Water Quality, Flow Control, Conveyance)

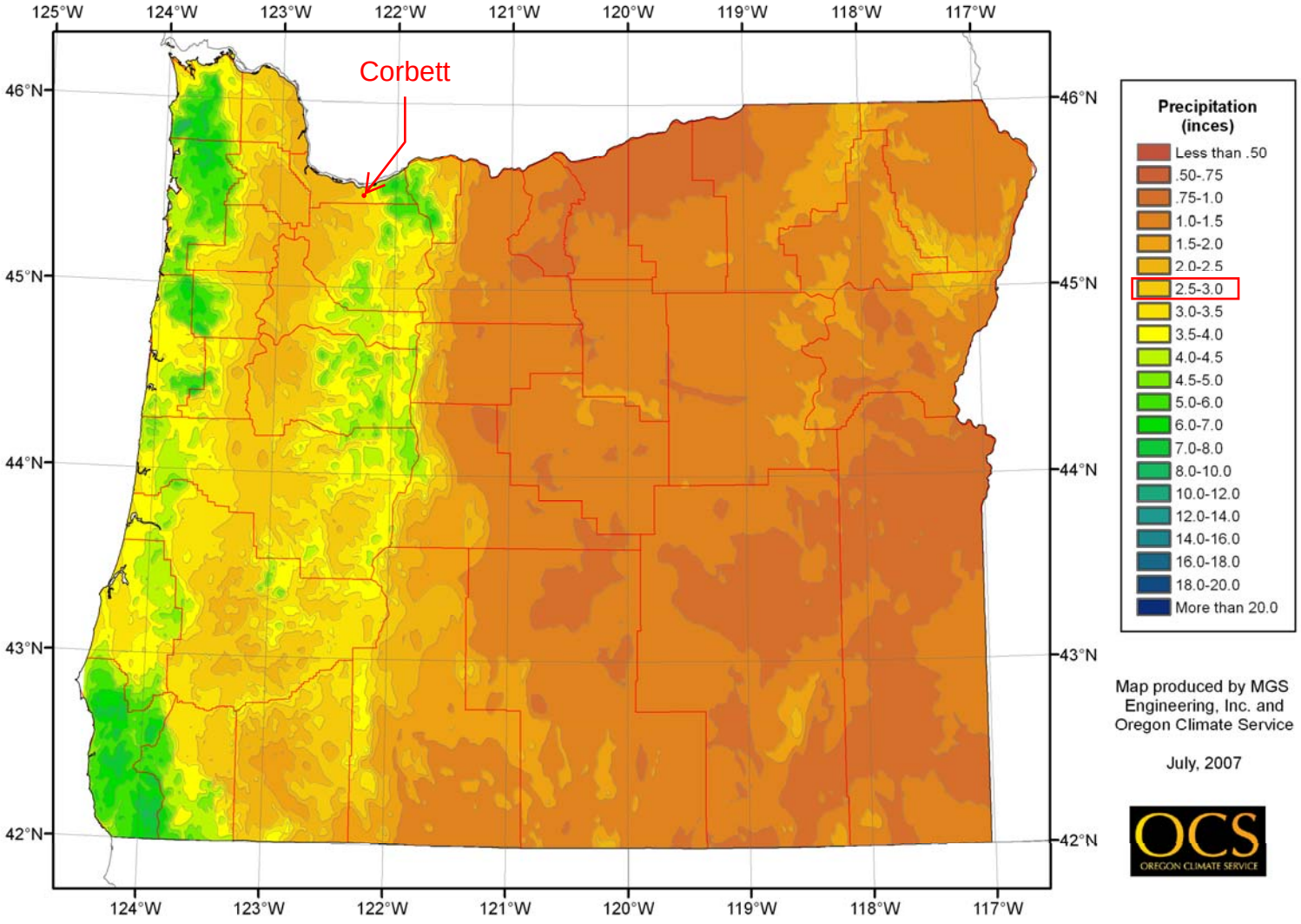
Water Quality (WQ) Storm Event =	1.5	in/24-hours per ODOT Hydraulics Manual
2-year Storm Event=	3.0	in/24-hours per ODOT Hydraulics Manual
10-year Storm Event=	4.0	in/24-hours per ODOT Hydraulics Manual
50-year Storm Event=	5.0	in/24-hours per ODOT Hydraulics Manual

Time of Concentration	**5.0**	minutes
Roughness Coefficient	**0.013**	

Curve Number Assumptions:

