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CIVIL ENGINEERING | WATER RESOURCES | COMMUNITY PLANNING

PRELIMINARY STORM WATER REPORT

WEST UNION CHEVRON
WASHINGTON COUNTY, OR 97229

June 3, 2021

Prepared For:

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I hereby certify that this Stormwater Management Report for the West Union Chevron has been prepared by me or under my supervision and meets minimum standards of the Clean Water Services 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.

EXECUTIVE SUMMARY

The proposed project is located at 18450 NW West Union Road in unincorporated Washington County. The property consists of two tax lots (1n1 19bc 00500 & 00600). The total site area is 1.204 acres and contains a café with an associated parking lot and a house with a shop. All existing structures will be demolished to construct a new Chevron Gas Station.

The proposed project will construct a new fuel station with associated parking lot and market. Additionally, frontage improvements will be made along NW West Union Road. Runoff from onsite will be conveyed to a BayFilter Manhole to be treated. After treatment water will be detained in an ADS Stormtech Chamber before discharging to the existing drainage system in NW West Union Road. The proposed ADS StormTech Chamber is designed to over detain to account for the frontage improvements. Runoff from the frontage improvements will sheet flow to the existing drainage system in NW West Union Road. A fee-in-lieu of treatment is being pursued for the frontage improvements.

A downstream analysis was conducted for the existing line in NW West Union Rd and a visual inspection was conducted for Bethany Creek. The line in NW West Union Rd has capacity to receive un-detained flow and safely convey runoff with no out of system flooding. Additionally, the increase in runoff from the proposed development will have a negligible effect on Bethany Creek.

The purpose of this report is to describe the treatment and detention facilities being proposed, to show the downstream system has sufficient capacity to receive the un-detained flows and to show that the design follows current Clean Water Services Design and Construction Standards issued December 2019.

PROJECT DESCRIPTION

The proposed project will consist of demolishing all existing structures and constructing a new Chevron Gas Station with associated parking lot. Runoff from the proposed development will be treated in a new BayFilter Manhole and detained in an ADS StormTech Chamber system before being discharged to the existing line in NW West Union Rd.

The purpose of this report is to describe the treatment and detention facilities being proposed, the downstream system has sufficient capacity to receive the un-detained flows from the site and the design follows Clean Water Services Design and Construction Standards, issued December 2019.

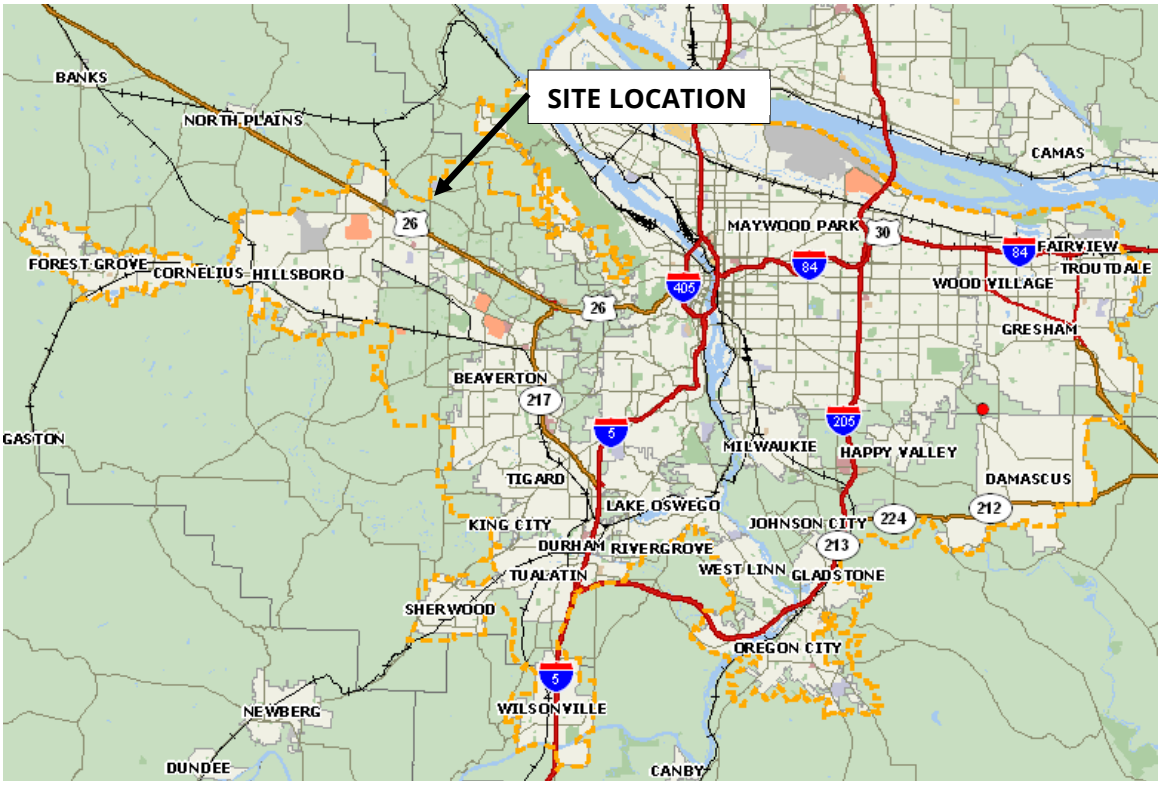


Figure 1 - Vicinity Map

Figure 2 - Site Location

EXISTING CONDITIONS

Site

The existing site contains a café with an associated parking lot and a house with a shop. There is no known drainage system onsite.

Flood Map

The site is located within Zone X (un-shaded) per flood insurance rate map (FIRM) community-panel number 41067 C0361E (See Technical Appendix: Exhibits – National Flood Hazard Layer FIRMette). FEMA's definition of Zone X (un-shaded) is an area of minimal flood risk outside the 1-percent-annual-chance floodplain. Just south of the proposed development is the floodplain for Bethany Creek. All work will be located outside of the 100-year floodplain.

Site Geology

The soil types as classified by the United States Department of Agriculture Soil Survey of Washington County are identified in Table 1 (See Technical Appendix: Exhibits – Hydrologic Soil Group-Washington County, Oregon).

Soil Type	Hydrologic Group
Aloha Silt Loam	C/D
Verboort Silt Clay Loam	D

Table 1 - Soil Characteristics

All soil onsite will be defined as hydrologic soils group D. Hydrologic soils group D is defined as having a very slow infiltration rate when thoroughly wet.

Geotechnical Report

A geotechnical investigation was performed by GeoEngineers on January 21, 2019 (See Technical Appendix: Geotechnical Report). Soils onsite were observed to be man-made fills, underlain by flood deposits silt with an occasional layer of fine sandy silt. Four infiltration tests were performed onsite and infiltration rates for the site were measured between 0 in/hr to 1.50 in/hr. Infiltration facilities are not recommended as a sole source for stormwater disposal and any infiltration facility should include an overflow that conveys water to an approved discharge point.

Existing Hydrology

Runoff from the existing site generally sheet flows to the south towards Bethany Creek. Elevations vary between 183' to 176'.

Existing Basin Areas

Tables 2 and 3 show the current impervious and pervious areas for the property and offsite area (See Technical Appendix: Exhibits – Existing Site Conditions).

Existing Onsite Basin Area	ft^2	Acres
Impervious Area (total)	10,869	0.250
Modified	8,307	0.191
Removed	2,562	0.059
Gravel Area (total)	12,463	0.286
Modified	8,215	0.189
Removed	4,248	0.097
Pervious Area	29,122	0.668
Total Area	52,454	1.204

Table 2 – Existing Onsite Basin Area

Existing Offsite Basin Area	ft²	Acres
Impervious Area (total)	1,545	0.036
Modified	1,387	0.032
Removed	158	0.004
Gravel Area (total)	51	0.001
Modified	43	0.001
Removed	8	~0.000
Pervious Area	214	0.005
Total Area	1,810	0.042

Table 3 – Existing Offsite Basin Area

POST-DEVELOPED CONDITIONS

Site

The proposed site will consist of a new Chevron Gas Station, fueling pumps, and associated parking lot. Runoff from the site will be conveyed to a BayFilter Manhole that will treat runoff. Following treatment, runoff will be detained in a new StormTech Chamber system and then released to the existing drainage system in NW West Union Rd. Additionally, frontage improvements will be provided along NW West Union Road. All runoff from the frontage improvements will sheet flow to the existing drainage system in NW West Union Road. No treatment or detention is provided for the frontage improvements; although, the detention facility onsite is designed to over detain to account for the increased runoff from NW West Union Road.

Post-Developed Basin Areas

Tables 4 and 5 show the proposed impervious and pervious areas for the property and offsite area (See Technical Appendix: Exhibits – Post-Developed Site Conditions).

Post-Developed Onsite Basin Area	ft²	Acres
Impervious Area	32,833	0.754
Pervious Area	19,621	0.450
Total Area	52,454	1.204

Table 4 – Post-Developed Onsite Basin Area

Post-Developed Offsite Basin Area	ft²	Acres
Impervious Area	1,620	0.037
Pervious Area	190	0.005
Total Area	1,810	0.042

Table 5 – Post-Developed Offsite Basin Area

HYDROLOGIC ANALYSIS DESIGN GUIDELINES

Design Guidelines

The site is located within the jurisdiction of Washington County and Clean Water Services. The guidelines used for the design of this project reflect current Clean Water Services Design and Construction Standards, issued December 2019.

Hydrograph Method

Naturally occurring rainstorms dissipate over long periods of time. An effective way of estimating storm rainfall is by using the hydrograph method. The Santa Barbara Urban Hydrograph (SBUH) method was used to develop runoff rates. The computer software XPSTORM was used in modeling the hydrology during the predeveloped and post-developed conditions to determine the increase in runoff and allowable release rate for the proposed site.

Design Storm

The rainfall distribution to be used for this area is the design storm of 24-hour duration based on the standard Type 1A rainfall distribution. Table 6 shows total precipitation depths for the two storm events used in the analysis, which were used as multipliers for the Type 1A 24-hour rainfall distribution (See Detail Drawing No. 1280 in the Clean Water Services Design and Construction Standards).

Recurrence Interval (Years)	Total Precipitation Depth (inches)
2	2.50
5	3.10
10	3.45
25	3.90
100	4.50

Table 6 - Design Storms

RUNOFF PARAMETERS

Curve Number

The major factors for determining the CN values are hydrologic soil group, cover type, treatment, hydrologic condition, and antecedent runoff condition. The curve number represents runoff potential from the ground. Table 2-2a from the TR55 Urban Hydrology for Small Watersheds was used to determine the appropriate curve numbers (See Technical Appendix: Exhibits – Table 2-2a Runoff Curve Numbers).

All modified impervious area is given a curve number of 75, per section 4.08.6 of the CWS Design and Construction Standards. The predeveloped site was given a curve number of 80 for pervious area, which corresponds to open space in good condition. The post-developed site was given a curve number of 84 for all pervious area, which corresponds to open space in fair condition. A curve number of 98 was used for all impervious area.

Time of Concentration

Due to the size of the site and the existing grade, the predeveloped site was assumed to have a time of concentration of 5 minutes. Additionally, the post-developed site was also assumed to have a time of concentration of 5 minutes.

Basin Runoff

The existing and post-developed runoff rates for the onsite area and offsite are shown in Table 7 and 8 (See Technical Appendix: Hydrographs).

Recurrence Interval (Years)	Predeveloped Runoff Rate (cfs)	Post-Developed Runoff Rate (cfs)	Allowable Release Rate (cfs)
2	0.18	0.54	0.09
5	0.31	0.71	0.31
10	0.39	0.81	0.39
25	0.50	0.94	-
100	0.65	1.12	-

Table 7 - Basin Runoff Rates (Onsite)

Recurrence Interval (Years)	Predeveloped Runoff Rate (cfs)	Post-Developed Runoff Rate (cfs)	Allowable Release Rate (cfs)
2	0.01	0.02	0.01
5	0.01	0.03	0.01
10	0.02	0.03	0.02
25	0.02	0.04	-
100	0.03	0.04	-

Table 8 - Basin Runoff Rates (Offsite)

HYDRAULIC ANALYSIS

System Characteristics

The stormwater conveyance system will be sized in the final design phase of the project to convey all storm events up to and including the 100-year storm event without any out of system flooding.