Impervious Area =	**98**	
Pervious Area =	**81**	Pre-Developed

24-hour 2-year Precipitation, Oregon

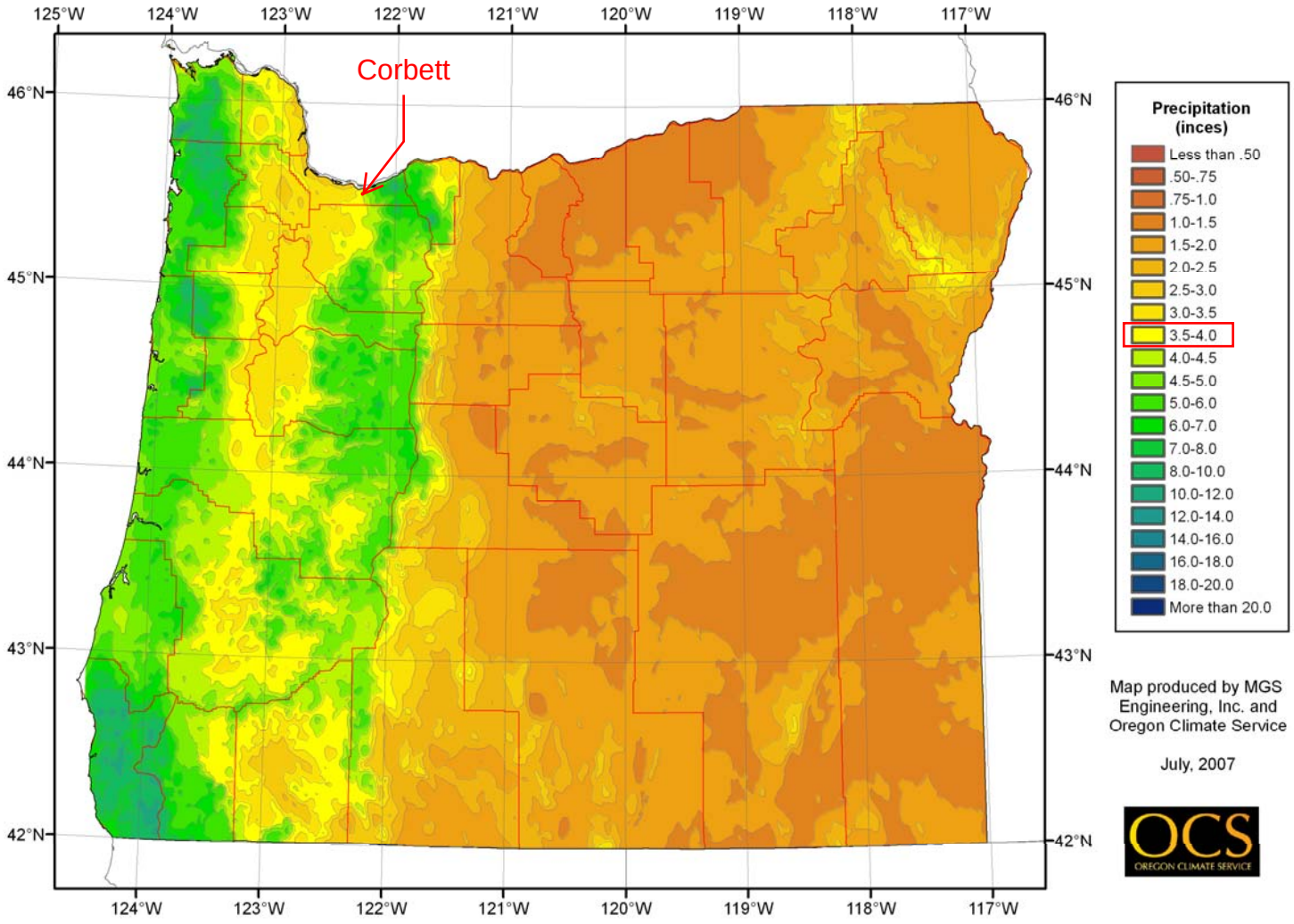


Map produced by MGS Engineering, Inc. and Oregon Climate Service

July, 2007

OCS
OREGON CLIMATE SERVICE

24-hour 10-year Precipitation, Oregon

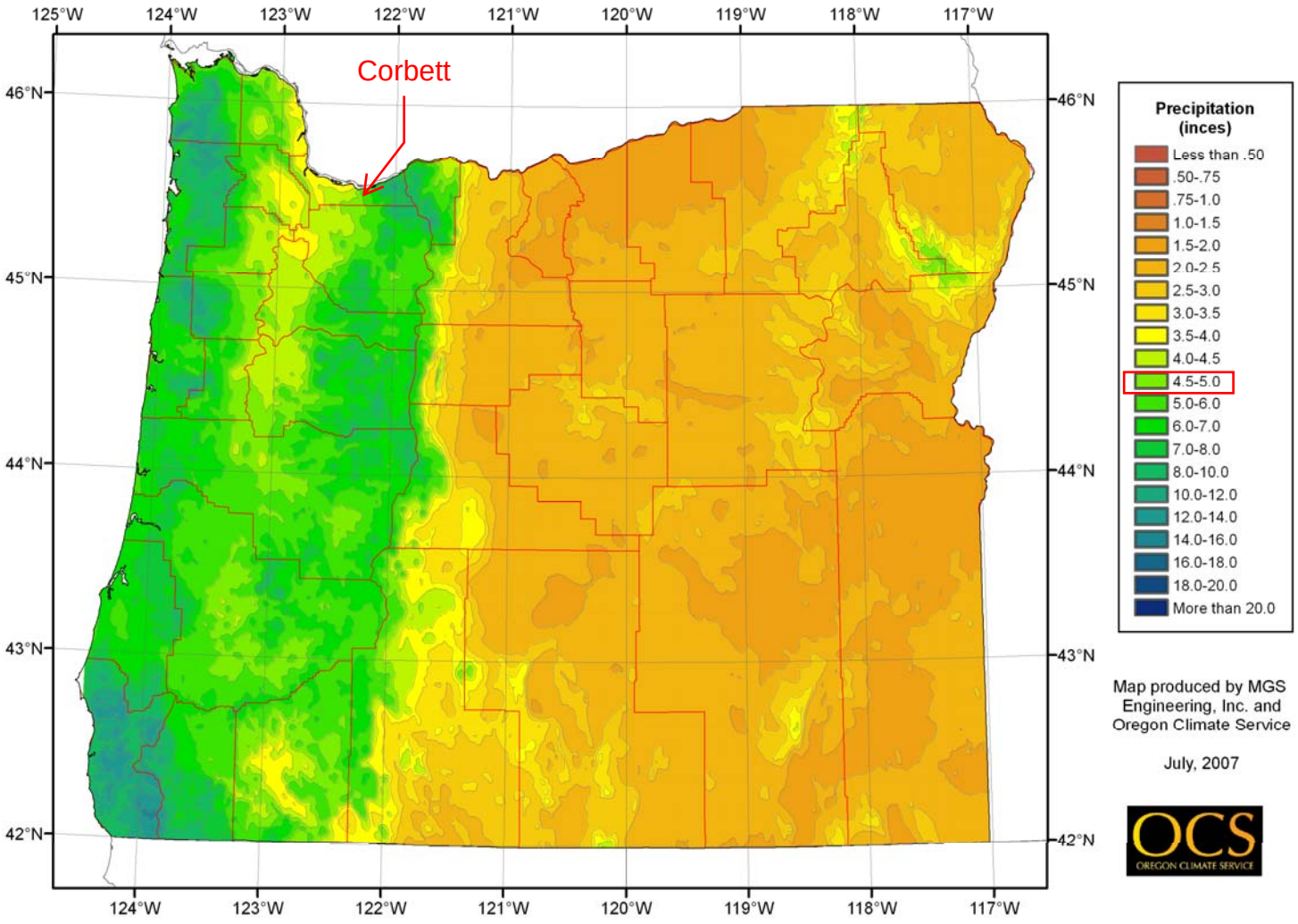


Map produced by MGS Engineering, Inc. and Oregon Climate Service

July, 2007

OCS
OREGON CLIMATE SERVICE

24-hour 50-year Precipitation, Oregon



Map produced by MGS Engineering, Inc. and Oregon Climate Service

July, 2007

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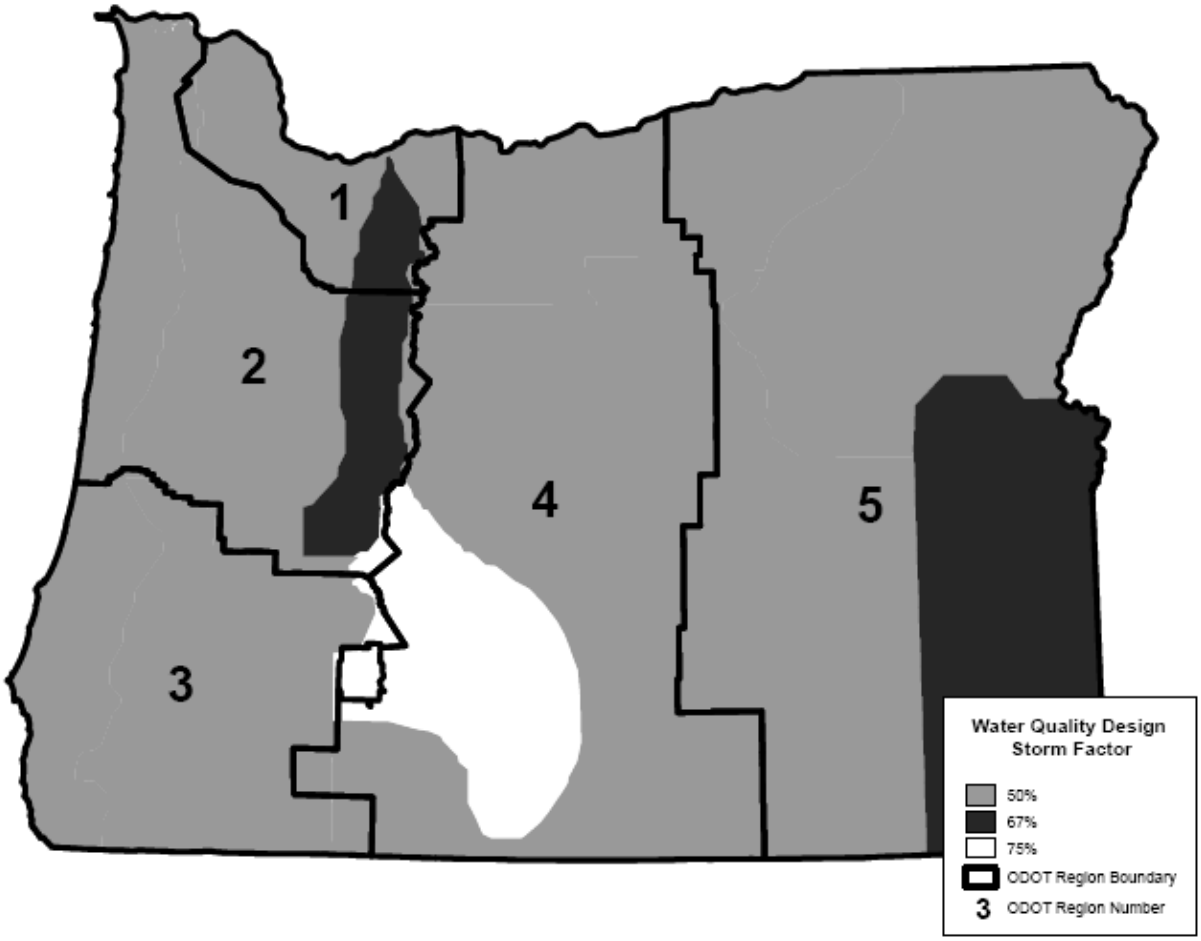


Figure 14-5 Design Storm Factors

Figure 14-6a illustrates an on-line treatment facility.

A single treatment and storage capacity facility is an option when both water quality and water quantity must be provided because of receiving water requirements. This application is considered to be an "on-line" facility and in many situations the most cost-effective stormwater management approach. Use the water quality design guidance in this chapter when designing combination facilities. Combination facilities are examples of units that can provide treatment and storage capacity in a single unit. Additional information on combination facilities is discussed in Section 14.10.7. Storage facility design guidance is discussed in **Chapter 12**.

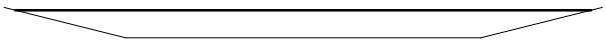
A single treatment and high flow conveyance facility is an option when:

- Water quality must be provided because of receiving water requirements, and
- Regulating the quantity of stormwater is not required.

Appendix D: Water Quality Treatment

Project 23-C012
Springdale Fire Station Improvements

TRAPEZOIDAL CHANNEL FLOW
Bio Swale

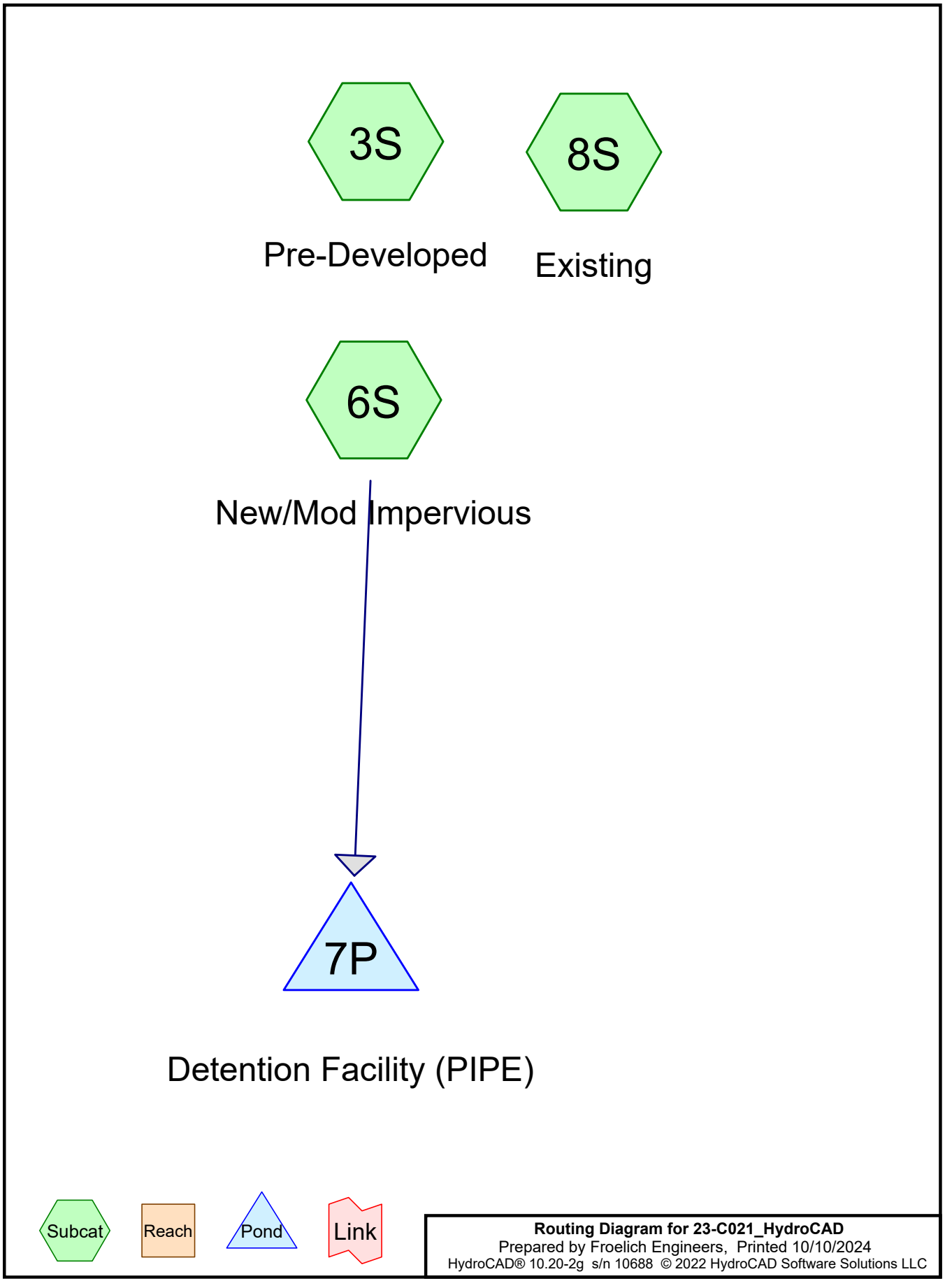


.2'

left slope = 25.00%
bottom width = 2.00'
right slope = 25.00%
channel slope = 1.00%
flow = 0.06 cfs
channel type: shallow swale Manning's n = 0.250

depth = 0.16'
velocity = 0.15 feet/sec
flow area = 0.41 sq.ft.
surface width = 3.24'

Appendix E: Detention System Sizing Calculations



Routing Diagram for 23-C021_HydroCAD
Prepared by Froelich Engineers, Printed 10/10/2024

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	10-Year	Type IA 24-hr		Default	24.00	1	4.00	2
2	50-Year	Type IA 24-hr		Default	24.00	1	5.00	2
3	WQ Event	Type IA 24-hr		Default	24.00	1	1.50	2

Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
4,705	98	Existing Parking (8S)
2,097	81	Existing Pervious (8S)
2,654	98	Existing Roof (6S, 8S)
6,802	98	New/Modified Impervious (6S)
8,129	81	Pre-Developed Pervious (3S)
24,387	**91**	**TOTAL AREA**

Time span=0.04-36.00 hrs, dt=0.20 hrs, 181 points
Runoff by SBUH method, Weighted-Q
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment3S: Pre-Developed Runoff Area=8,129 sf 0.00% Impervious Runoff Depth=2.12"
Tc=5.0 min CN=WQ Runoff=0.09 cfs 1,437 cf

Subcatchment6S: New/Mod Impervious Runoff Area=8,129 sf 100.00% Impervious Runoff Depth=3.77"
Tc=5.0 min CN=WQ Runoff=0.17 cfs 2,551 cf

Subcatchment8S: Existing Runoff Area=8,129 sf 74.20% Impervious Runoff Depth=3.34"
Tc=5.0 min CN=WQ Runoff=0.15 cfs 2,264 cf

Pond 7P: Detention Facility (PIPE) Peak Elev=11.84' Storage=230 cf Inflow=0.17 cfs 2,551 cf
Outflow=0.08 cfs 2,716 cf

Total Runoff Area = 24,387 sf Runoff Volume = 6,252 cf Average Runoff Depth = 3.08"
41.93% Pervious = 10,226 sf 58.07% Impervious = 14,161 sf

Summary for Subcatchment 3S: Pre-Developed

[49] Hint: Tc<2dt may require smaller dt

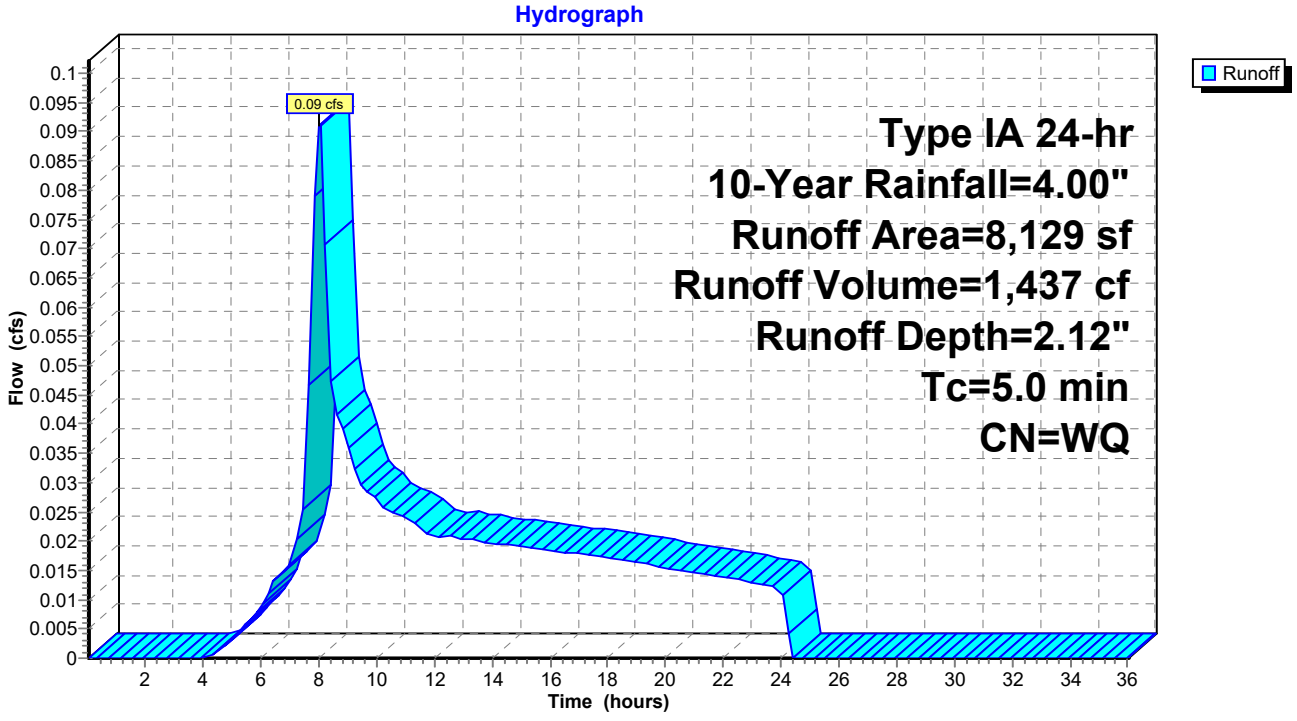
Runoff = 0.09 cfs @ 8.01 hrs, Volume= 1,437 cf, Depth= 2.12"

Runoff by SBUH method, Weighted-Q, Time Span= 0.04-36.04 hrs, dt= 0.20 hrs
Type IA 24-hr 10-Year Rainfall=4.00"

	Area (sf)	CN	Description
*	6,802	81	Pre-Developed Pervious
*	1,327	81	Pre-Developed Pervious
	8,129		Weighted Average
	8,129	81	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 3S: Pre-Developed



Summary for Subcatchment 6S: New/Mod Impervious

[49] Hint: Tc<2dt may require smaller dt

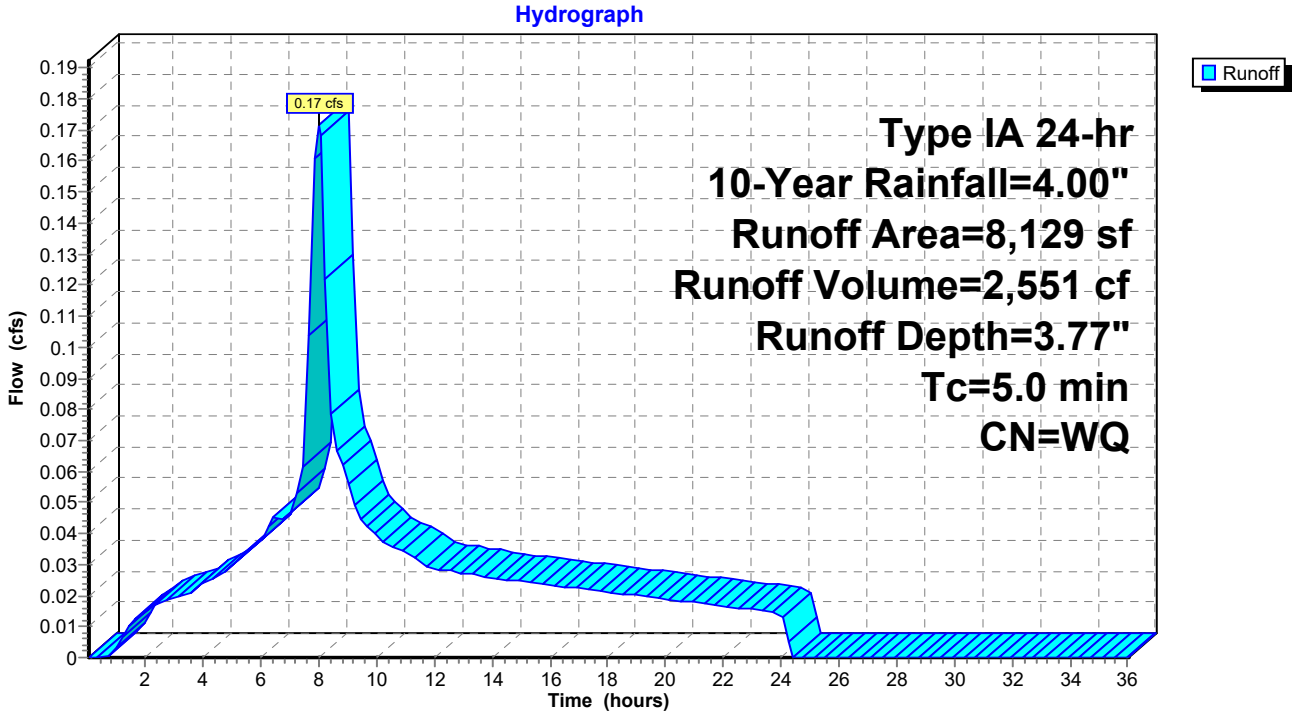
Runoff = 0.17 cfs @ 7.97 hrs, Volume= 2,551 cf, Depth= 3.77"
Routed to Pond 7P : Detention Facility (PIPE)

Runoff by SBUH method, Weighted-Q, Time Span= 0.04-36.04 hrs, dt= 0.20 hrs
Type IA 24-hr 10-Year Rainfall=4.00"

	Area (sf)	CN	Description
*	6,802	98	New/Modified Impervious
*	1,327	98	Existing Roof
	8,129		Weighted Average
	8,129	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 6S: New/Mod Impervious



Summary for Subcatchment 8S: Existing

[49] Hint: Tc<2dt may require smaller dt

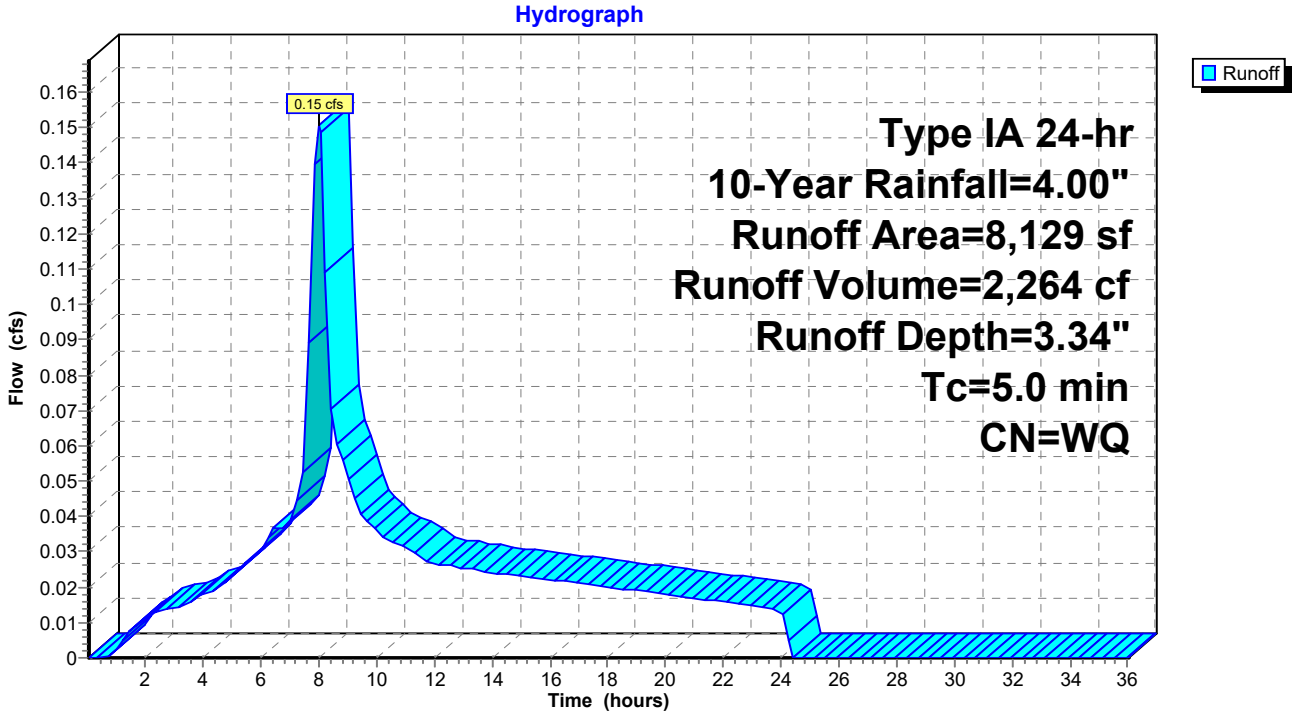
Runoff = 0.15 cfs @ 7.98 hrs, Volume= 2,264 cf, Depth= 3.34"

Runoff by SBUH method, Weighted-Q, Time Span= 0.04-36.04 hrs, dt= 0.20 hrs
Type IA 24-hr 10-Year Rainfall=4.00"

	Area (sf)	CN	Description
*	2,097	81	Existing Pervious
*	1,327	98	Existing Roof
*	4,705	98	Existing Parking
	8,129		Weighted Average
	2,097	81	25.80% Pervious Area
	6,032	98	74.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 8S: Existing



Summary for Pond 7P: Detention Facility (PIPE)

Inflow Area = 8,129 sf,100.00% Impervious, Inflow Depth = 3.77" for 10-Year event
Inflow = 0.17 cfs @ 7.97 hrs, Volume= 2,551 cf
Outflow = 0.08 cfs @ 8.49 hrs, Volume= 2,716 cf, Atten= 53%, Lag= 31.2 min
Primary = 0.08 cfs @ 8.49 hrs, Volume= 2,716 cf

Routing by Stor-Ind method, Time Span= 0.04-36.04 hrs, dt= 0.20 hrs / 2
Peak Elev= 11.84' @ 8.49 hrs Surf.Area= 498 sf Storage= 230 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 36.1 min (701.5 - 665.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	9.67'	0 cf	**6.00'W x 83.00'L x 4.00'H Field A** 1,992 cf Overall - 513 cf Embedded = 1,478 cf x 0.0010% Voids
#2A	10.17'	392 cf	**ADS N-12 30"** x 4 Inside #1 Inside= 30.0"W x 30.0"H => 4.90 sf x 20.00'L = 98.0 cf Outside= 36.0"W x 36.0"H => 6.41 sf x 20.00'L = 128.3 cf
		392 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	10.00'	**1.500" Horiz. Orifice/Grate** C= 0.600
#2	Primary	12.25'	**4.000" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.08 cfs @ 8.49 hrs HW=11.83' (Free Discharge)
└**1=Orifice/Grate** (Orifice Controls 0.08 cfs @ 6.52 fps)
└**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 7P: Detention Facility (PIPE) - Chamber Wizard Field A

Chamber Model = ADS N-12 30" (ADS N-12® Pipe)
Inside= 30.0"W x 30.0"H => 4.90 sf x 20.00'L = 98.0 cf
Outside= 36.0"W x 36.0"H => 6.41 sf x 20.00'L = 128.3 cf

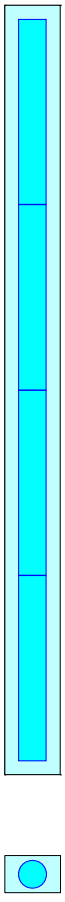
4 Chambers/Row x 20.00' Long = 80.00' Row Length +18.0" End Stone x 2 = 83.00' Base Length
1 Rows x 36.0" Wide + 18.0" Side Stone x 2 = 6.00' Base Width
6.0" Stone Base + 36.0" Chamber Height + 6.0" Stone Cover = 4.00' Field Height

4 Chambers x 98.0 cf = 392.0 cf Chamber Storage
4 Chambers x 128.3 cf = 513.1 cf Displacement

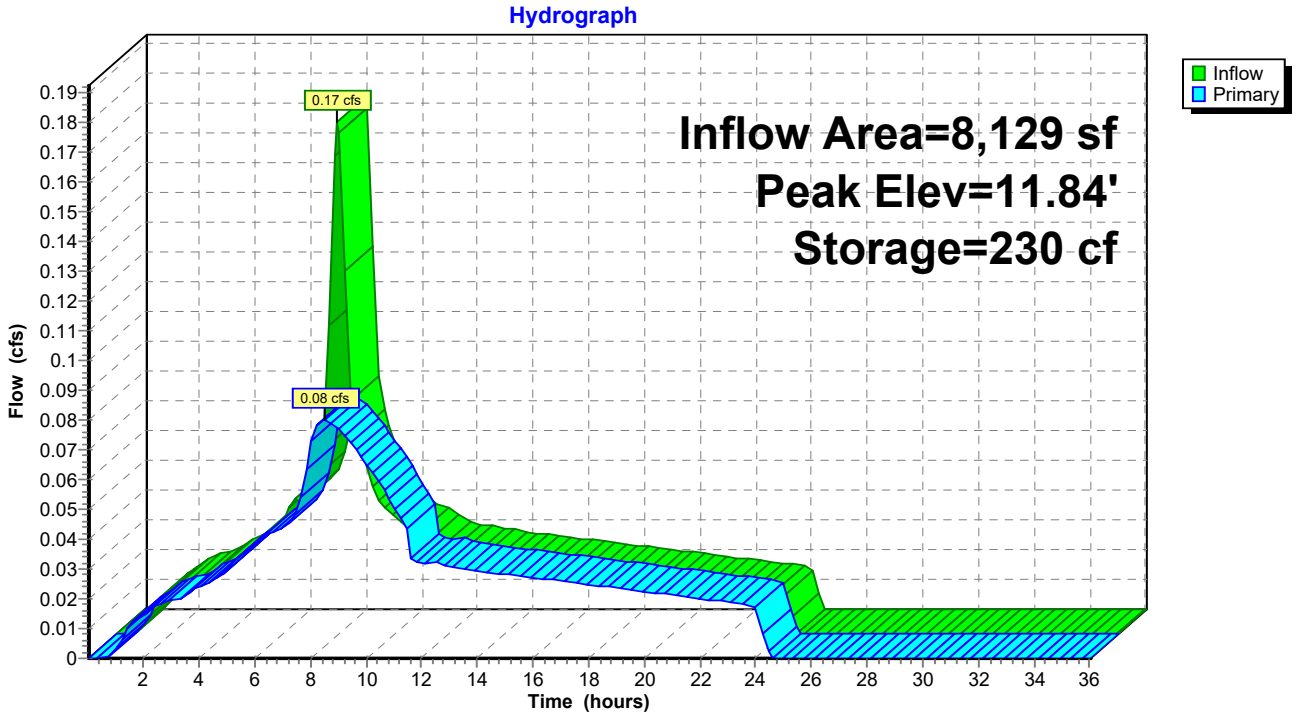
1,991.5 cf Field - 513.1 cf Chambers = 1,478.5 cf Stone x 0.0010% Voids = 0.0 cf Stone Storage

Chamber Storage + Stone Storage = 392.0 cf = 0.009 af
Overall Storage Efficiency = 19.6841%
Overall System Size = 83.00' x 6.00' x 4.00'

4 Chambers
73.8 cy Field
54.8 cy Stone



Pond 7P: Detention Facility (PIPE)



Time span=0.04-36.00 hrs, dt=0.20 hrs, 181 points
Runoff by SBUH method, Weighted-Q
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment3S: Pre-Developed Runoff Area=8,129 sf 0.00% Impervious Runoff Depth=2.99"
Tc=5.0 min CN=WQ Runoff=0.13 cfs 2,023 cf