HYDROMODIFICATION ASSESSMENT

Hydromodification Guidelines & Assessment

The proposed site is located in an area designated as having moderate hydromodification risk (See Technical Appendix: Exhibits – Hydromod Planning Tool). The existing line in NW West Union RD outfalls to Bethany Creek in Allenbach Acres, south of the proposed site. Approximately 790' downstream of the outfall, water is conveyed through a box culvert under NW 185th Ave and discharges to Bethany Lake. The downstream analysis continues approximately ¼ mile downstream of the outfall, in Bethany Lake (See Downstream Analysis).

Based on the location, existing conditions onsite, and size of the proposed development, the site falls under Category 2 in Table 4-2 in the CWS Design and Construction Standards. Sites within Category 2 represent those with moderate anticipated hydromodification risk. The following options can be considered for the site:

1. Infiltration LIDA, using the Standard LIDA Sizing
2. Peak-Flow Matching Detention
3. A combination of option 1 & 2
4. Any option listed in Category 3

The use of LIDA facilities for the site are not a viable option due to the grading onsite and the lack of open space to fit a surface facility. Due to these constraints, option 2 will be utilized for the site using underground detention in an ADS StormTech Chamber. A flow control manhole will be designed to hold water in the detention facility and release it at a rate that meets the CWS Hydromodification Standards.

Peak flow matching due to hydromodification shall follow Table 9 below.

Post-Developed Peak Runoff Rate	Predevelopment Peak Runoff Rate Target
2-year, 24-hour	50% of the 2-year, 24-hour
5-year, 24-hour	5-year, 24-hour
10-year, 24-hour	10-year, 24-hour

Table 9 – Peak Flow Matching Requirements for Hydromodification

WATER QUALITY

New & Modified Impervious Area (Onsite)

CWS requires all runoff from new impervious area and 3X the modified impervious area less the permanently removed impervious area up to the total impervious area onsite be treated. The required treatment area is calculated below.

Required Treatment Area = 9,501 sf + 3 (16,522 sf – 6,810 sf) = 38,637 sf
= 38,637 sf > Post-Construction Impervious Area = **32,833 sf**

The proposed site is required to treat the total post-construction impervious area onsite.

Water Quality Guidelines & Calculations (Onsite)

Per Clean Water Services guidelines, water quality treatment facilities are required to be designed to treat the rainfall of 0.36" over a 4-hour period with a return period of 96-hours. The following shows the calculated treatment flow rate for the design the water quality treatment facilities.

$$\text{Water Quality Volume (WQV)} = \frac{\text{Impervious Area (ft}^2\text{) X 0.36 (in)}}{\text{12 (in/ft)}} = \frac{\text{32,833 (ft}^2\text{) X 0.36 (in)}}{\text{12 (in/ft)}} = 985 \text{ ft}^3$$

Water Quality Flow (WQF) = $\frac{\text{WQV}}{\text{14,400 seconds}} = \frac{\text{985 (ft}^3\text{)}}{\text{14,400 sec}}$ = 0.07 cfs

BayFilter Manhole (Onsite)

Runoff from the proposed development will be treated in a BayFilter Manhole that will be installed inline with the proposed drainage system. The manhole will contain BayFilter 522 Cartridges, which have the capacity to treat up to 22.5 gpm (0.05 cfs) per cartridge. See calculation below for the minimum number of cartridges required to treat the WQF calculated above.

Number of Cartridges = $\frac{\text{0.07 cfs}}{\text{0.05 cfs / cartridge}}$ = 1.40 cartridges → **2 Cartridges**

The BayFilter Cartridges will be housed in a 60" manhole (see Technical Appendix: Calculations – BayFilter Design Tool).

Water Quality Manhole

Stormwater will be pre-treated in a water quality manhole which will precede the BayFilter Manhole. The water quality manhole was sized in accordance to section 4.06.1 of the CWS Design and Construction Standards and detail drawings number 250. See calculation below.

$\frac{20 \text{ ft}^3}{1 \text{ cfs}}$ X 0.94 cfs = 18.8 ft^3 → **60" manhole with 36" sump (54" from ie$_{out}$ to bottom of sump)**

Fee-in-Lieu (Offsite)

The proposed frontage improvements will be allowed to sheet flow to the existing drainage system in NW West Union Road. No treatment is being proposed for these improvements. Instead, a fee-in-lieu of treatment is being proposed for the frontage improvements. The total water quality treatment area for the frontage improvements is calculated below.

Required Treatment Area = 24 sf + 3 (1,430 sf) = 4,314 sf
= 4,314 sf > Post-Construction Impervious Area = **1,620 sf**

WATER QUANTITY

Design Guidelines

Due to the risk of hydromodification from the proposed site, the onsite development will provide detention and flow control to meet the peak flow requirements in section 4.08.6 (see Table 7) of the CWS Design and Construction Standards.

StormTech Chambers

The proposed StormTech Chambers will be utilized to detain runoff onsite and a flow control manhole following the chambers will release water at a rate that meets the peak flow requirements for hydromodification in section 4.08.6 of the CWS Design and Construction Standards. The ADS SC740 StormTech Chambers will be used to design the facility. The proposed detention facility will over detain to account for the frontage improvements. The chambers will have a minimum volume of 6,673

cf of volume to detain runoff from the site (See Technical Appendix: Calculations – StormTech Cumulative Storage).

Flow Control Structure

The flow control structure for the site will follow the detention system for the proposed site. The design of the flow control structure will be included with the final design phase of the project.

DOWNSTREAM ANALYSIS

Clean Water Services (CWS) requires a downstream analysis when new impervious area greater than 5,000 square feet is created. According to CWS' *Design And Construction Standards for Sanitary Sewer and Surface Water Management*, the analysis must show capacity in the downstream system for the additional volume of water. The analysis shall extend downstream to a point where the drainage from the proposed development constitutes less than 10% of total flow. When the flow drops below the 10% threshold the analysis must continue for ¼ of a mile or until the additional flow is less than 5% of total drainage flow.

The proposed site will discharge runoff to the existing system in West Union Rd. Water is conveyed east via a 12" pipe approximately 460' before being upsized to a 15" pipe and conveyed an additional 20'. The system then outfalls to Bethany Creek in Allenbach Acres to the south via two (2) separate outfall pipes, one (1) 12" pipe and one (1) 15" pipe. Water is conveyed approximately 790' to the west and a through a box culvert under NW 185th Ave. The box culvert discharges water to Bethany Lake, approximately 0.25 miles downstream of the outfall (See Technical Appendix: Downstream Analysis – Downstream Exhibits & Photos).

The system in NW West Union Rd was modeled for the 25 and 100-year storm events up to the outfall to ensure that there is sufficient capacity for the increase in runoff due to the increased impervious area. The proposed site was modeled using unmitigated flows. Basins were delineated using the area measurement tool in the CWS Sanitary and Strom Sewer Map (See Technical Appendix: Downstream Analysis – Downstream Basins). Areas within the right-of-way were assumed to be 100% impervious and developed areas outside of the right-of-way were assumed to be 80% impervious. The CN for the downstream basins were based on land coverage and hydrologic soils group. The existing pipes were given a Manning's n of 0.013. All surface elevations and pipe data were taken from the CWS Sanitary and Storm Sewer Map.

The line in NW West Union Rd was determined to have capacity for the proposed development. The system has capacity to convey the 25-year design storm without surcharge conditions and a minimum freeboard of 3.11'. Additionally, the system has capacity to convey the 100-year design storm with a minimum freeboard of 3.03', although the system will have surcharge conditions in the 12" outfall. At the outfalls, the proposed development constitutes 10% of the overall basin peak runoff rate.

Bethany Creek was visually inspected for any downstream obstructions or deficiencies. The basin contributing to Bethany Creek was determined to be well over 1,000 acres and the proposed increase in runoff will be negligible. Based on the visual inspection of Bethany Creek and Bethany Lake, the drainage is unobstructed and there are no deficiencies (See Technical Appendix: Downstream Analysis – Downstream Exhibits & Photos). A Certificate of Investigation has been included in the Technical Appendix (Downstream Analysis: Certificate of Investigation).

SUMMARY

The proposed stormwater management system for the West Union Chevron development will meet and exceed the requirements of Clean Water Services. Runoff from the proposed development will be treated in an ADS BayFilter Manhole and detained in an ADS StormTech Chamber prior to discharging offsite. Due to existing grade and developed surrounding areas, runoff from the proposed right-of-way improvements cannot be conveyed a treated in the onsite stormwater system. Instead a fee-in-lieu of treatment is proposed for the right-of-way improvements. The proposed ADS StormTech Chambers will be oversized to account for the water quantity requirements for the right-of-way.

TECHNICAL APPENDIX

Exhibits

- National Flood Hazard Layer FIRMette
- Hydrologic Soil Group-Washington County
- Tables 2-2a Runoff Curve Numbers
- Hydromod Planning Tool
- Existing Conditions
- Post-Developed Conditions

Calculations

- BayFilter Design Tool
- StormTech Cumulative Storage

Hydrographs

- Existing Runoff Hydrograph
- Post-Developed Runoff Hydrograph

Downstream Analysis

- Downstream Exhibits & Photos
- Downstream Basin Delineation
- Clean Water Services – Sewer Map
- Hydrologic Soil Group – Washington County, OR (Downstream Basin #5 & #6)
- XPSTORM Hydraulic Layout – Downstream Analysis
- XPSTORM Downstream Runoff Data
- XPSTORM Downstream Conveyance Data
- Downstream Certificate of Investigation

Geotechnical Report

- Geotechnical Engineering Report by GeoEngineers dated January 21,2019

Operations & Maintenance Plan

REFERENCES

1. Design and Construction Standards for Sanitary Sewer and Surface Water Management Issued December 2019 – Clean Water Services

EXHIBITS

National Flood Hazard Layer FIRMette

FEMA

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN — Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 — Cross Sections with 1% Annual Chance
- 17.5 — Water Surface Elevation
- Coastal Transect
- 513 — Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