Subcatchment6S: New/Mod Impervious Runoff Area=8,129 sf 100.00% Impervious Runoff Depth>4.76"
Tc=5.0 min CN=WQ Runoff=0.22 cfs 3,227 cf

Subcatchment8S: Existing Runoff Area=8,129 sf 74.20% Impervious Runoff Depth>4.31"
Tc=5.0 min CN=WQ Runoff=0.19 cfs 2,916 cf

Pond 7P: Detention Facility (PIPE) Peak Elev=12.29' Storage=315 cf Inflow=0.22 cfs 3,227 cf
Outflow=0.12 cfs 3,081 cf

Total Runoff Area = 24,387 sf Runoff Volume = 8,166 cf Average Runoff Depth = 4.02"
41.93% Pervious = 10,226 sf 58.07% Impervious = 14,161 sf

Summary for Subcatchment 3S: Pre-Developed

[49] Hint: Tc<2dt may require smaller dt

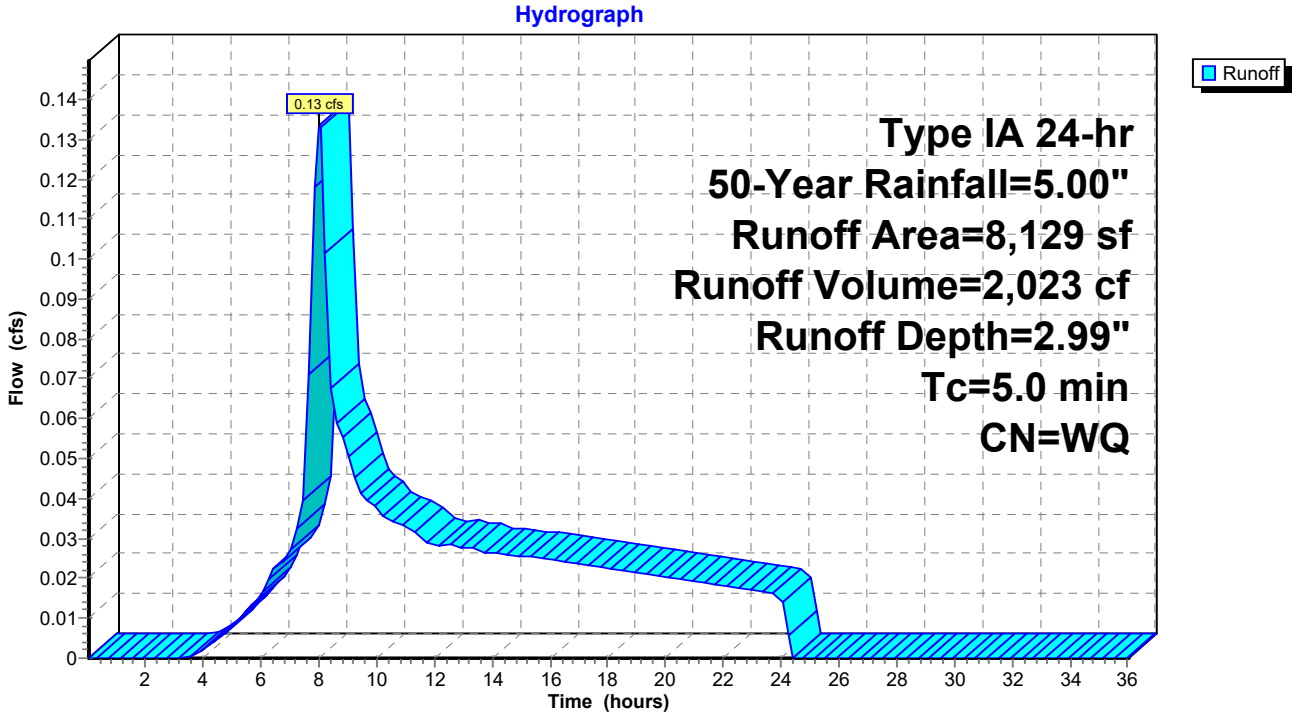
Runoff = 0.13 cfs @ 8.00 hrs, Volume= 2,023 cf, Depth= 2.99"

Runoff by SBUH method, Weighted-Q, Time Span= 0.04-36.04 hrs, dt= 0.20 hrs
Type IA 24-hr 50-Year Rainfall=5.00"

	Area (sf)	CN	Description
*	6,802	81	Pre-Developed Pervious
*	1,327	81	Pre-Developed Pervious
	8,129		Weighted Average
	8,129	81	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 3S: Pre-Developed



Summary for Subcatchment 6S: New/Mod Impervious

[49] Hint: Tc<2dt may require smaller dt

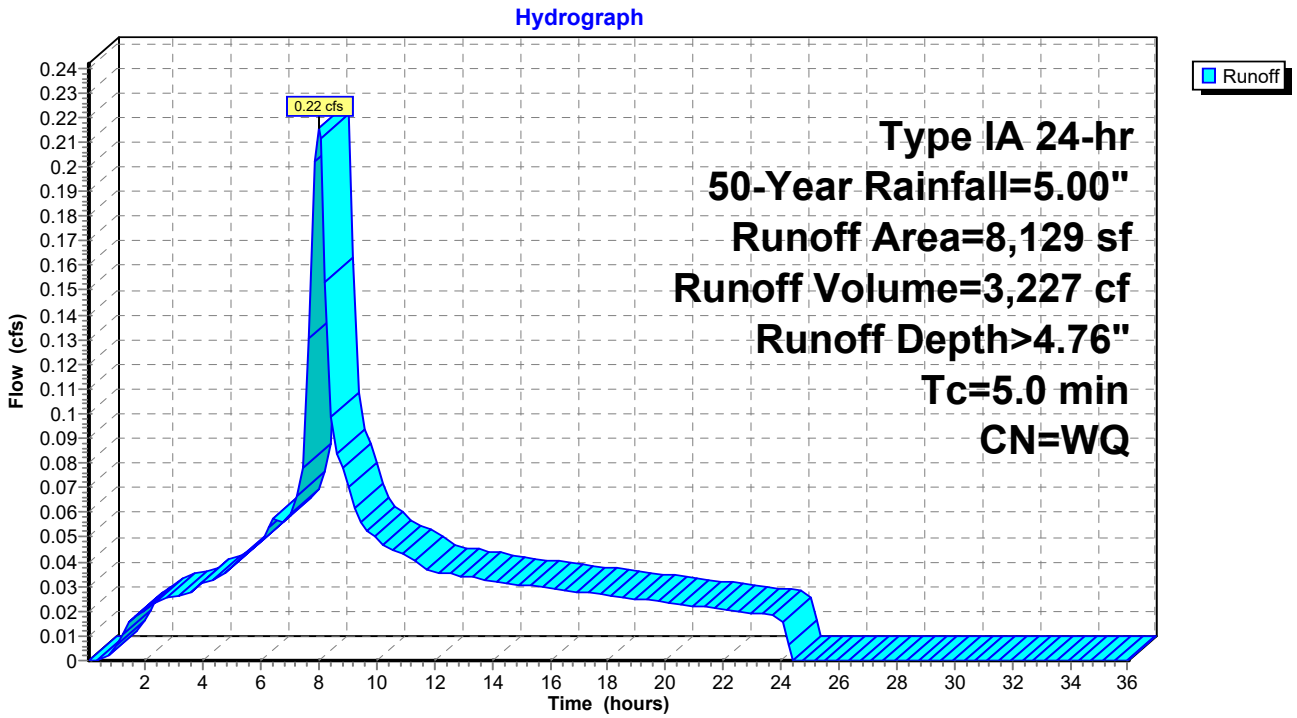
Runoff = 0.22 cfs @ 7.97 hrs, Volume= 3,227 cf, Depth> 4.76"
Routed to Pond 7P : Detention Facility (PIPE)

Runoff by SBUH method, Weighted-Q, Time Span= 0.04-36.04 hrs, dt= 0.20 hrs
Type IA 24-hr 50-Year Rainfall=5.00"

	Area (sf)	CN	Description
*	6,802	98	New/Modified Impervious
*	1,327	98	Existing Roof
	8,129		Weighted Average
	8,129	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 6S: New/Mod Impervious



Summary for Subcatchment 8S: Existing

[49] Hint: Tc<2dt may require smaller dt

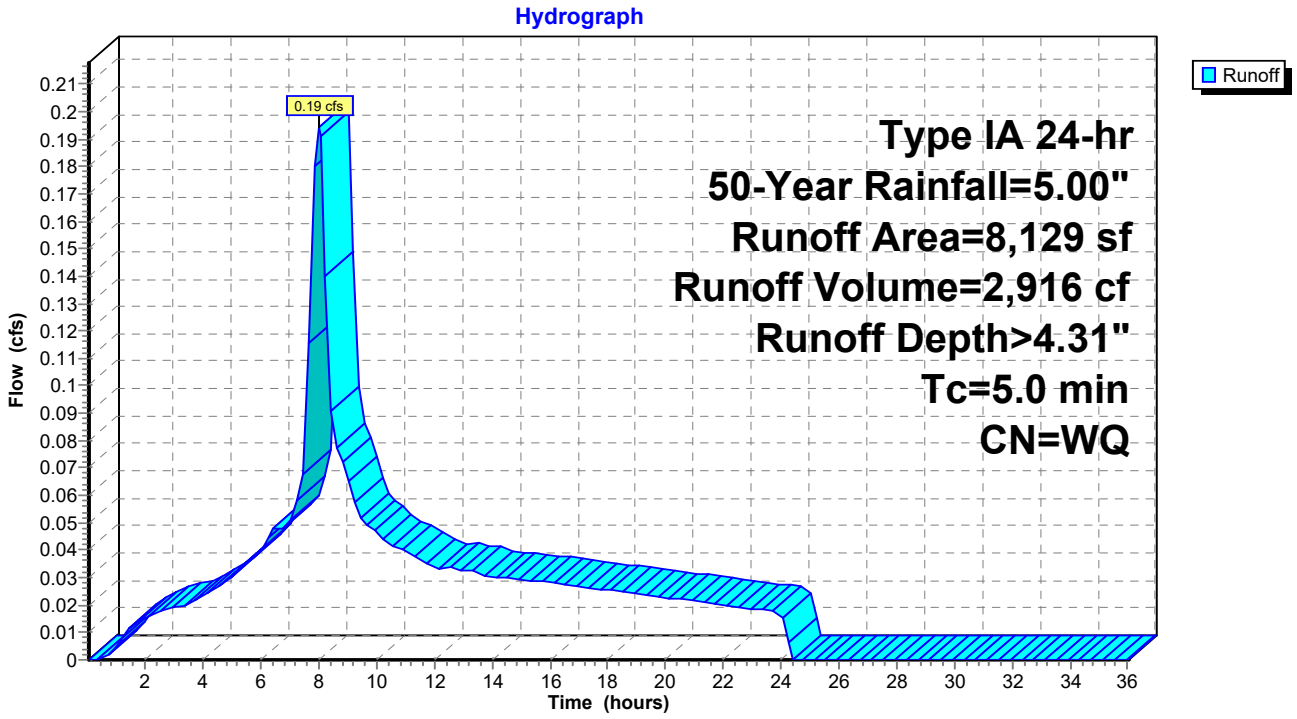
Runoff = 0.19 cfs @ 7.97 hrs, Volume= 2,916 cf, Depth> 4.31"

Runoff by SBUH method, Weighted-Q, Time Span= 0.04-36.04 hrs, dt= 0.20 hrs
Type IA 24-hr 50-Year Rainfall=5.00"

	Area (sf)	CN	Description
*	2,097	81	Existing Pervious
*	1,327	98	Existing Roof
*	4,705	98	Existing Parking
	8,129		Weighted Average
	2,097	81	25.80% Pervious Area
	6,032	98	74.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 8S: Existing



Summary for Pond 7P: Detention Facility (PIPE)

Inflow Area = 8,129 sf,100.00% Impervious, Inflow Depth > 4.76" for 50-Year event
Inflow = 0.22 cfs @ 7.97 hrs, Volume= 3,227 cf
Outflow = 0.12 cfs @ 8.30 hrs, Volume= 3,081 cf, Atten= 44%, Lag= 19.9 min
Primary = 0.12 cfs @ 8.30 hrs, Volume= 3,081 cf

Routing by Stor-Ind method, Time Span= 0.04-36.04 hrs, dt= 0.20 hrs / 2
Peak Elev= 12.29' @ 8.24 hrs Surf.Area= 498 sf Storage= 315 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Volume	Invert	Avail.Storage	Storage Description
#1A	9.67'	0 cf	**6.00'W x 83.00'L x 4.00'H Field A** 1,992 cf Overall - 513 cf Embedded = 1,478 cf x 0.0010% Voids
#2A	10.17'	392 cf	**ADS N-12 30"** x 4 Inside #1 Inside= 30.0"W x 30.0"H => 4.90 sf x 20.00'L = 98.0 cf Outside= 36.0"W x 36.0"H => 6.41 sf x 20.00'L = 128.3 cf
		392 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	10.00'	**1.500" Horiz. Orifice/Grate** C= 0.600
#2	Primary	12.25'	**4.000" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.12 cfs @ 8.30 hrs HW=12.29' (Free Discharge)
└**1=Orifice/Grate** (Orifice Controls 0.09 cfs @ 7.28 fps)
└**2=Orifice/Grate** (Weir Controls 0.03 cfs @ 0.64 fps)

Pond 7P: Detention Facility (PIPE) - Chamber Wizard Field A

Chamber Model = ADS N-12 30" (ADS N-12® Pipe)
Inside= 30.0"W x 30.0"H => 4.90 sf x 20.00'L = 98.0 cf
Outside= 36.0"W x 36.0"H => 6.41 sf x 20.00'L = 128.3 cf

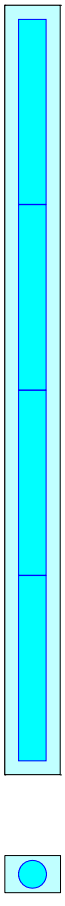
4 Chambers/Row x 20.00' Long = 80.00' Row Length +18.0" End Stone x 2 = 83.00' Base Length
1 Rows x 36.0" Wide + 18.0" Side Stone x 2 = 6.00' Base Width
6.0" Stone Base + 36.0" Chamber Height + 6.0" Stone Cover = 4.00' Field Height

4 Chambers x 98.0 cf = 392.0 cf Chamber Storage
4 Chambers x 128.3 cf = 513.1 cf Displacement

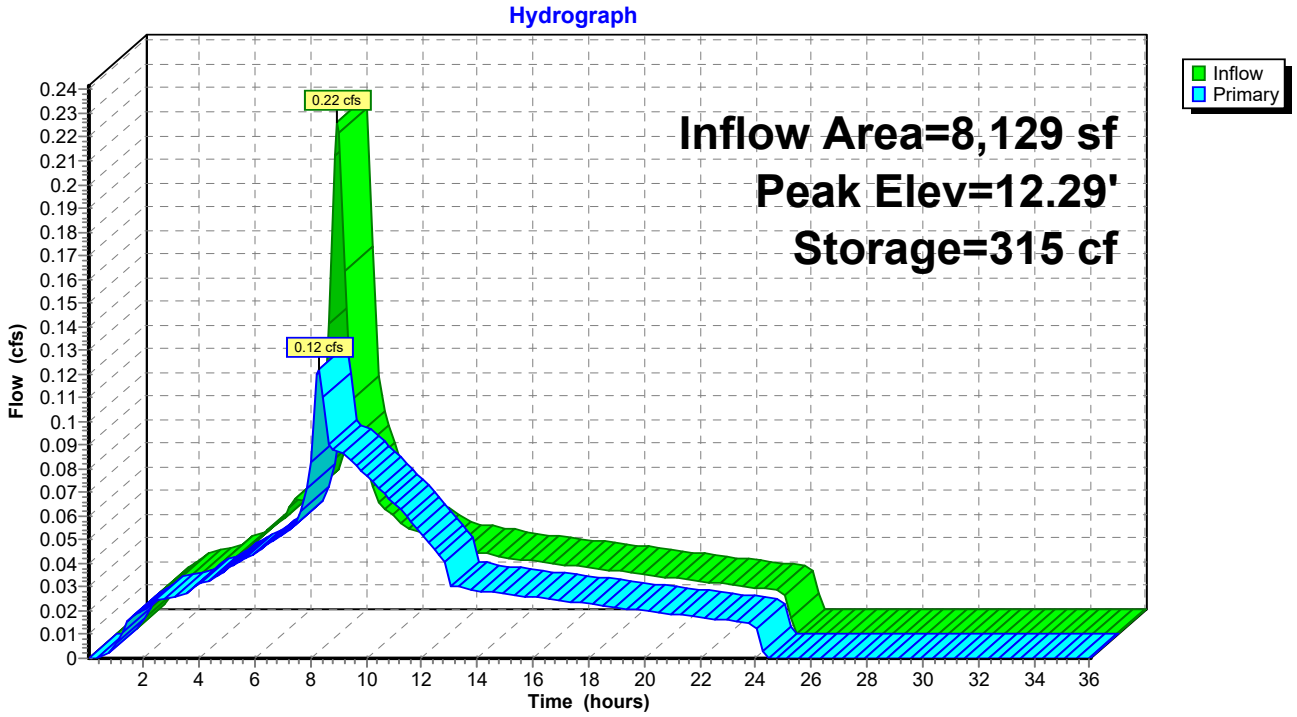
1,991.5 cf Field - 513.1 cf Chambers = 1,478.5 cf Stone x 0.0010% Voids = 0.0 cf Stone Storage

Chamber Storage + Stone Storage = 392.0 cf = 0.009 af
Overall Storage Efficiency = 19.6841%
Overall System Size = 83.00' x 6.00' x 4.00'

4 Chambers
73.8 cy Field
54.8 cy Stone



Pond 7P: Detention Facility (PIPE)



Time span=0.04-36.00 hrs, dt=0.20 hrs, 181 points
Runoff by SBUH method, Weighted-Q
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment3S: Pre-Developed Runoff Area=8,129 sf 0.00% Impervious Runoff Depth=0.31"
Tc=5.0 min CN=WQ Runoff=0.01 cfs 213 cf

Subcatchment6S: New/Mod Impervious Runoff Area=8,129 sf 100.00% Impervious Runoff Depth=1.28"
Tc=5.0 min CN=WQ Runoff=0.06 cfs 867 cf

Subcatchment8S: Existing Runoff Area=8,129 sf 74.20% Impervious Runoff Depth=1.03"
Tc=5.0 min CN=WQ Runoff=0.05 cfs 699 cf

Pond 7P: Detention Facility (PIPE) Peak Elev=10.64' Storage=17 cf Inflow=0.06 cfs 867 cf
Outflow=0.05 cfs 1,113 cf

Total Runoff Area = 24,387 sf Runoff Volume = 1,779 cf Average Runoff Depth = 0.88"
41.93% Pervious = 10,226 sf 58.07% Impervious = 14,161 sf

Summary for Subcatchment 3S: Pre-Developed

[49] Hint: Tc<2dt may require smaller dt

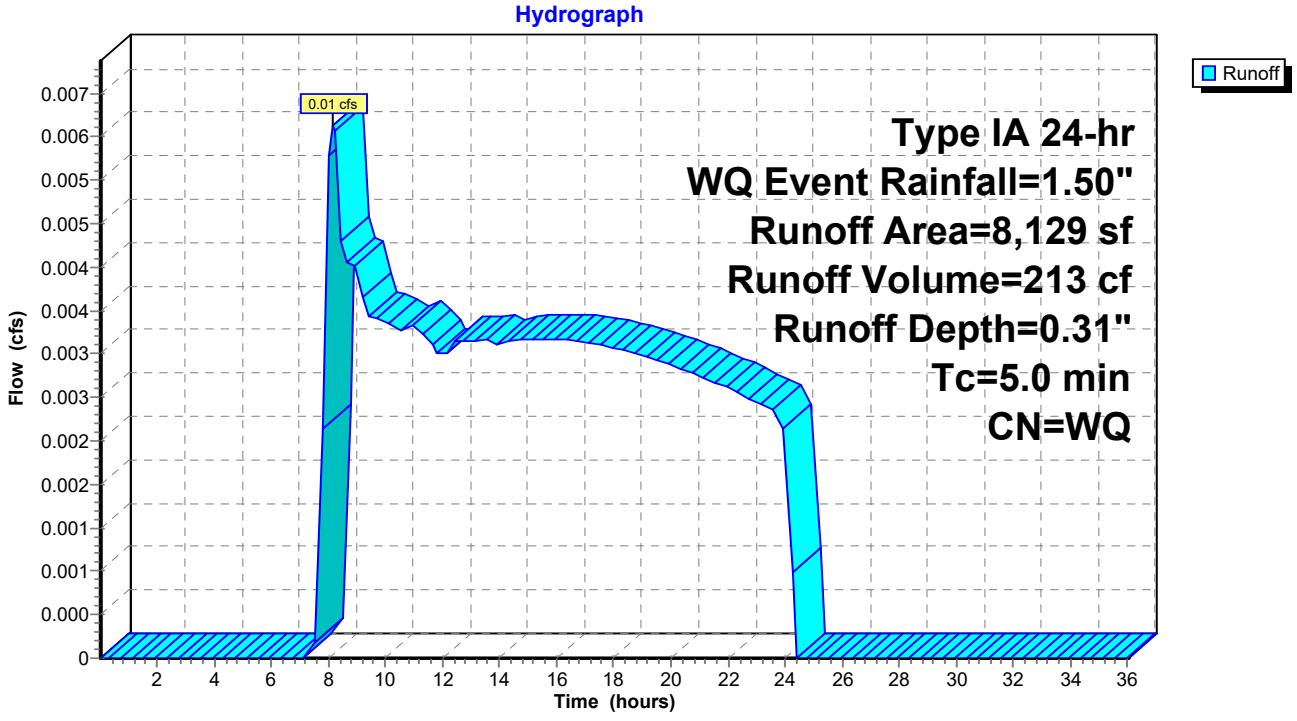
Runoff = 0.01 cfs @ 8.18 hrs, Volume= 213 cf, Depth= 0.31"

Runoff by SBUH method, Weighted-Q, Time Span= 0.04-36.04 hrs, dt= 0.20 hrs
Type IA 24-hr WQ Event Rainfall=1.50"

	Area (sf)	CN	Description
*	6,802	81	Pre-Developed Pervious
*	1,327	81	Pre-Developed Pervious
	8,129		Weighted Average
	8,129	81	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 3S: Pre-Developed



Summary for Subcatchment 6S: New/Mod Impervious

[49] Hint: Tc<2dt may require smaller dt

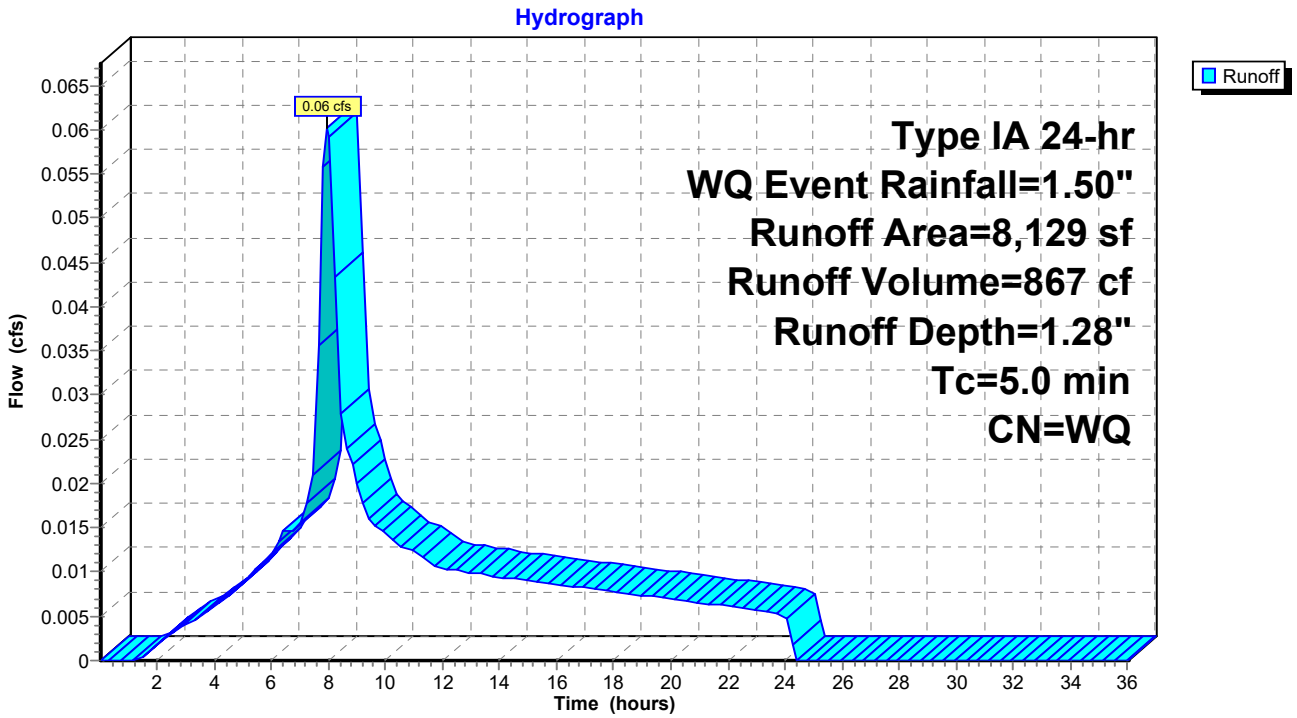
Runoff = 0.06 cfs @ 7.98 hrs, Volume= 867 cf, Depth= 1.28"
Routed to Pond 7P : Detention Facility (PIPE)

Runoff by SBUH method, Weighted-Q, Time Span= 0.04-36.04 hrs, dt= 0.20 hrs
Type IA 24-hr WQ Event Rainfall=1.50"

	Area (sf)	CN	Description
*	6,802	98	New/Modified Impervious
*	1,327	98	Existing Roof
	8,129		Weighted Average
	8,129	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 6S: New/Mod Impervious