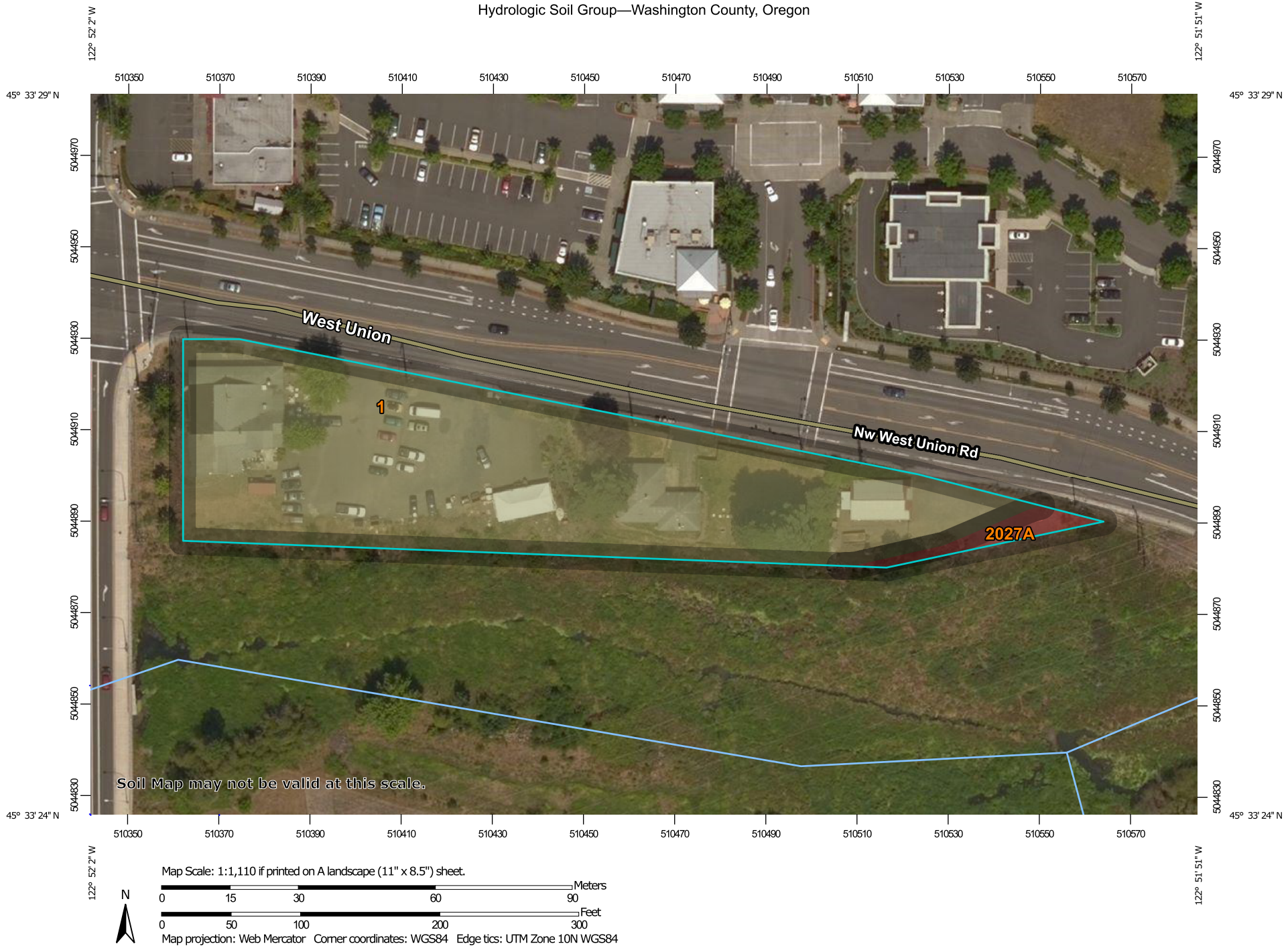
N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 5/20/2019 at 3:54:00 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.



Map Scale: 1:1,110 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 15 30 60 90

Feet
0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Washington County, Oregon
Survey Area Data: Version 16, Sep 18, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 3, 2014—Aug 23, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1	Aloha silt loam	C/D	1.4	97.0%
2027A	Verboort silty clay loam, 0 to 3 percent slopes	D	0.0	3.0%
Totals for Area of Interest			**1.4**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Table 2-2a Runoff curve numbers for urban areas [1/]

Cover description		Curve numbers for hydrologic soil group			
Cover type and hydrologic condition	Average percent impervious area [2/]	A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.) [3/]:					
Poor condition (grass cover < 50%)		68	79	*86	*89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) [4/]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Developing urban areas					
Newly graded areas (pervious areas only, no vegetation) [5/]		77	86	91	94
Idle lands (CN's are determined using cover types similar to those in table 2-2c).					

[1] Average runoff condition, and $I_a = 0.2S$.

[2] The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using figure 2-3 or 2-4.

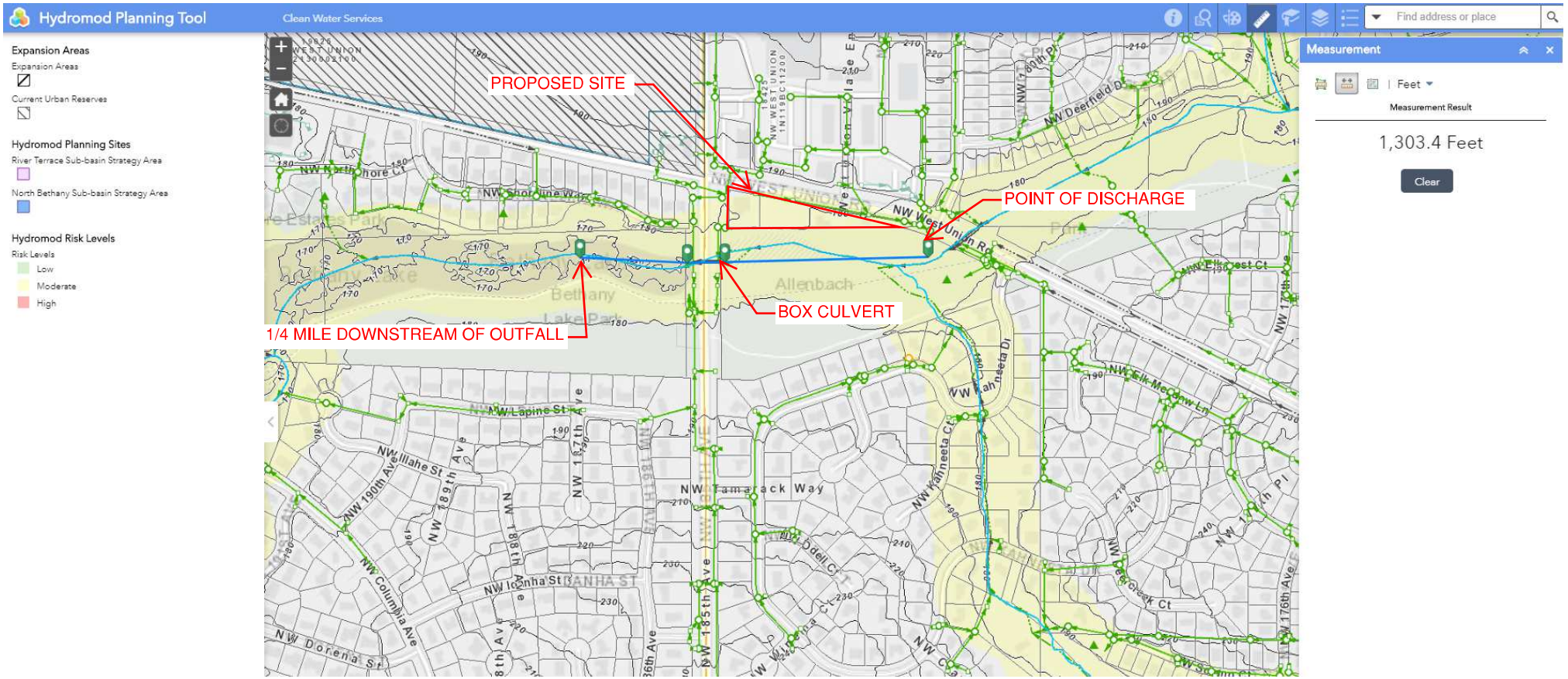
[3] CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.

[4] Composite CN's for natural desert landscaping should be computed using figures 2-3 or 2-4 based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.

[5] Composite CN's to use for the design of temporary measures during grading and construction should be computed using figure 2-3 or 2-4 based on the degree of development (impervious area percentage) and the CN's for the newly graded pervious areas.

*CN used in the downstream analysis

Hydromod Planning Tool



LEGEND

- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- SURFACE RUN-OFF FLOW ARROW
- IMPERVIOUS AREA (ONSITE)
- GRAVEL AREA (ONSITE)
- IMPERVIOUS AREA (OFFSITE)
- GRAVEL AREA (OFFSITE)

TOTAL SITE AREA = 52,454 SF = 1.204 ACRES
- IMPERVIOUS AREA = 10,869 SF = 0.250 ACRES
  - MODIFIED = 8,307 SF = 0.191 ACRES
  - REMOVED = 2,562 SF = 0.059 ACRES
- GRAVEL AREA = 12,463 SF = 0.286 ACRES
  - MODIFIED = 8,215 SF = 0.189 ACRES
  - REMOVED = 4,248 SF = 0.097 ACRES
- PERVIOUS AREA = 29,122 SF = 0.668 ACRES

OFFSITE IMPROVEMENTS
- TOTAL AREA = 1,810 SF = 0.042 ACRES
  - IMPERVIOUS AREA = 1,545 SF = 0.036 ACRES
    - MODIFIED IMPERVIOUS AREA = 1,387 SF = 0.032 ACRES
    - REMOVED IMPERVIOUS AREA = 158 SF = 0.004 ACRES
  - GRAVEL AREA = 51 SF = 0.001 ACRES
    - MODIFIED GRAVEL AREA = 43 SF = 0.001 ACRES
    - REMOVED GRAVEL AREA = 8 SF = ~0.000 ACRES
  - PERVIOUS AREA = 214 SF = 0.005 ACRES

N W E S

SCALE: 1" = 80'
0 80 FT

WEST UNION CHEVRON

06/03/2021

CJRW, LLC

EXISTING CONDITIONS

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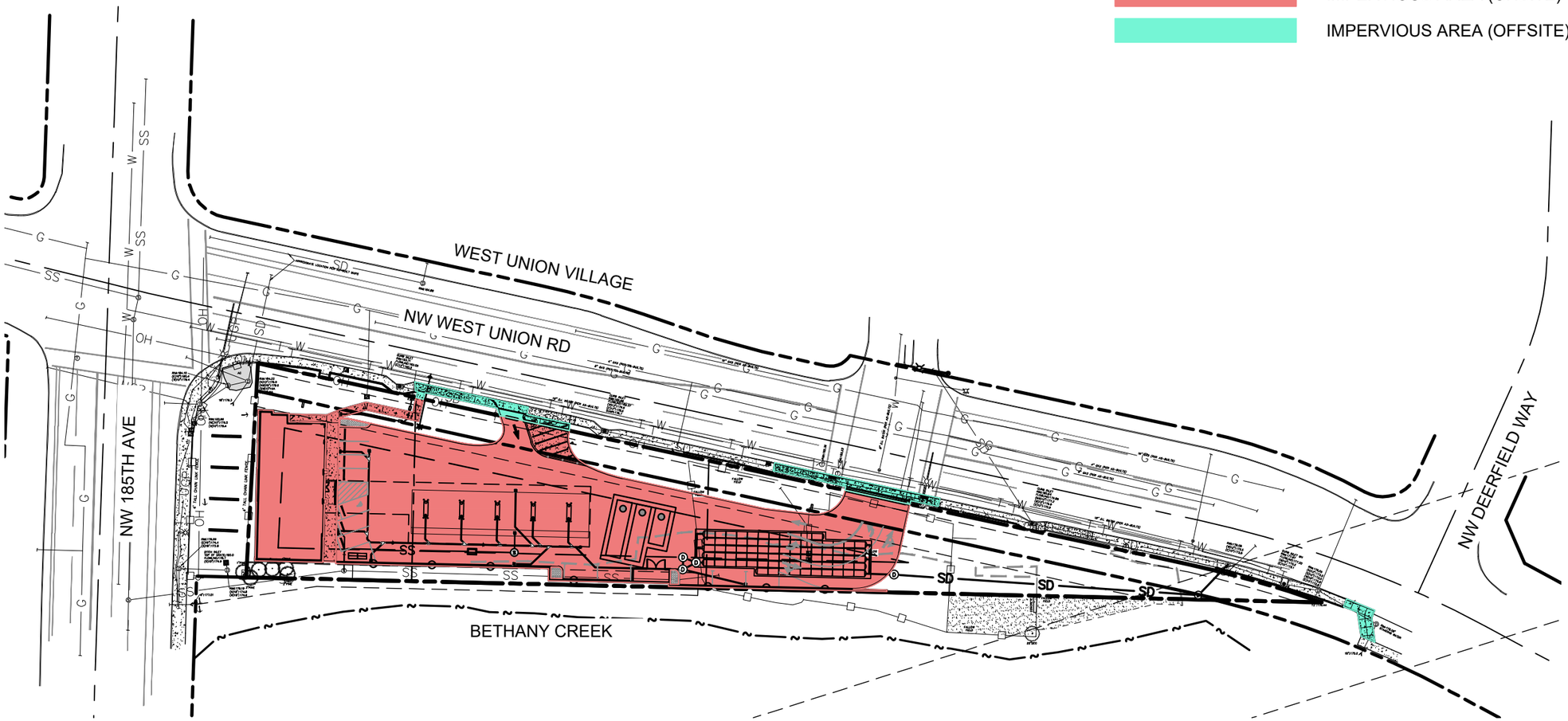
LEGEND

IMPERVIOUS AREA (ONSITE)

IMPERVIOUS AREA (OFFSITE)



TOTAL SITE AREA = 52,454 SF = 1.204 ACRES
IMPERVIOUS AREA = 32,833 SF = 0.754 ACRES
PERVIOUS AREA = 19,621 SF = 0.450 ACRES

OFFSITE IMPROVEMENTS
TOTAL AREA = 1,810 SF = 0.042 ACRES
IMPERVIOUS AREA = 1,620 SF = 0.037 ACRES
PERVIOUS AREA = 190 SF = 0.005 ACRES

N
W E
S

SCALE: 1" = 80'
0 80 FT

WEST UNION CHEVRON **06/03/2021**

CJRW, LLC ***POST-CONSTRUCTION CONDITIONS***

3J CONSULTING
CIVIL ENGINEERING . WATER RESOURCES . COMMUNITY PLANNING

CALCULATIONS

BAYSAVER TECHNOLOGIES

1-800-BAYSAVER (1-800-229-7283)

Filter Design Tool v1.0

ADS

Project Name:	West Union Chevron	Location:	Washington County, OR
Designer:	Joe Conner		
ADS Sales:		ADS EPM:	
Date:	3/12/2021		

System Elevations

Rim Elevation:	20.00	ft
Inlet Elevation:	13.00	ft
Outlet Elevation:	10.00	ft
Drop from Inlet to Outlet:	36	in
Is there a storage system upstream?	No	

Design Method

Select the Design Parameter:

(•) Flow Rate

Treatment Flow, Q_{TRT} 0.07 cfs

$$\#\ Cartridges = \frac{Q_{TRT}(cfs) * 448.8 \frac{gpm}{cfs}}{Q_{BayFilter}}$$

( ) Volume

Treatment Volume, V_{TRT} 15000 cf

$$\#\ Cartridges = \frac{V_{TRT}(cf)}{V_{BayFilter}}$$

BayFilter Series 500

TSS and Phosphorous removal with EMC media

Recommended Model Type: 545

Recommended filter based on largest filter to meet recommended drop without a weir

Select Filter for Design:

Model	QBayFilter gpm/sf	# of Cartridges
522	22.5	2

Structure & Bypass

( ) StreamFilter Catch Basin

[ ] Use Curb Inlet

(•) Manhole w/ External Bypass

Minimum headwater depth achieved

Manhole Diameter is 60in
Structure height is 6ft

( ) Vault w/ External Bypass

( ) Vault w/ Internal Bypass

Sediment Load Check *(optional)*

Avg Annual Precipitation, P	50	in
Area of Site, A	3	acres
Runoff Coefficient, c	0.9	
Percent Capture	90%	

Default is 90% unless otherwise specified

Annual Treated Runoff Volume, V_{TRT} 439931 ft^3

$$V_{TRT}(ft^3) = P * A * c * \frac{ft}{12in} * \frac{43{,}450 ft^2}{acre} * \frac{\%\ Capture}{100}$$

Influent TSS Concentration, TSS_{IN} 60 mg/l

Default is 60mg/l unless otherwise specified; reduce if pretreatment used

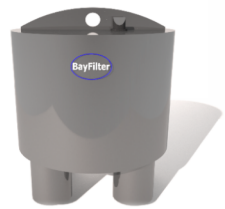
Annual Mass of Sediment, L 1643.4 lbs

$$L(lbs) = V_{TRT} * TSS_{IN} * \frac{28.3l}{ft^3} * \frac{kg}{10^6 mg} \frac{2.2lbs}{kg}$$

Number of Cartridges for Sediment Load: 10

Sediment load is high, more frequent maintenance may be required

Show Filter Drawings



StormTech Cumulative Storage

Project: **West Union Chevron**

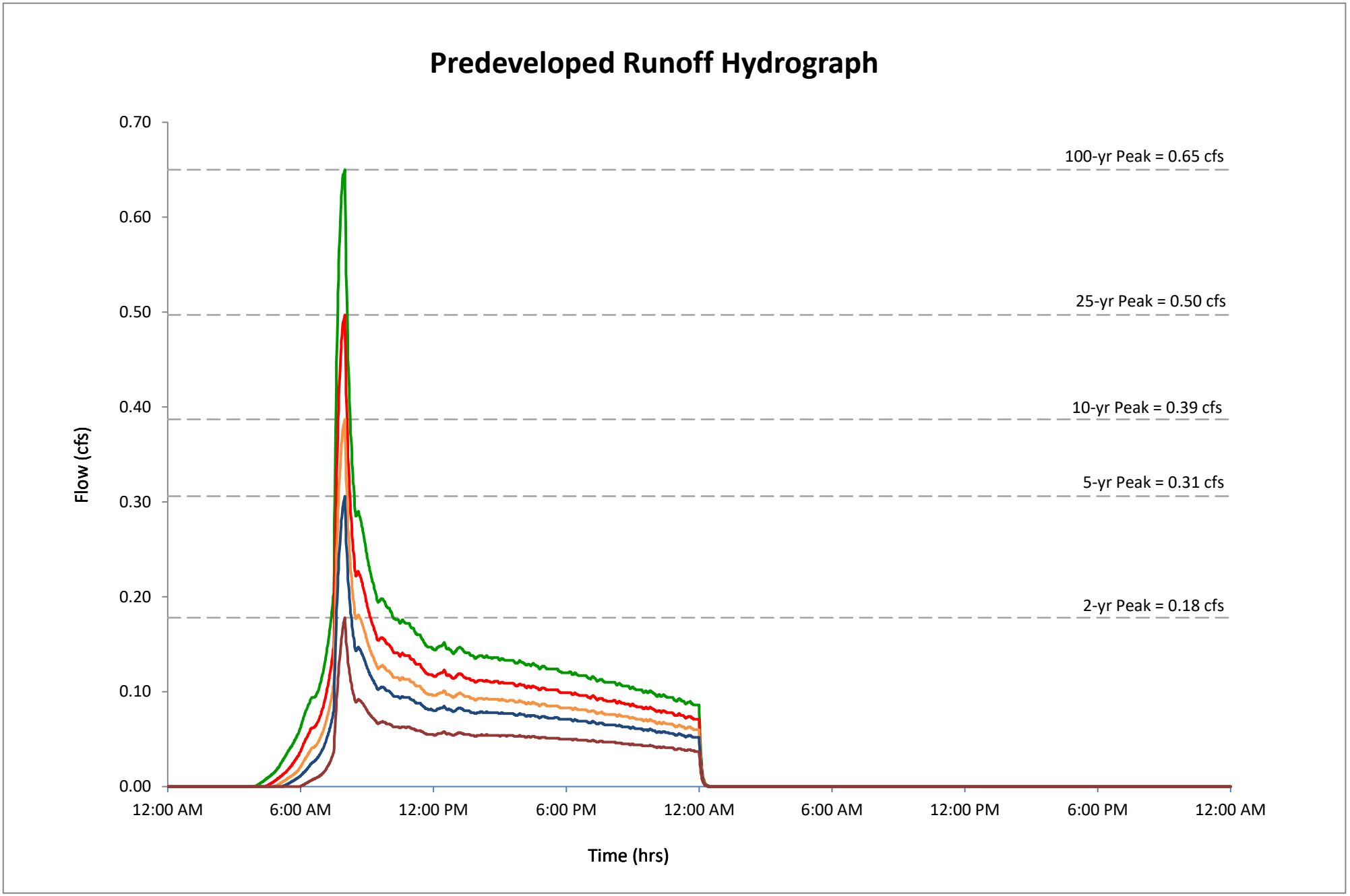
Chamber Model -	SC-740	
Units -	**Imperial**	Click Here for Metric
Number of chambers -	81	
Voids in the stone (porosity) -	40	%
Base of Stone Elevation -	100.00	ft
Amount of Stone Above Chambers -	6	in
Amount of Stone Below Chambers -	6	in
Area of system -	3171	sf