Summary for Subcatchment 8S: Existing

[49] Hint: Tc<2dt may require smaller dt

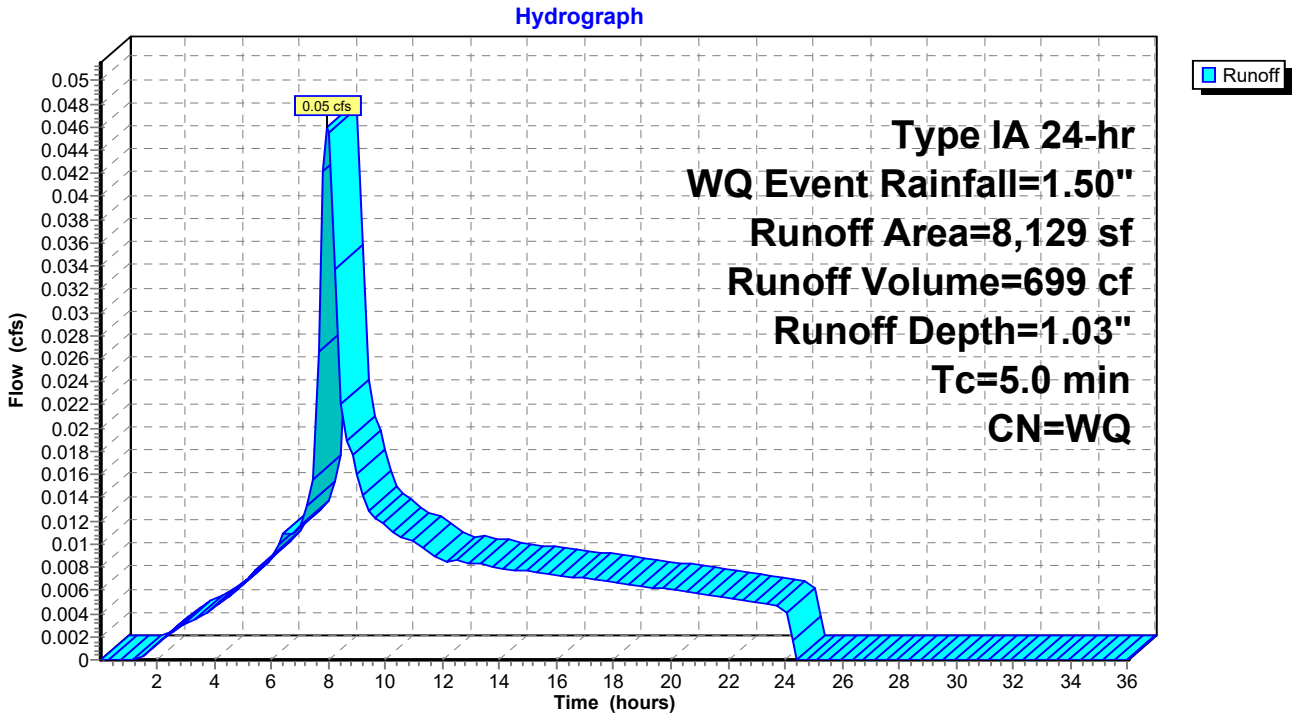
Runoff = 0.05 cfs @ 7.98 hrs, Volume= 699 cf, Depth= 1.03"

Runoff by SBUH method, Weighted-Q, Time Span= 0.04-36.04 hrs, dt= 0.20 hrs
Type IA 24-hr WQ Event Rainfall=1.50"

	Area (sf)	CN	Description
*	2,097	81	Existing Pervious
*	1,327	98	Existing Roof
*	4,705	98	Existing Parking
	8,129		Weighted Average
	2,097	81	25.80% Pervious Area
	6,032	98	74.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 8S: Existing



Summary for Pond 7P: Detention Facility (PIPE)

Inflow Area = 8,129 sf,100.00% Impervious, Inflow Depth = 1.28" for WQ Event event
Inflow = 0.06 cfs @ 7.98 hrs, Volume= 867 cf
Outflow = 0.05 cfs @ 8.19 hrs, Volume= 1,113 cf, Atten= 21%, Lag= 13.1 min
Primary = 0.05 cfs @ 8.19 hrs, Volume= 1,113 cf

Routing by Stor-Ind method, Time Span= 0.04-36.04 hrs, dt= 0.20 hrs / 2
Peak Elev= 10.64' @ 8.19 hrs Surf.Area= 498 sf Storage= 17 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 65.0 min (763.1 - 698.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	9.67'	0 cf	**6.00'W x 83.00'L x 4.00'H Field A** 1,992 cf Overall - 513 cf Embedded = 1,478 cf x 0.0010% Voids
#2A	10.17'	392 cf	**ADS N-12 30"** x 4 Inside #1 Inside= 30.0"W x 30.0"H => 4.90 sf x 20.00'L = 98.0 cf Outside= 36.0"W x 36.0"H => 6.41 sf x 20.00'L = 128.3 cf
		392 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	10.00'	**1.500" Horiz. Orifice/Grate** C= 0.600
#2	Primary	12.25'	**4.000" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.05 cfs @ 8.19 hrs HW=10.64' (Free Discharge)
↑ **1=Orifice/Grate** (Orifice Controls 0.05 cfs @ 3.84 fps)
└ **2=Orifice/Grate** (Controls 0.00 cfs)

Pond 7P: Detention Facility (PIPE) - Chamber Wizard Field A

Chamber Model = ADS N-12 30" (ADS N-12® Pipe)
Inside= 30.0"W x 30.0"H => 4.90 sf x 20.00'L = 98.0 cf
Outside= 36.0"W x 36.0"H => 6.41 sf x 20.00'L = 128.3 cf

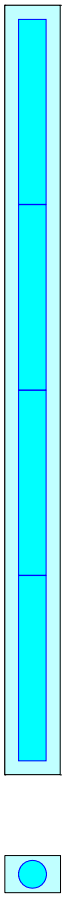
4 Chambers/Row x 20.00' Long = 80.00' Row Length +18.0" End Stone x 2 = 83.00' Base Length
1 Rows x 36.0" Wide + 18.0" Side Stone x 2 = 6.00' Base Width
6.0" Stone Base + 36.0" Chamber Height + 6.0" Stone Cover = 4.00' Field Height

4 Chambers x 98.0 cf = 392.0 cf Chamber Storage
4 Chambers x 128.3 cf = 513.1 cf Displacement

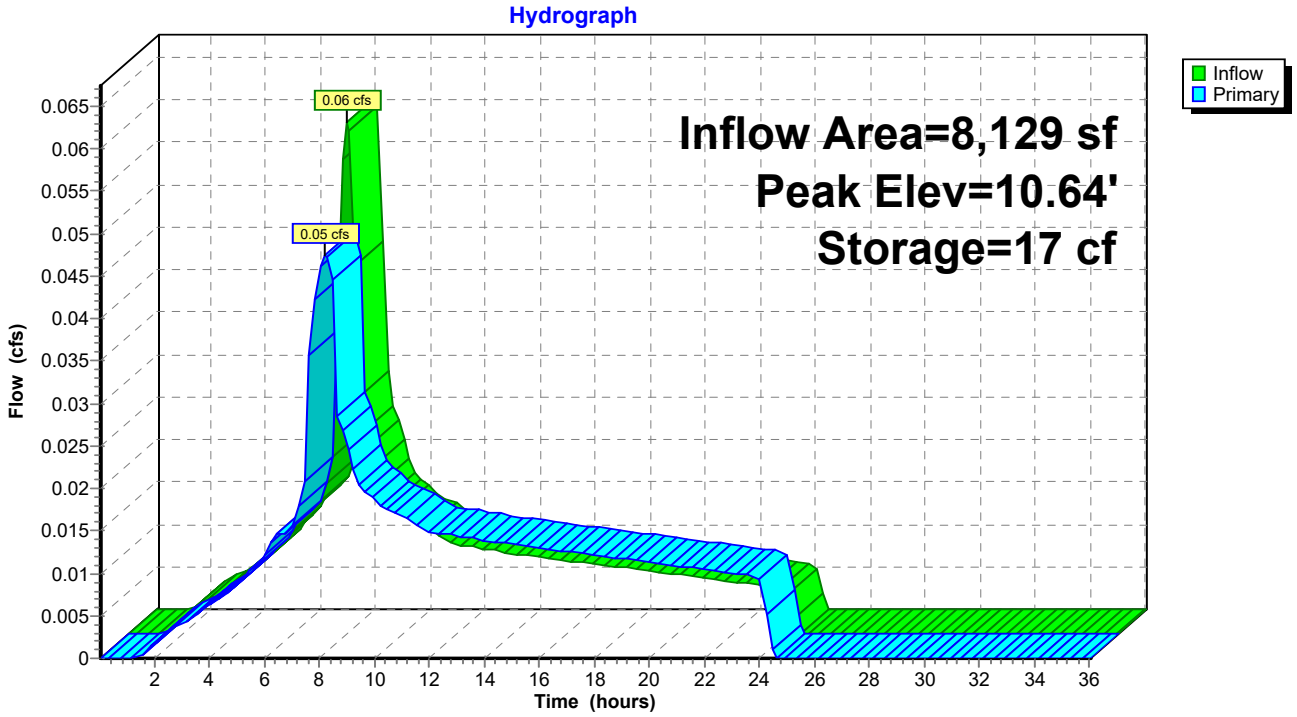
1,991.5 cf Field - 513.1 cf Chambers = 1,478.5 cf Stone x 0.0010% Voids = 0.0 cf Stone Storage

Chamber Storage + Stone Storage = 392.0 cf = 0.009 af
Overall Storage Efficiency = 19.6841%
Overall System Size = 83.00' x 6.00' x 4.00'

4 Chambers
73.8 cy Field
54.8 cy Stone



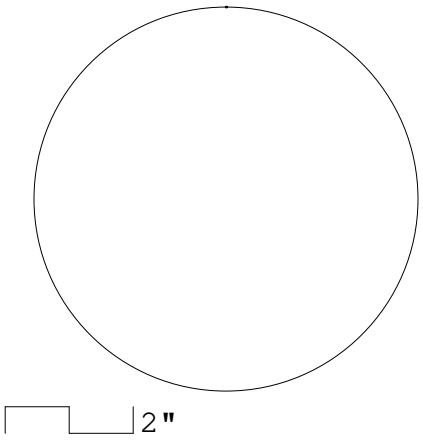
Pond 7P: Detention Facility (PIPE)



Appendix F: Conveyance Calculations

Project 23-C012
Springdale Fire Station Improvements

GRAVITY PIPE FLOW (Chezy-Manning)
6-inch Pipe @ 1%

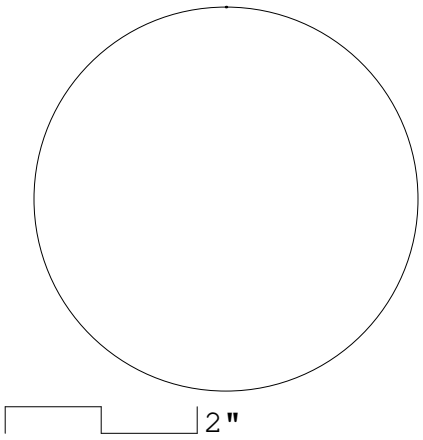


diameter = 6.0"
slope = 1.00%
material: ABS, PVC
Manning's n = 0.013
depth of flow = 100.00% of diameter (full)

wetted perimeter = 1.57'
area = 0.20 s.f.
hydraulic radius = 0.13'
velocity = 2.86 fps
flow = 0.56 cfs

Project 23-C012
Springdale Fire Station Improvements

GRAVITY PIPE FLOW (Chezy-Manning)
4-inch Pipe @ 1%



diameter = 4.0"
slope = 1.00%
material: ABS, PVC
Manning's n = 0.013
depth of flow = 100.00% of diameter (full)

wetted perimeter = 1.05'
area = 0.09 s.f.
hydraulic radius = 0.08'
velocity = 2.18 fps
flow = 0.19 cfs

Appendix G: Geotechnical Report

Report of Geotechnical Engineering Services

Springdale Station

Troutdale, Oregon

March 29, 2024

Geotechnical ■ Environmental ■ Special Inspections

Columbia West

Engineering, Inc

www.columbiawestengineering.com

Geotechnical ▪ Environmental ▪ Special Inspections
Columbia West Engineering, Inc

Vancouver, Washington • Phone: 360-823-2900
Portland, Oregon • Phone: 971-384-1666
www.columbiawestengineering.com

March 29, 2024

Corbett Fire District #14
36930 Historic Columbia River Highway
Corbett, OR 97019

Attn: Dave Flood

Re: Report of Geotechnical Engineering Services
Springdale Station
31727 Historic Columbia River Highway
Troutdale, Oregon
CWE Project: CFD-1-01-1

Columbia West Engineering, Inc. (Columbia West) is pleased to present this report of geotechnical engineering services for the Springdale Station project located in Troutdale, Oregon. Our services were conducted in accordance with our proposal dated January 23, 2024.

We appreciate the opportunity to work on the project. Please contact us if you have any questions regarding this document.

Sincerely,

Jason F. Merritt, PE
Senior Project Engineer

Signed for
Brett A. Shipton, PE, GE
Principal Engineer

cc: Erik Matthews, em architecture llc

JFM:NNP:kat
Attachments
Document ID: CFD-1-01-1-032924-geor.docx

EXECUTIVE SUMMARY

This executive summary presents the primary geotechnical considerations associated with the Springdale Station project located in Troutdale, Oregon. Our conclusions and recommendations are based on the subsurface information presented in the report and proposed development information provided by the design team. A detailed discussion of the geotechnical considerations summarized here is presented in respective sections of the report.

- The proposed structure can be supported on conventional spread footings bearing on firm, native soil or structural fill overlying firm, native soil.

- Based on the results of our site-specific seismic hazard evaluation, the parameters provided by ASCE 7-16 general response spectrum for Site Class C should be used for the site.

- Although not observed in the borings, undocumented fill may be present at the site, particularly below existing structural elements. All undocumented fill beneath proposed improvements should be assessed by Columbia West following demolition when subgrade conditions are exposed.