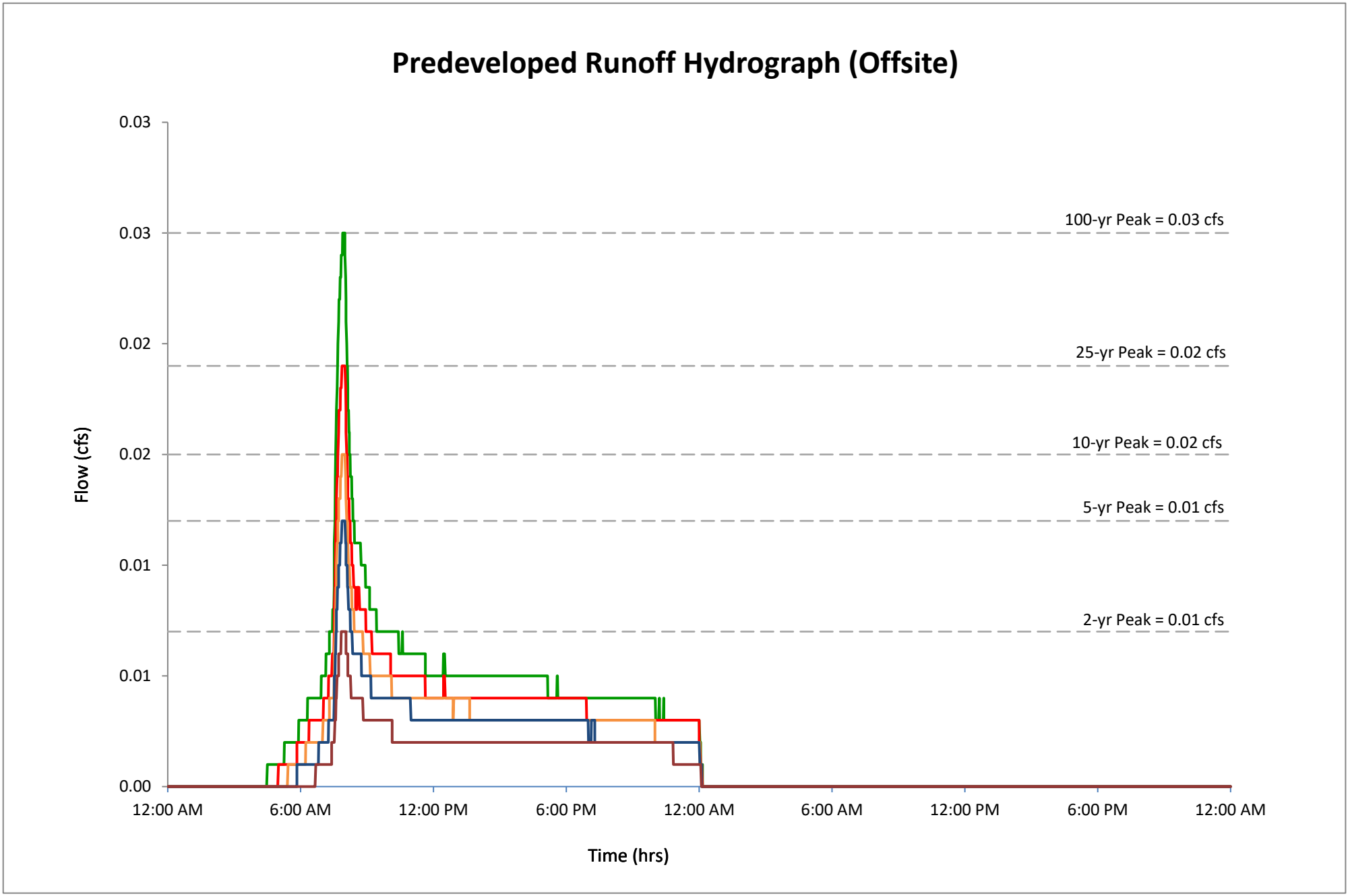
Include Perimeter Stone in Calculations

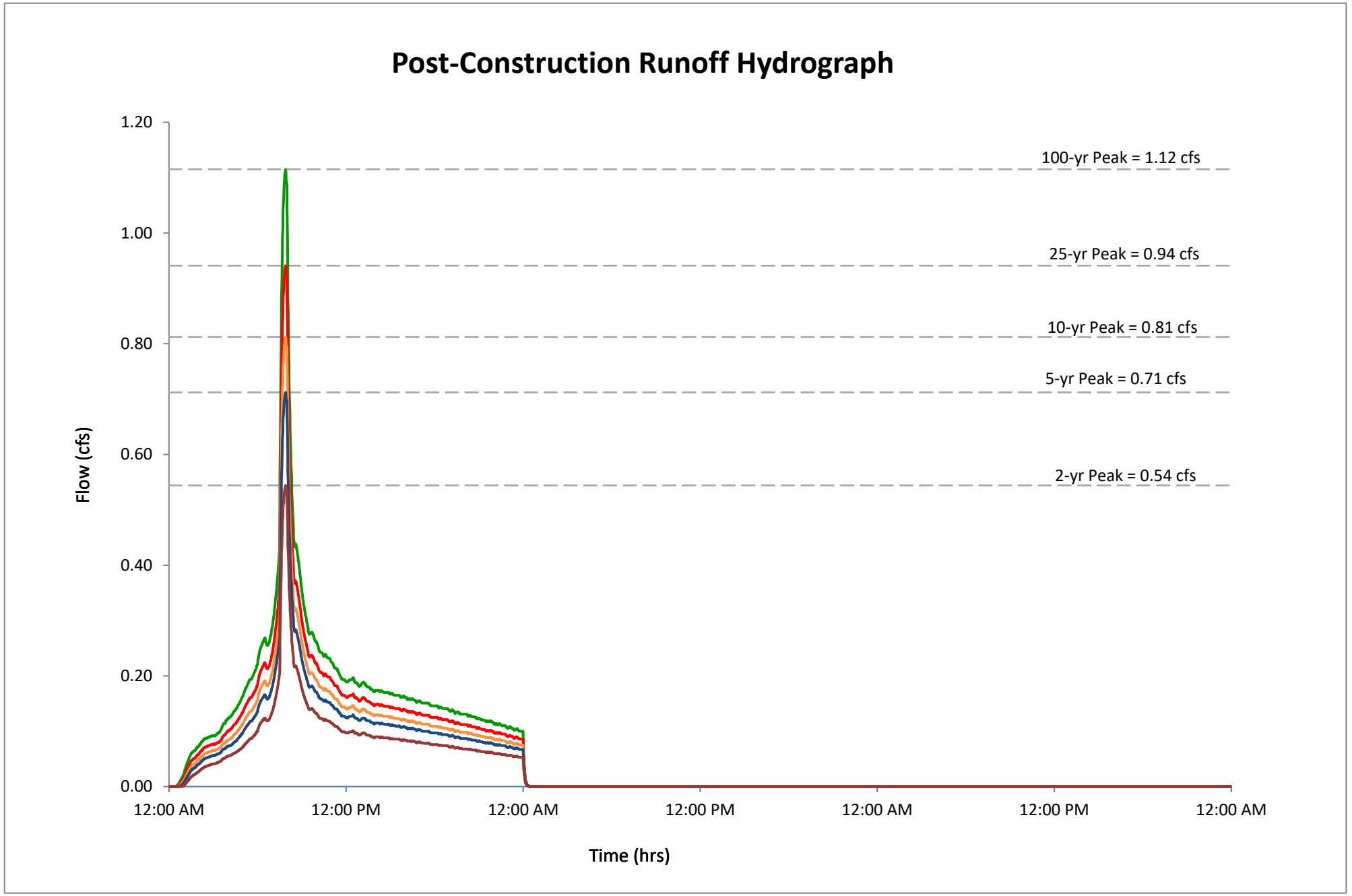
Min. Area - 2738 sf min. area

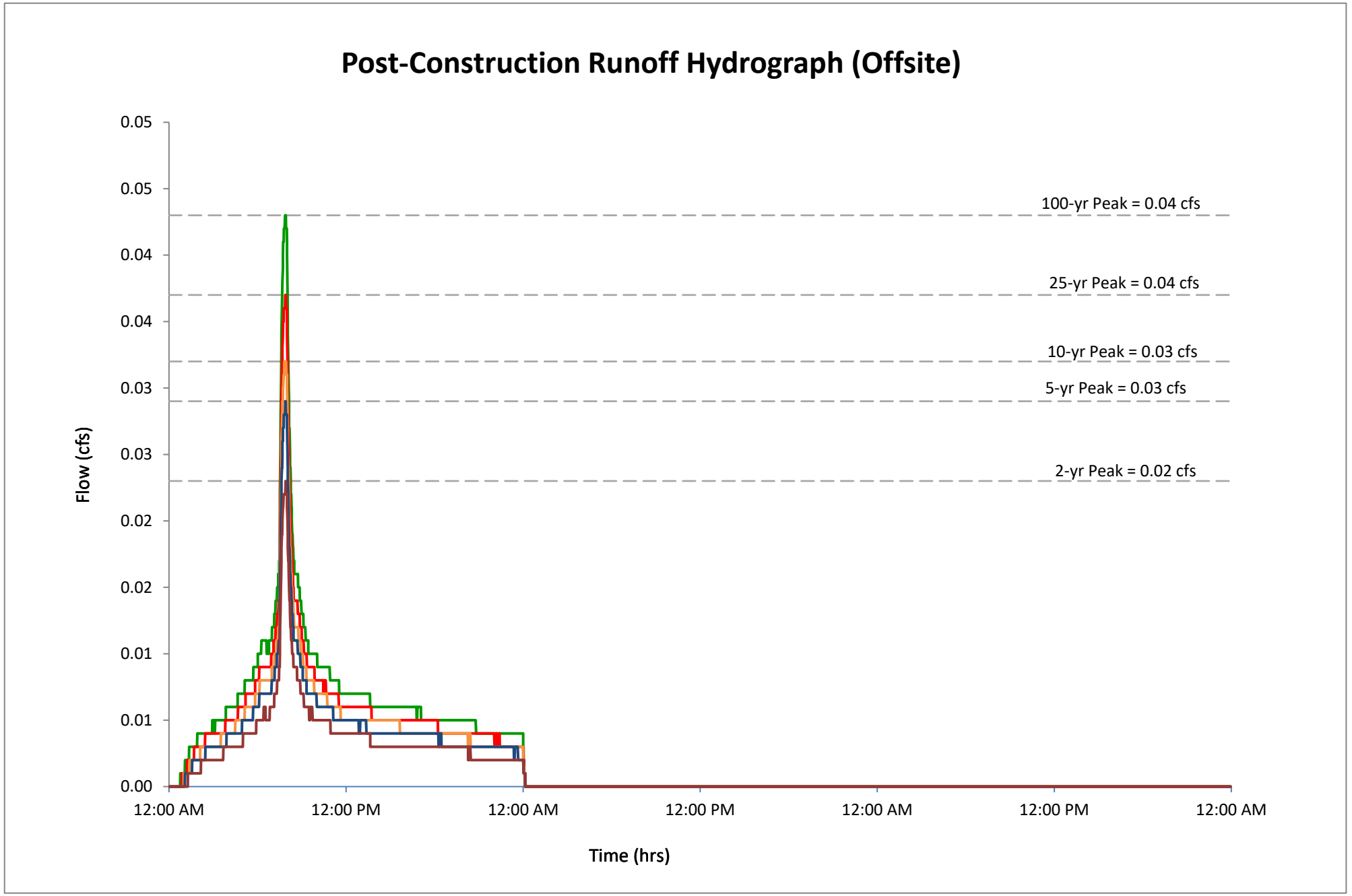
Height of System *(inches)*	Incremental Single Chamber *(cubic feet)*	Incremental Total Chamber *(cubic feet)*	Incremental Stone *(cubic feet)*	Incremental Ch & St *(cubic feet)*	Cumulative Chamber *(cubic feet)*	Elevation *(feet)*
42	0.00	0.00	105.70	105.70	6672.61	103.50
41	0.00	0.00	105.70	105.70	6566.91	103.42
40	0.00	0.00	105.70	105.70	6461.21	103.33
39	0.00	0.00	105.70	105.70	6355.51	103.25
38	0.00	0.00	105.70	105.70	6249.81	103.17
37	0.00	0.00	105.70	105.70	6144.11	103.08
36	0.05	4.45	103.92	108.37	6038.41	103.00
35	0.16	13.20	100.42	113.62	5930.04	102.92
34	0.28	22.84	96.57	119.40	5816.42	102.83
33	0.60	48.92	86.13	135.05	5697.02	102.75
32	0.80	64.94	79.72	144.66	5561.97	102.67
31	0.95	77.00	74.90	151.90	5417.30	102.58
30	1.07	87.04	70.89	157.92	5265.40	102.50
29	1.18	95.62	67.45	163.07	5107.48	102.42
28	1.27	102.52	64.69	167.21	4944.41	102.33
27	1.36	109.76	61.80	171.55	4777.20	102.25
26	1.45	117.78	58.59	176.37	4605.64	102.17
25	1.52	123.50	56.30	179.80	4429.27	102.08
24	1.58	128.17	54.43	182.60	4249.47	102.00
23	1.64	133.02	52.49	185.51	4066.87	101.92
22	1.70	137.66	50.64	188.30	3881.35	101.83
21	1.75	141.99	48.91	190.89	3693.06	101.75
20	1.80	146.03	47.29	193.32	3502.17	101.67
19	1.85	150.25	45.60	195.85	3308.85	101.58
18	1.89	153.34	44.36	197.70	3113.00	101.50
17	1.93	156.65	43.04	199.69	2915.29	101.42
16	1.97	159.97	41.71	201.68	2715.60	101.33
15	2.01	162.80	40.58	203.38	2513.91	101.25
14	2.04	165.64	39.44	205.09	2310.53	101.17
13	2.07	168.07	38.47	206.54	2105.45	101.08
12	2.10	170.50	37.50	208.00	1898.90	101.00
11	2.13	172.68	36.63	209.31	1690.90	100.92
10	2.15	174.46	35.92	210.38	1481.60	100.83
9	2.18	176.34	35.16	211.51	1271.22	100.75
8	2.20	178.07	34.47	212.54	1059.72	100.67
7	2.21	178.79	34.18	212.98	847.18	100.58
6	0.00	0.00	105.70	105.70	634.20	100.50
5	0.00	0.00	105.70	105.70	528.50	100.42
4	0.00	0.00	105.70	105.70	422.80	100.33
3	0.00	0.00	105.70	105.70	317.10	100.25
2	0.00	0.00	105.70	105.70	211.40	100.17
1	0.00	0.00	105.70	105.70	105.70	100.08

HYDROGRAPHS


Predeveloped Runoff Hydrograph
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Flow (cfs)
100-yr Peak = 0.65 cfs
25-yr Peak = 0.50 cfs
10-yr Peak = 0.39 cfs
5-yr Peak = 0.31 cfs
2-yr Peak = 0.18 cfs
12:00 AM
6:00 AM
12:00 PM
6:00 PM
12:00 AM
6:00 AM
12:00 PM
6:00 PM
12:00 AM
Time (hrs)

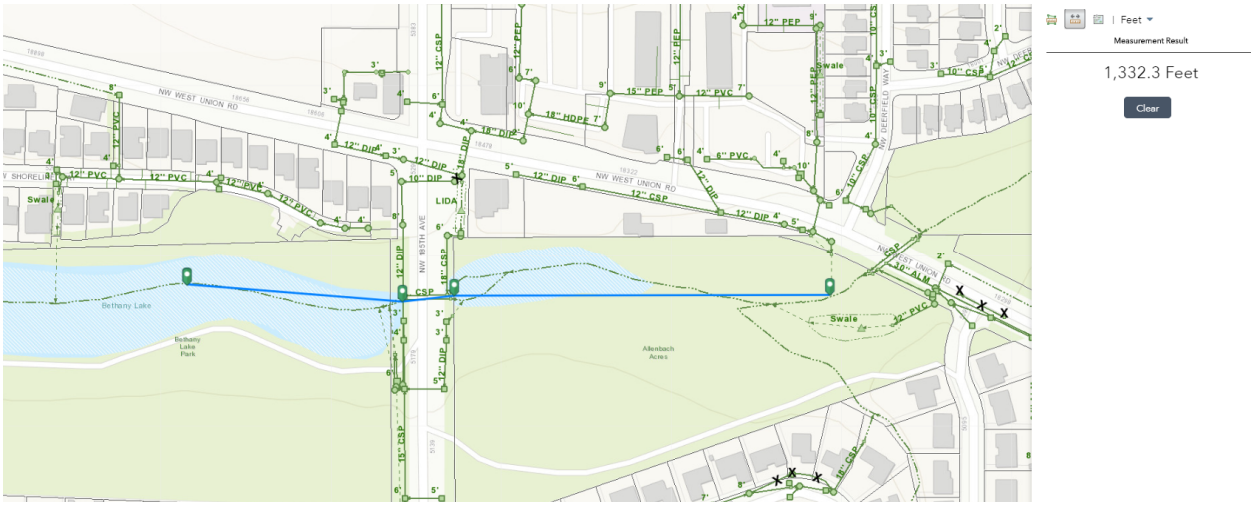

Predeveloped Runoff Hydrograph (Offsite)
0.03
0.03
0.02
0.02
0.01
0.01
0.00
Flow (cfs)
100-yr Peak = 0.03 cfs
25-yr Peak = 0.02 cfs
10-yr Peak = 0.02 cfs
5-yr Peak = 0.01 cfs
2-yr Peak = 0.01 cfs
12:00 AM
6:00 AM
12:00 PM
6:00 PM
12:00 AM
6:00 AM
12:00 PM
6:00 PM
12:00 AM
Time (hrs)


Post-Construction Runoff Hydrograph
1.20
1.00
0.80
0.60
0.40
0.20
0.00
Flow (cfs)
100-yr Peak = 1.12 cfs
25-yr Peak = 0.94 cfs
10-yr Peak = 0.81 cfs
5-yr Peak = 0.71 cfs
2-yr Peak = 0.54 cfs
12:00 AM
12:00 PM
12:00 AM
12:00 PM
12:00 AM
12:00 PM
12:00 AM
Time (hrs)


Post-Construction Runoff Hydrograph (Offsite)
Flow (cfs)
0.05
0.05
0.04
0.04
0.03
0.03
0.02
0.02
0.01
0.01
0.00
100-yr Peak = 0.04 cfs
25-yr Peak = 0.04 cfs
10-yr Peak = 0.03 cfs
5-yr Peak = 0.03 cfs
2-yr Peak = 0.02 cfs
12:00 AM
12:00 PM
12:00 AM
12:00 PM
12:00 AM
12:00 PM
12:00 AM
Time (hrs)

DOWNSTREAM ANALYSIS

Downstream Exhibits & Photos



CWS Sanitary & Storm Sewer Map – Extent of Downstream Analysis

12” Outfall

Downstream Exhibits & Photos

Downstream Discharge Area

Bethany Creek Upstream of NW 185 Ave

Downstream Exhibits & Photos

Bethany Creek Downstream of NW 185th Ave (Bethany Lake)

Upstream Side of Box Culvert Under NW 185th Ave

Downstream Exhibits & Photos

Downstream Side of Box Culvert Under NW 185th Ave

Overall Downstream System

LEGEND

110	PROPOSED MAJOR CONTOUR
108	PROPOSED MINOR CONTOUR
⇨	SURFACE RUN-OFF FLOW ARROW

DOWNSTREAM BASIN TABLE

BASIN	TOTAL AREA (ACRES)	PERCENT IMPERVIOUS	PERVIOUS CN	TOC (MIN)	DRAINS TO
1	0.320	100	98.0	5	CB-154058
2	0.330	100	98.0	5	CB-154059
3	0.983	100	98.0	5	CB-154062
4	0.471	100	98.0	5	CB-311798
5	0.830	80	87.9	5	MH-311797
6	2.875	80	86.6	5	MH-311797
7	SEE POST-CONSTRUCTION CONDITIONS EXHIBIT				

N
W E
S

SCALE: 1" = 100'
0 100 FT

WEST UNION CHEVRON

06/11/2021

CJRW, LLC

DOWNSTREAM BASIN DELINEATION

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Clean Water Services -- Sewer Map

Legend

- Cleanout
- Fitting
- Valve
- Manhole
- Inlet
- Pond
- Vault
- Treatment Plant
- Pump Station
- Gravity Line
- Pressure Line
- Open Channel
- Virtual Flow
- Pond Outline
- CWS Boundary
- County Boundary
- Urban Growth Boundary
- Abandoned
- CWS Sani
- CWS Storm
- Partner Sani
- Partner Storm

N

0 0.01 0.02 0.04 mi

Clean Water Services

Hydrologic Soil Group—Washington County, Oregon
(Downstream Basin #5)

Map Scale: 1:567 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 5 10 20 30

Feet
0 25 50 100 150

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Soil Rating Lines

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Soil Rating Points

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Water Features

Streams and Canals

Transportation

Rails
Interstate Highways
US Routes
Major Roads
Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Washington County, Oregon
Survey Area Data: Version 18, Jun 11, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 19, 2018—Oct 20, 2018

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1	Aloha silt loam	C/D	0.6	63.8%
19B	Helvetia silt loam, 2 to 7 percent slopes	C	0.3	36.2%
Totals for Area of Interest			**0.9**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

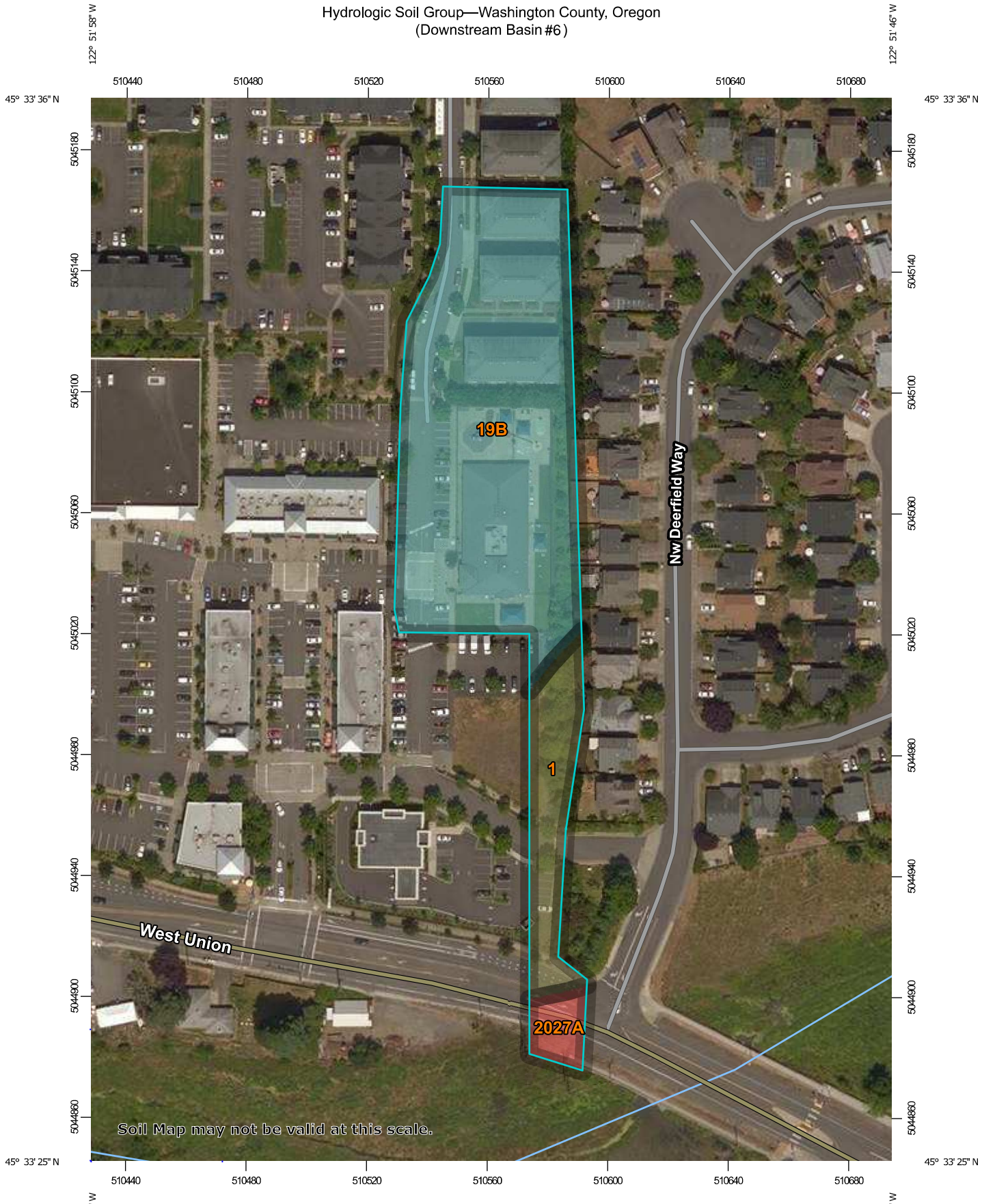
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Hydrologic Soil Group—Washington County, Oregon
(Downstream Basin #6)



Map Scale: 1:1,710 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Washington County, Oregon
Survey Area Data: Version 16, Sep 18, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 3, 2014—Aug 23, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1	Aloha silt loam	C/D	0.4	15.1%
19B	Helvetia silt loam, 2 to 7 percent slopes	C	2.0	80.7%
2027A	Verboort silty clay loam, 0 to 3 percent slopes	D	0.1	4.1%
Totals for Area of Interest			**2.5**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

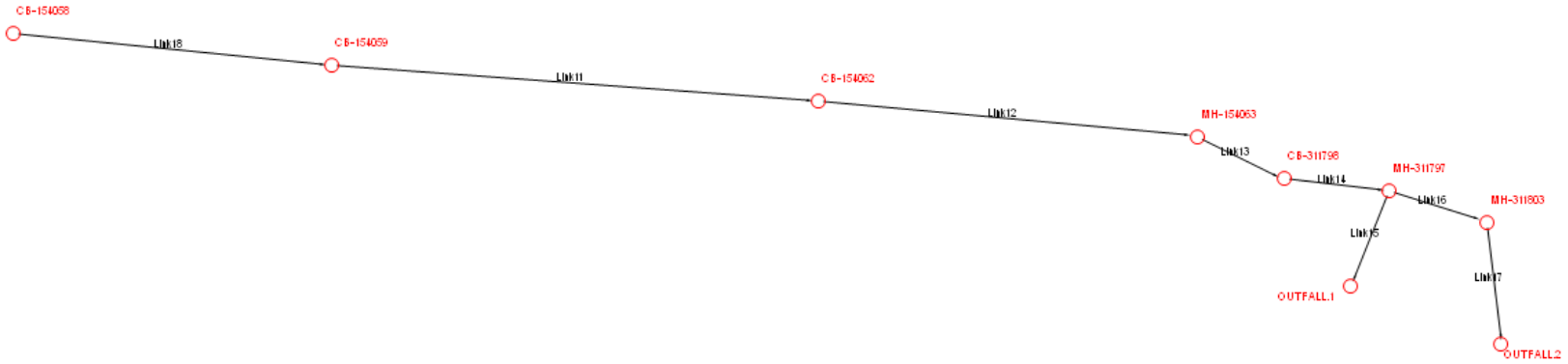
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher



XPSTORM Hydraulic Layout – Downstream Analysis

XPSTORM-DOWNSTREAM RUNOFF DATA - 25 YR - STORM EVENT								
WEST UNION CHEVRON								
Node Information					Runoff Information			
Node Name	Area	Impervious	Curve Number	Tc	Rainfall	Infiltration	Surface Runoff	
	acre	%		min.	in	in	in	cfs
CB-154059	0.330	100	98.0	5	3.90	1.618	2.282	1.243
	0.754	100	98.0	5				
	0.450	0	84.0	5				
CB-154062	0.983	100	98.0	5	3.90	0.000	3.664	0.900
CB-311798	0.471	100	98.0	5	3.90	0.000	3.664	0.431
MH-311797	2.875	80	86.6	5	3.90	0.462	3.438	3.247
	0.830	80	87.9	5				
CB-154058	0.320	100	98.0	5	3.90	0.000	3.664	0.293

XPSTORM-DOWNSTREAM RUNOFF DATA - 100 YR - STORM EVENT								
WEST UNION CHEVRON								
Node Information					Runoff Information			
Node Name	Area	Impervious	Curve Number	Tc	Rainfall	Infiltration	Surface Runoff	
	acre	%		min.	in	in	in	cfs
CB-154059	0.330	100	98.0	5	4.50	1.684	2.816	1.465
	0.754	100	98.0	5				
	0.450	0	84.0	5				
CB-154062	0.983	100	98.0	5	4.50	0.000	4.263	1.042
CB-311798	0.471	100	98.0	5	4.50	0.000	4.263	0.499
MH-311797	2.875	80	86.6	5	4.50	0.468	4.032	3.794
	0.830	80	87.9	5				
CB-154058	0.320	100	98.0	5	4.50	0.000	4.263	0.339

XPSTORM DOWNSTREAM CONVEYANCE DATA (25-YEAR STORM EVENT)

WEST UNION CHEVRON

Location			Conduit Properties			Conduit Results						Conduit Profile							
Link	Station																		
	From	To	Diameter	Length	Slope	Design Capacity	Qmax/ Qdesign	Max Flow	Max Velocity	Max Flow Depth	y/d0	US Ground Elev.	DS Ground Elev.	US IE	DS IE	US Freeboard	DS Freeboard	US HGL	DS HGL
			ft	ft	%	cfs		cfs	ft/s	ft		ft	ft	ft	ft	ft	ft	ft	ft
Link11	CB-154059	CB-154062	1.00	289.00	0.7	3.04	0.51	1.53	3.87	0.50	0.50	179.52	177.22	173.20	170.90	4.32	4.31	175.20	172.91
Link12	CB-154062	MH-154063	1.00	131.54	1.7	4.71	0.52	2.43	6.04	0.51	0.51	177.22	173.60	170.90	169.90	4.31	3.11	172.91	170.49
Link13	MH-154063	CB-311798	1.00	37.00	1.1	3.70	0.66	2.43	4.83	0.64	0.64	173.60	174.50	169.90	169.40	3.11	4.37	170.49	170.14
Link14	CB-311798	MH-311797	1.25	20.00	0.5	4.57	0.63	2.86	3.78	0.75	0.60	174.50	174.48	169.40	169.30	4.37	4.43	170.14	170.05
Link15	MH-311797	OUTFALL.1	1.00	3.00	0.5	2.52	1.18	2.96	4.73	0.75	0.75	174.48	174.00	169.30	169.29	4.43	3.98	170.05	170.02
Link16	MH-311797	MH-311803	1.25	45.00	0.5	4.62	0.68	3.15	4.20	0.75	0.60	174.48	174.32	169.30	164.47	4.43	4.62	170.05	169.70
Link17	MH-311803	OUTFALL.2	1.25	21.40	0.6	4.84	0.65	3.15	4.30	0.73	0.58	174.32	174.00	164.47	168.85	4.62	4.44	169.70	169.56
Link18	CB-154058	CB-154059	1.00	140.00	0.5	2.52	0.12	0.29	2.15	0.24	0.24	180.22	179.52	175.10	173.20	3.38	4.32	176.84	175.20

XPSTORM DOWNSTREAM CONVEYANCE DATA (100-YEAR STORM EVENT)

WEST UNION CHEVRON

Location			Conduit Properties			Conduit Results						Conduit Profile							
Link	Station																		
	From	To	Diameter	Length	Slope	Design Capacity	Qmax/ Qdesign	Max Flow	Max Velocity	Max Flow Depth	y/d0	US Ground Elev.	DS Ground Elev.	US IE	DS IE	US Freeboard	DS Freeboard	US HGL	DS HGL
			ft	ft	%	cfs		cfs	ft/s	ft		ft	ft	ft	ft	ft	ft	ft	ft
Link11	CB-154059	CB-154062	1.00	289.00	0.7	3.04	0.59	1.80	4.03	0.55	0.55	179.52	177.22	173.20	170.90	4.27	4.26	175.25	172.96
Link12	CB-154062	MH-154063	1.00	131.54	1.7	4.71	0.60	2.84	6.28	0.56	0.56	177.22	173.60	170.90	169.90	4.26	3.03	172.96	170.57
Link13	MH-154063	CB-311798	1.00	37.00	1.1	3.70	0.77	2.84	4.97	0.71	0.71	173.60	174.50	169.90	169.40	3.03	4.29	170.57	170.21
Link14	CB-311798	MH-311797	1.25	20.00	0.5	4.57	0.73	3.34	3.97	0.82	0.65	174.50	174.48	169.40	169.30	4.29	4.36	170.21	170.12
Link15	MH-311797	OUTFALL.1	1.00	3.00	0.5	2.52	1.40	3.52	5.17	0.82	0.82	174.48	174.00	169.30	169.29	4.36	3.91	170.12	170.09
Link16	MH-311797	MH-311803	1.25	45.00	0.5	4.62	0.78	3.61	4.39	0.82	0.65	174.48	174.32	169.30	164.47	4.36	4.56	170.12	169.76
Link17	MH-311803	OUTFALL.2	1.25	21.40	0.6	4.84	0.75	3.61	4.50	0.79	0.63	174.32	174.00	164.47	168.85	4.56	4.38	169.76	169.62
Link18	CB-154058	CB-154059	1.00	140.00	0.5	2.52	0.14	0.34	2.24	0.25	0.25	180.22	179.52	175.10	173.20	3.37	4.27	176.85	175.25

West Union Chevron
June 13, 2019

CERTIFICATE OF INVESTIGATION

Per section 2.04.2.m.3.D of the Clean Water Service's Design and Construction Standards, a Certificate of Investigation is required when a downstream analysis has not been conducted for at least one-quarter mile stating that the downstream system has been visually inspected and no observable downstream impacts to structures were observed.

The total basin draining to the creek in which the proposed West Union Chevron will contribute is well over 1,000 acres in size. Due to the size and complexity, the total upstream basin was not delineated and the proposed increase in runoff from the site was determined to be negligible to the total flow in the creek (under 5%). Based off of the visual inspection and aerial photos with the use of a drone, there are no downstream obstructions or deficiencies.

It is proposed that the increase in runoff from the proposed West Union Chevron will not impact the downstream system.

Kathleen Freeman, PE, CFM
Water Resources Project Manager

GEOTECHNICAL REPORT

Full Geotechnical Report available upon request.

Geotechnical Engineering Report

West Union Chevron
18450 NW West Union Road
Portland, Oregon

for
West Union Chevron

January 21, 2019

GeoEngineers
Earth Science + Technology

Geotechnical Engineering Report

West Union Chevron
18450 NW West Union Road
Portland, Oregon

for
West Union Chevron

January 21, 2019

GeoEngineers

4000 Kruse Way Place
Building 3, Suite 200
Lake Oswego, Oregon 97035
503.624.9274

Geotechnical Engineering Report

West Union Chevron
18450 NW West Union Road
Portland, Oregon

File No. 23698-001-00

January 21, 2019

Prepared for:

West Union Chevron
c/o Bob Barman and Danny Draper
PO Box 2092
Lake Oswego, Oregon 97035

Prepared by:

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EXPIRES: 06/30/20

TAP:JCV:cje

GeoEngineers

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APPENDICES

Subsurface Conditions

We completed field explorations for this study at the site on December 4 and 17, 2018. Our explorations included six drilled borings (B-1 through B-6) to depths of 6½ to 31½ feet bgs, and four infiltration tests (IT-1 through IT-4) at depths of 4½ to 5½ feet bgs. A summary of our exploration methods as well as the boring logs can be found in Appendix A. Laboratory test results are also provided in the exploration logs and described in Appendix A. The approximate locations of the explorations are shown in the Site Plan, Figure 2.

In general, the site is mantled by a varied mixture of man-made fills and underlain by flood deposits silt with occasional layers or lenses of fine sandy silt. The surface of the site is mantled with a mixture of soil and artificial materials ranging from demolition debris, presumably generated during demolition of the 18450 residence, asphalt and gravel pavement and soil fill. Fill encountered in B-1 consisted of 1½ feet of gravel with debris. In explorations B-3 through B-5 the fill consisted of 2 to 4½ feet of silt fill with debris. Below the fills in B-1 and B-3 through B-5, and at the ground surface in B-2 and B-6, we encountered medium stiff to stiff, and occasionally soft to medium stiff intermediate-depth flood deposits consisting of silt and find sandy silt to 31.5 feet, the maximum depth explored.

Groundwater

We encountered groundwater at approximately 23 feet bgs in B-5 during drilled explorations. This groundwater was confined and rose approximately 7 feet (to approximately 16 feet bgs) in approximately 25 minutes. Groundwater should be expected to rise several feet during periods of extended rainfall as well as from capillary rise. Dewatering of trenches and excavations will be required when groundwater seepage and/or perched groundwater are encountered. Groundwater conditions at the site are expected to vary seasonally due to rainfall events and other factors not observed in our explorations.

CONCLUSIONS

General

Based on our explorations, testing, and analyses, it is our opinion that the site is suitable for the proposed project from a geotechnical engineering standpoint, provided the recommendations in this report are included in design and construction. We offer the following conclusions regarding geotechnical engineering design at the site.

- The upper silt soil at the site will likely become disturbed from earthwork occurring during periods of wet weather or when the moisture content of the soil is more than a few percentage points above optimum. Wet weather construction practices will be required, except during the dry summer months.
- Groundwater was observed at depths between approximately 20 and 23 feet bgs. Following extended periods of wet weather, groundwater depths may be as shallow as 12 to 15 feet bgs. Due to groundwater fluctuations and capillary rise, dewatering or similar methods will be required for excavations deeper than about 15 feet below existing ground surface, except during the dry season. Even during drier periods, dewatering may be required for some deeper excavations.
- Excavations for the proposed fuel tanks and deep utilities will be required to be sloped back or temporarily shored.