- Moisture conditioning will be likely be required to use the on-site soil as structural fill. Accordingly, extended dry weather will be required to adequately condition and place the silt as structural fill. It will be difficult, if not impossible, to adequately compact the on-site soil during the rainy season or during prolonged periods of rainfall.

- Based on results of in-situ infiltration testing in one of the borings, on-site stormwater infiltration systems are not feasible at the site.

3.3.2 Soil Conditions

3.3.2.1 Pavement Section

Borings B-1 and B-2 were drilled through a pavement section consisting of 5 inches of AC underlain by 6 inches of aggregate base.

3.3.2.2 Fine-Grained Alluvium

Silt with varying proportions of sand is present below the AC sections (B-1 and B-2) and in the south-facing slope (HA-1). The silt observed in the borings varies from medium stiff to stiff. Laboratory testing indicates the moisture content of native silt ranges from 29 to 38 percent and the fines content (percent passing the U.S. Standard No. 200 sieve) is between 53 and 95 percent. Atterberg limit testing indicates the silt has medium plasticity.

3.3.3 Groundwater

Perched groundwater was observed in borings B-1 and B-2 at depths of 3 and 3.5 feet BGS, respectively. Seeps were observed in boring HA-1 at a depth of approximately 4 feet below top of slope elevation and are likely from surface infiltration. The depth to perched groundwater may fluctuate in response to prolonged rainfall, seasonal changes, changes in surface topography, and other factors not observed during this study. Perched groundwater could be higher than observed in our explorations during the wet season or periods of persistent rainfall.

3.4 INFILTRATION TESTING

Infiltration testing was performed in boring B-2 at a depth of 2.5 feet BGS. Infiltration testing was conducted using the encased falling head method. Infiltration was not observed in the boring. Based on the results of our testing and observations, subsurface disposal of stormwater is not feasible in our opinion.

4.0 DESIGN

4.1 FOUNDATION SUPPORT

4.1.1 General

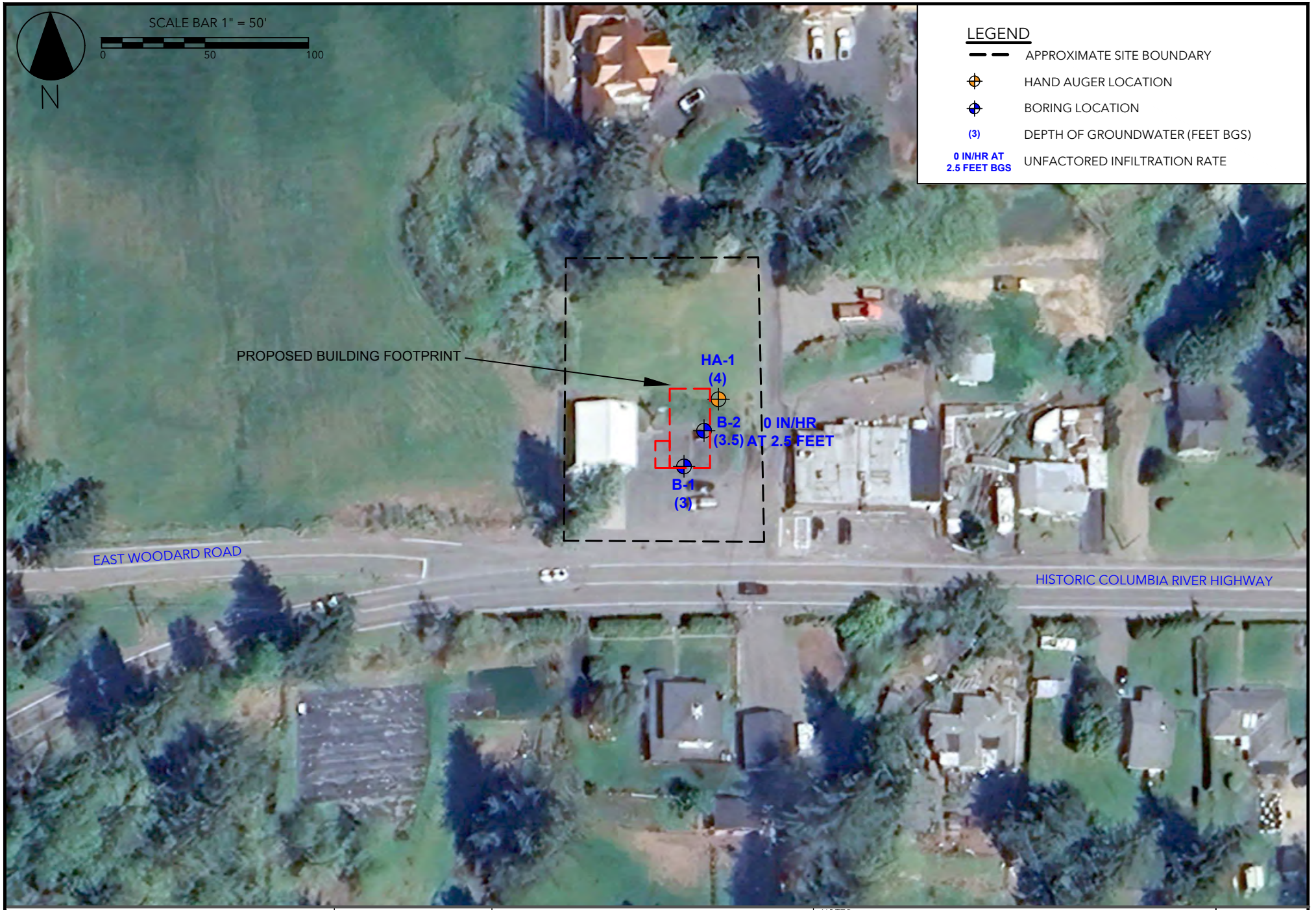
Provided foundation and floor slab loads are as described in Section 1.0 (Introduction) and the site is prepared as recommended in Section 5.0 (Construction), it is our opinion that the proposed building can be supported on conventional spread footings that bear on undisturbed, native soil or structural fill overlying undisturbed, native soil.

Foundations should not be supported on topsoil, tilled soil, undocumented fill, or loose/disturbed soil. If present below planned footings, these materials should be removed and replaced with structural fill as recommended in this report.

4.1.2 Bearing Capacity

Continuous perimeter wall and isolated spread footings should have minimum widths of 18 and 24 inches, respectively. The base of exterior footings should be at least 18 inches below the lowest adjacent exterior grade. The base of interior footings should bear at least 12 inches below the base of the floor.

Footings bearing on subgrade prepared as recommended in Section 5.1 (Site Preparation) should be sized based on an allowable bearing pressure of 2,500 psf. As the allowable bearing pressure



Geotechnical ▪ Environmental ▪ Special Inspections
Columbia West Engineering, Inc

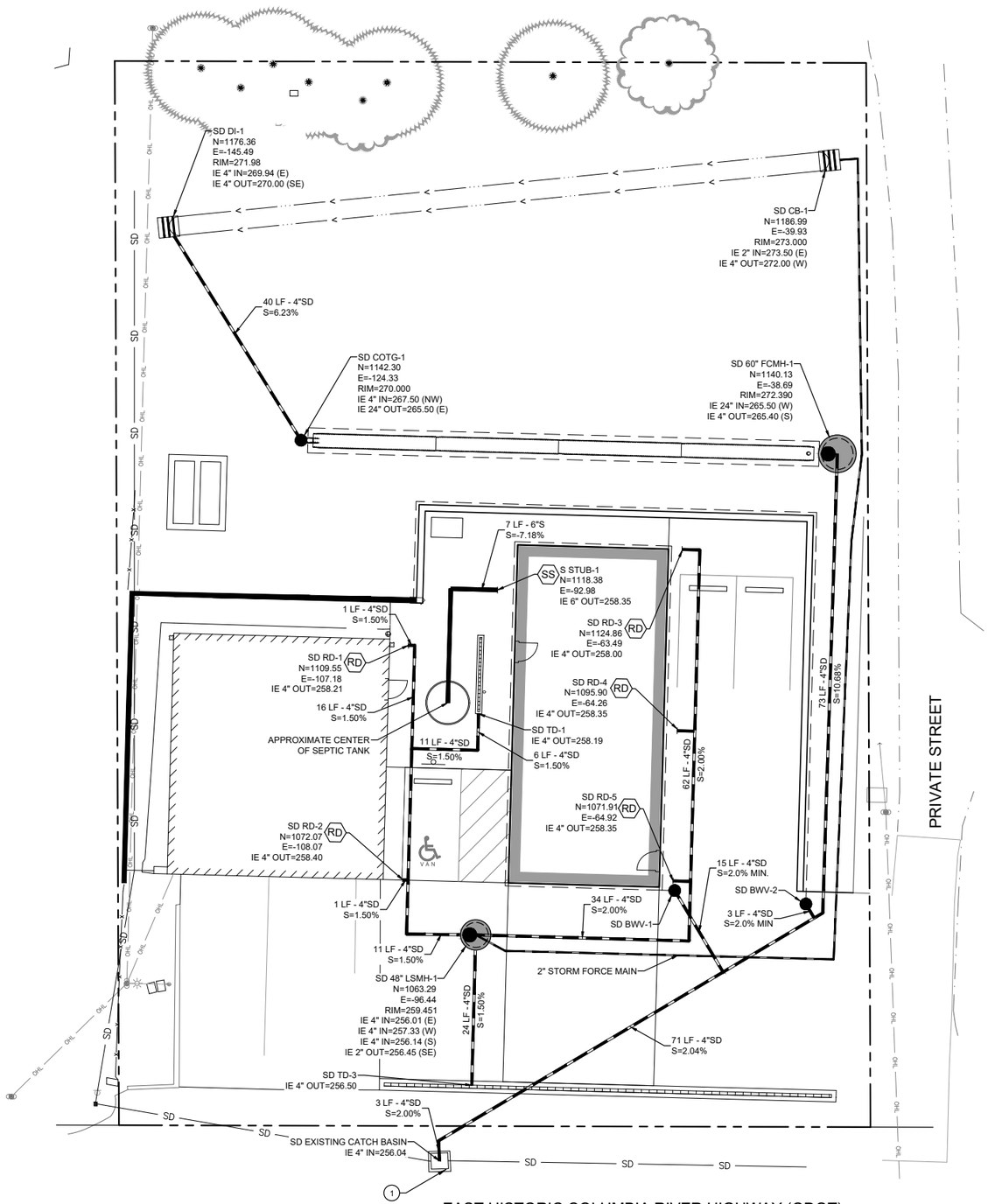
Job No: CFD-1-01-1
Date: 03/20/24
Drawn: SSC
Checked: JFM

EXPLORATION LOCATION MAP
SPRINGDALE STATION
TROUTDALE, OREGON

NOTES:
1. SITE LOCATION: 31727 HISTORIC COLUMBIA RIVER HIGHWAY, TROUTDALE, OREGON.
2. SITE CONSISTS OF PROPERTY ID NO. R322491 TOTALING APPROXIMATELY 0.47 ACRE.
3. AERIAL PHOTO SOURCED FROM GOOGLE EARTH.
4. EXPLORATION LOCATIONS ARE APPROXIMATE AND NOT SURVEYED.
5. BORINGS BACKFILLED WITH BENTONITE AND CAPPED WITH ASPHALT CONCRETE ON MARCH 1, 2024.
6. HAND AUGER BACKFILLED WITH ON-SITE SOIL ON MARCH 1, 2024.

FIGURE
2

Appendix H: Utility Plan / Details



SHEET NOTES

1. PIPE BEDDING AND BACKFILL FOR ALL UTILITIES SHALL BE DONE PER DETAIL X/C5.X.
2. STRUCTURES LOCATIONS ARE BASED ON CENTER OF STRUCTURE.

KEY NOTES

1 FIELD VERIFY LOCATION AND IE OF EXISTING CATCH BASIN PRIOR TO CONSTRUCTION.

UTILITY LABEL LEGEND

STRUCTURE LABEL

UTILITY TYPE (SD=STORM DRAINAGE, S=SANITARY SEWER, W=WATER, FP=FIRE PROTECTION)
STRUCTURE TYPE CALLOUT
ID NUMBER (WHERE APPLICABLE)

XX.XX-XX
N=XX.XX ← LOCATION (WHERE APPLICABLE)
E=XX.XX
RIM=
IE IN = XX.X ← STRUCTURE INFO (WHERE APPLICABLE)
IE OUT = XX.X

PIPE LABEL

UTILITY LENGTH
UTILITY SIZE
UTILITY TYPE

XXLF - XX" XX

S=X.XX%
SLOPE (WHERE APPLICABLE)

STRUCTURE TYPE

CALLOUT	DESCRIPTION	DETAIL REF.
BEND	BEND, USE FITTING IF APPLICABLE	(X / XXX)
BWV	BACKWATER VALVE	
CB	CATCH BASIN	
COTG	CLEANOUT TO GRADE	
CONN	CONNECTION	
DI	DITCH INLET	
FCMH	FLOW CONTROL MANHOLE	
FD	FOUNDATION DRAINAGE POINT OF CONN.	
GV	GATE VALVE	
LSMH	LIFT STATION MANHOLE	
TD	TRENCH DRAIN	
TEE	TEE CONNECTION	
WYE	WYE CONNECTION	

SHEET LEGEND

(RD) CONNECT TO STORM DRAIN/ROOF DRAIN. SEE PLUMBING PLANS FOR CONTINUATION. SIZE AND IE AS NOTED.

(SS) CONNECT TO SANITARY SEWER LINE. SEE PLUMBING PLANS FOR CONTINUATION. SIZE AND IE AS NOTED.

(!!) UTILITY CROSSING. PROVIDE 12" MIN. CLEARANCE, U.N.O.

(X / XXX)

SCALE 1 INCH = 10 FEET
10 0 10 20

FROELICH ENGINEERS
CIVIL · STRUCTURAL
Portland, OR. | Bend, OR. | Denver, CO.
(503) 624-7005

PRELIMINARY NOT FOR CONSTRUCTION

SPRINGDALE FIRE STATION IMPROVEMENTS

3172? EAST HISTORIC COLUMBIA RIVER HWY
TROUTDALE, OR, 97019

LAND USE SET

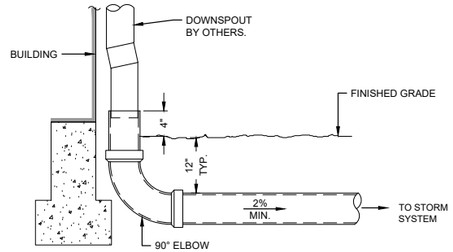
REV	DATE	ISSUE TITLE

PROJECT MANAGER:	EME
DESIGNER:	EME
DRAWN BY:	EEYKELBOSCH
PROJECT NO:	---
DATE:	10/11/24
SCALE:	AS SHOWN

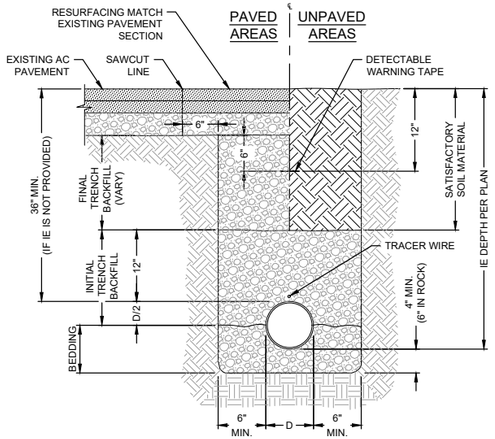
SHEET TITLE:
UTILITY PLAN

SHEET NUMBER:
C4.00
LAND USE SET

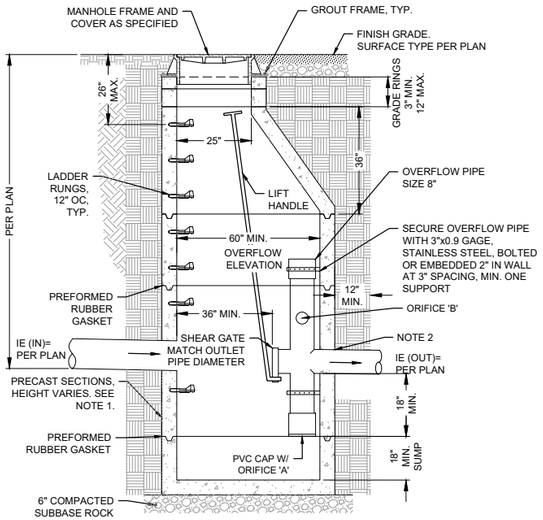
File: P:\2023\23-C021 (Springdale Fire Station Improvements)\300 Document Development - Froelich\302 CAD\PLOT\23_C021_C4.00_UTIL.dwg TAB:C4.00
Plotted: 10/10/24 at 5:57pm By: eeykelbosch



X DOWNSPOUT/STORM DRAIN CONNECTION
SCALE: NTS



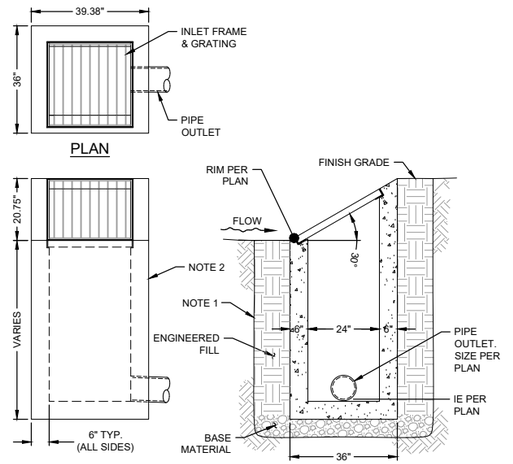
X TYPICAL PIPE BEDDING AND BACKFILL
SCALE: NTS



NOTES:
1. ALL PRECAST SECTIONS SHALL CONFORM TO REQUIREMENTS OF ASTM C-478.
2. ALL CONNECTING PIPES SHALL HAVE FLEXIBLE, GASKETED AND UNRESTRAINED JOINT WITHIN 18" OF MANHOLE VAULT. PIPE SIZES NOTED ON PLANS. PIPE CONNECTION TO MANHOLES SHALL HAVE KOR-N-SEAL BOOT OR APPROVED EQUAL.
3. ORIFICE AND OVERFLOW ELEVATIONS ARE RELATIVE TO IE (OUT)

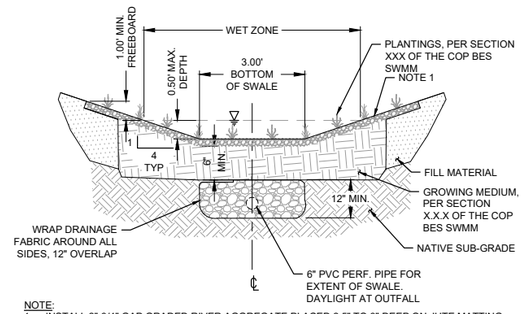
	FCMH-1
DIAMETER OF ORIFICE 'A' (IN)	7/8"
ORIFICE B IE ELEVATION (FT)	+1.90'
DIAMETER OF ORIFICE B (IN)	3"
OVERFLOW ELEVATION (FT)	+2.40'

6 FLOW CONTROL MANHOLE
SCALE: NTS



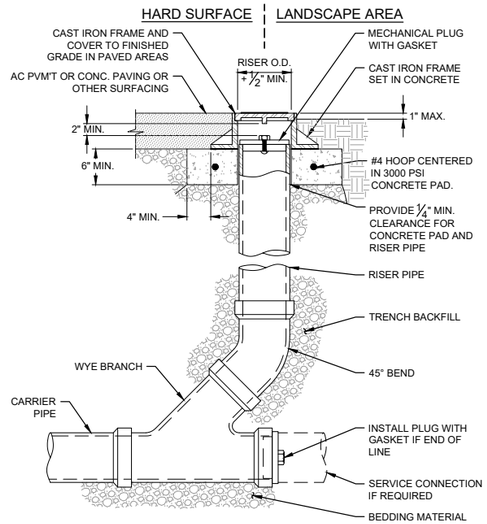
NOTES:
1. CONTRACTOR TO WIDEN EXCAVATION AS REQUIRED TO OBTAIN COMPACTION WITH CONTRACTORS COMPACTION EQUIPMENT.
2. CONCRETE BASIN TO BE 3000 PSI.

X DITCH INLET - TYPE 1
SCALE: NTS



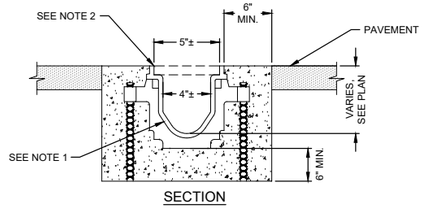
NOTE:
1. INSTALL 2"-3/4" GAP GRADED RIVER AGGREGATE PLACED 2.5" TO 3" DEEP ON JUTE MATTING

X TYP. BIOSWALE
SCALE: NTS



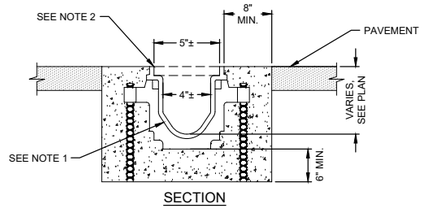
NOTES:
1. CAST IRON FRAME AND COVER SHALL MEET H-20 LOAD REQUIREMENT.
2. FOR CARRIER PIPE SIZE 6"Ø AND LESS, PROVIDE RISER PIPE SIZE TO MATCH CARRIER PIPE.
3. FOR CARRIER PIPE SIZE 8"Ø AND LARGER, RISER PIPE SHALL BE 6"Ø.
4. RISER PIPE MATERIAL TO MATCH CARRIER PIPE MATERIAL.

X STANDARD CLEANOUT (COTG)
SCALE: NTS



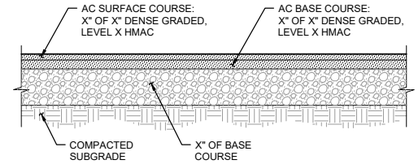
NOTES:
1. TRENCH DRAIN SHALL BE PRE-SLOPED 4" WIDE ZURN OR ACO TRENCH DRAIN OR APPROVED EQUAL.
2. TRENCH DRAINS GRATE SHALL BE LOCKABLE HEAVY DUTY SLOTTED IRON TRENCH GRATE - CLASS C.
3. TRENCH SYSTEM SHALL BE INSTALLED PER MANUFACTURER'S INSTRUCTIONS.

X TRENCH DRAIN - 4 INCH WIDE (TYPE 1)
SCALE: NTS

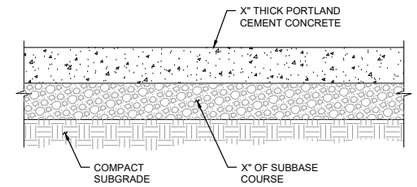


NOTES:
1. TRENCH DRAIN SHALL BE PRE-SLOPED 4" WIDE ZURN OR ACO TRENCH DRAIN OR APPROVED EQUAL.
2. TRENCH DRAINS GRATE SHALL BE LOCKABLE HEAVY DUTY SLOTTED IRON TRENCH GRATE - CLASS E.
3. TRENCH SYSTEM SHALL BE INSTALLED PER MANUFACTURER'S INSTRUCTIONS.

X TRENCH DRAIN - 4 INCH WIDE (TYPE 2)
SCALE: NTS

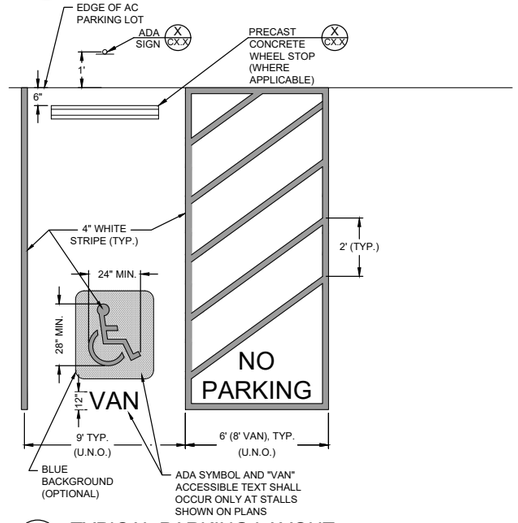


X ASPHALT PAVEMENT SECTION
SCALE: NTS

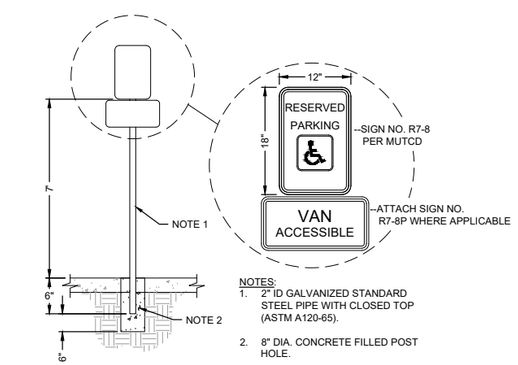


NOTES:
1. - CONSTRUCT CONTRACTION JOINTS AT 15' MAX. SPACING AND AT RAMPS.
   - CONSTRUCT EXPANSION JOINTS AT 200' MAX. SPACING AT POINTS OF TANGENCY AND AT ENDS OF EACH DRIVEWAY.
2. PROVIDE MEDIUM TO COARSE BROOM FINISH.

X CONCRETE PAVEMENT SECTION
SCALE: NTS



X TYPICAL PARKING LAYOUT
SCALE: NTS



NOTES:
1. 2" ID GALVANIZED STANDARD STEEL PIPE WITH CLOSED TOP (ASTM A120-65).
2. 8" DIA. CONCRETE FILLED POST HOLE.

X ADA PARKING SIGN
SCALE: NTS

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PRELIMINARY
NOT FOR
CONSTRUCTION

SPRINGDALE FIRE STATION IMPROVEMENTS

31727 EAST HISTORIC COLUMBIA RIVER HWY
TROUTDALE, OR. 97019

LAND USE SET

REV	DATE	ISSUE TITLE

PROJECT MANAGER:	EME
DESIGNER:	EME
DRAWN BY:	EEYKELBOSCH
PROJECT NO:	----
DATE:	10/11/24
SCALE:	AS SHOWN

SHEET TITLE:
DETAILS

SHEET NUMBER:
C5.00
LAND USE SET

File: P:\2023\23-C021 (Springdale Fire Station Improvements)\300 Document Development - Froelich\302 CAD\PLOT\23_C021_C5.00_DETL.dwg TAB:C5.00
Plotted: 10/10/24 at 5:57pm By: eeykelbosch

Appendix I: Operations and Maintenance

NOT INCLUDED WITH LAND USE