- Structures should be set back at least two times the total height of slope to the south measured from the top of the crest of the slope. Based on a review of the preliminary site plan, the proposed location of the building provides a sufficient setback from the top of the slope.
- The native alluvial soils will generally be suitable for reuse as structural fill provided they are properly moisture conditioned ("dried back") as a part of placement and compaction. On-site material is not recommended for structural fill during the wet season or when prolonged wet weather persists.
- Proposed structures can be satisfactorily supported on continuous and isolated shallow foundations supported on the firm native soils, or on structural fill that extends to the firm native soils.
- Based on the assumed design loads described above, we estimate total settlements will be less than 1 inch for foundations constructed as recommended. If larger structural loads are anticipated, we should review and reassess the estimated settlement.
- Slabs-on-grade can be satisfactorily supported on aggregate base that is founded on the firm native soils, or on structural fill that extends to the firm native soils. We recommend that slabs-on-grade be provided with proper moisture control by constructing a sub-slab Aggregate Base section as a capillary break and providing a vapor barrier for moisture-sensitive applications.
- Tanks installed below the static groundwater level may require some form of downward ballasting or anchoring against potential buoyant forces (uplift). Elements to anchor and resist uplift forces on the tank may consist of tie-down anchorages embedded to sufficient depth and structurally tied to the tanks, or a widened integrated concrete foundation using the soil mass over the widened portion or a sufficiently massive concrete section or helical pier/micropiles to mitigate the buoyant force.
- Tested infiltration rates at the site were minimal. In addition, infiltration rates provided below are in-place infiltration rates and will require correction factors to account for repeated wetting and drying that occur in the area, degree of in-system filtration, frequency and type of system maintenance, vegetation, potential for siltation and bio-fouling, etc., as well as system design correction factors for overflow or redundancy and base and facility size. Depending on proposed depth of infiltration, shallow groundwater conditions or proximity to creek slopes may limit potential infiltration locations or design infiltration rates.
- Standard pavement sections, consisting of AC over Aggregate Base and/or Aggregate Subbase, over properly prepared subgrade, can be used to support the estimated traffic loads provided the pavement sections are designed and constructed as recommended in this report.
- Retaining walls 8 feet or less in height can be designed with the equivalent fluid densities provided in this report.

The following sections present the results of our analyses and general geotechnical engineering recommendations for designing and constructing the proposed development.

INFILTRATION TESTING

As requested, we conducted on-site infiltration tests to assist in site evaluation for stormwater infiltration design. We conducted infiltration testing in general accordance with the City of Portland Stormwater Design Manual (2014) at depths between approximately 4½ and 5½ feet bgs. Each test location was pre-soaked over a 4-hour period by repeated addition of water into the embedded pipe when necessary.

After the saturation period, the hole was filled with clean water to at least 12 inches above the soil in the bottom of the boring,

The drop in water level was measured over a period of time after the soak period, and refilled to repeat the test a minimum of three times. In the case where the water level falls during the time-measured testing, infiltration rates diminish as a result of less head from the water column in the test. Field test results are summarized in Table 1. The data and incremental infiltration rate over time are included in the infiltration test data summary in Appendix A, Figures A-8 through A-11.

TABLE 1. INFILTRATION RESULTS

Infiltration Test No.	Depth (feet)	USCS Material Type	Soil Description	Field Measured Infiltration Rate[1] (inches/hour)
IT-1	4.5	ML	Yellow-brown silt	0
IT-2	5.0	ML	Yellow-brown silt	0
IT-3	5.5	ML	Yellow-brown silt	0.13
IT-4	5.0	ML	Yellow-brown silt	1.50

Notes:

[1] Appropriate factors should be applied to the field-measured infiltration rate, based on the design methodology and specific system used.

USCS = Unified Soil Classification System

The infiltration rates shown in Table 1 represent a field-measured infiltration rate. This measurement represents a short-term rate, and factors of safety have not been applied for the type of infiltration system being considered, or for variability that may be present across large areas in the on-site soil. In our opinion, and consistent with the state of the practice, correction factors should be applied to this measured rate to reflect the localized area of testing relative to the field sizes.

Appropriate correction factors should also be applied by the project civil engineer to account for long-term infiltration parameters. From a geotechnical perspective, we recommend a factor of safety (correction factor) of at least 2 be applied to the field infiltration values to account for potential soil variability with depth and location within the area tested. In addition, the stormwater system design engineer should determine and apply appropriate remaining correction factor values, or factors of safety, to account for repeated wetting and drying that occur in this area, degree of in-system filtration, frequency and type of system maintenance, vegetation, potential for siltation and bio-fouling, etc., as well as system design correction factors for overflow or redundancy, and base and facility size.

The actual depths, lateral extent and estimated infiltration rates can vary from the values presented above. Field testing/confirmation during construction is often required in large or long systems or other situations where soil conditions may vary within the area where the system is constructed. The results of this field testing might necessitate that the infiltration locations be modified to achieve the design infiltration rate.

The infiltration flow rate of a focused stormwater system like a drywell or small infiltration box or pond typically diminishes over time as suspended solids and precipitates in the stormwater further clog the void spaces between the soil particles or cake on the infiltration surface or in the engineered media. The serviceable life of an infiltration media in a stormwater system can be extended by pre-filtering or with on-

going accessible maintenance. Eventually, most systems will fail and will need to be replaced or have media regenerated or replaced.

We recommend that infiltration systems include an overflow that is connected to a suitable discharge point. Also, infiltration systems can cause localized, high groundwater levels and should not be located near basement walls, retaining walls, or other embedded structures unless these are specifically designed to account for the resulting hydrostatic pressure. Infiltration locations should not be located on sloping ground, unless it is approved by a geotechnical engineer, and should not be infiltrated at a location that allows for flow to travel laterally toward a slope face, such as a mounded water condition or too close to a slope face that could cause instability of the slope.

Suitability of Infiltration System

Successful design and implementation of stormwater infiltration systems and whether a system is suitable for a development depend on several site-specific factors. Stormwater infiltration systems are generally best suited for sites having sandy or gravelly soil with saturated hydraulic conductivities greater than 2 inches per hour. Sites with silty soil such as encountered at this site, and sites with fine sand, silty sand, or gravel that has a high percentage of silt or clay in the matrix, or sites with relatively shallow underlying decomposed rock (residual soil) are generally not well suited for exclusive stormwater infiltration. Soil that has fine-grained matrices is susceptible to volumetric change and softening during wetting and drying cycles. Fine-grained soil also has large variations in the magnitude of infiltration rates because of bedding and stratification that occurs during deposition and often has thin layers of less permeable or impermeable soil within a larger layer.

As a result of shallow groundwater, fine-grained soil conditions, and very low measured infiltration rates, we recommend infiltration of stormwater not be used as the sole source of stormwater management at this site

EARTHWORK RECOMMENDATIONS

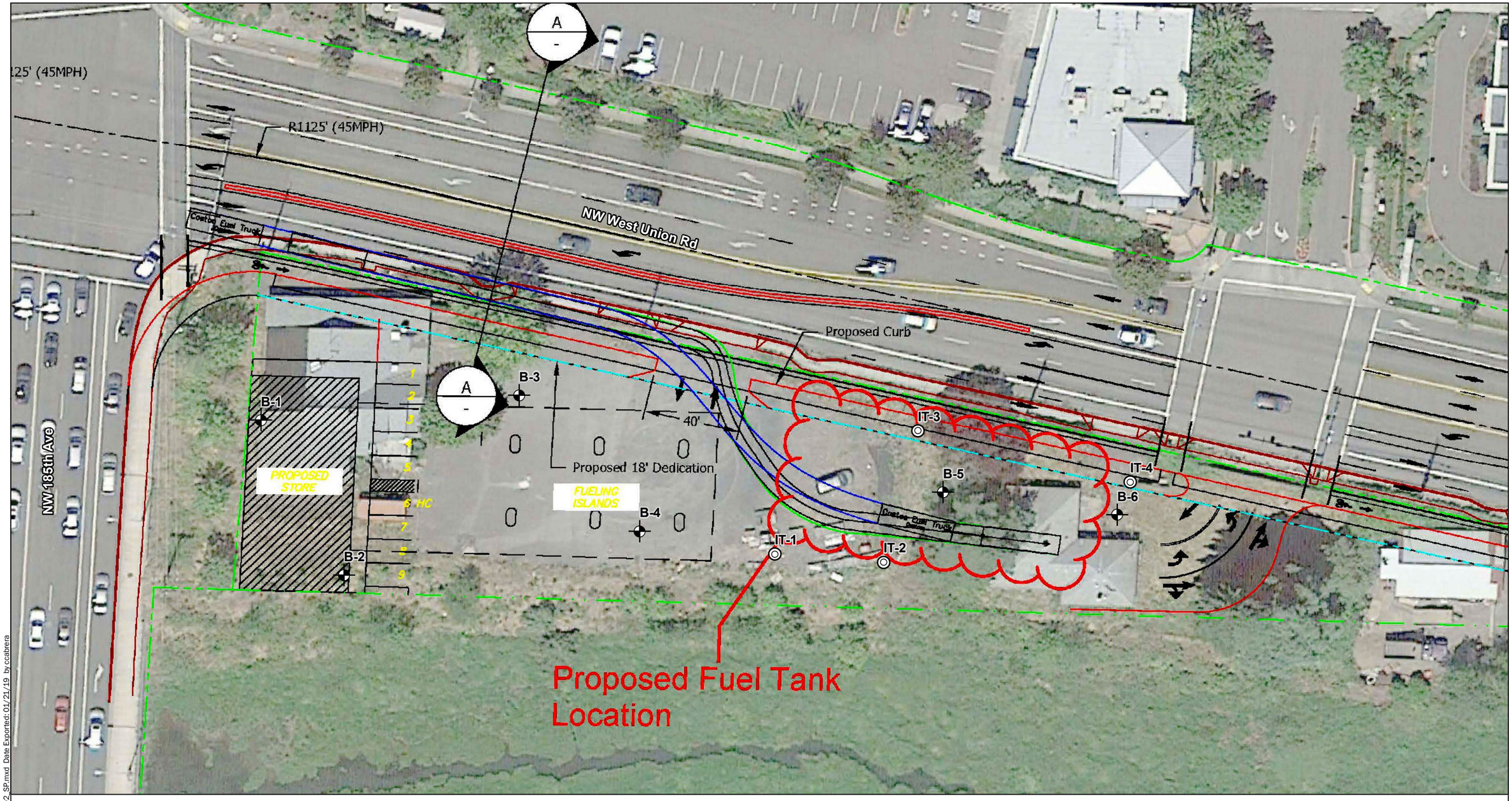
Site Preparation

In general, site preparation will include demolition of existing structural improvements, removing or relocating existing site utilities, stripping and grubbing of site organics, and grading the site per development plans.

Demolition

All existing structural elements, including above-grade structures, pavement, sidewalks or other hardscape features should be demolished and removed from proposed structural areas. All below-grade structural elements should be excavated and removed as a part of site demolition. If present, existing utilities that will be abandoned on site should be identified prior to project construction. Abandoned utility lines beneath proposed structural areas should be completely removed or filled with grout if abandoned, and left in place in order to reduce potential settlement or caving in the future. Materials generated during demolition of existing structural improvements should be transported off site for disposal.

Sites previously developed in an urban environment over several phases or used in multiple capacities (agricultural, storage, structurally developed) often have remnant buried features from previous uses such



Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Base drawing from Kittelson and Associates, July 18, 2018.

Projection: NAD 1983 HARN StatePlane Oregon North FIPS 3601 Feet Intl

Legend

- Boring Number and Approximate Location
- Infiltration Test Number and Approximate Location

N W E S

40 0 40
Feet

Site Plan

West Union Chevron
Portland, Oregon

GeoEngineers

Figure 2

P:\23\23698001\GIS\MXD\23698001_F02_SP.mxd Date Exported: 01/21/19 by ccabrera

OPERATIONS & MAINTENANCE PLAN

3J CONSULTING

CIVIL ENGINEERING | WATER RESOURCES | LAND USE PLANNING

OPERATIONS & MAINTENANCE PLAN FOR STORMWATER FACILITIES

West Union Chevron
Unincorporated Washington County, OR

June 3, 2021

Prepared For:

CJRW, LLC
PO Box 2092
Lake Oswego, OR 97035

Prepared By:
3J Consulting, Inc.
9600 SW Nimbus Avenue
Beaverton, Oregon 97008
Project No: 18509
JBC

PURPOSE

The purpose of this Operations and Maintenance (O&M) Plan is to bring attention to the on-going needs of the storm water management facilities located at the Wets Union Chevron Station in Unincorporated Washington County, OR. In order for the facility to operate as intended and increase the environmental benefits, a high quality maintenance program is required.

This document has been prepared to provide the owner with a single source document that will explain the maintenance requirements of the onsite private storm water facility. The owner of this property will be the fiscally responsible party for operating and maintaining the stormwater facilities.

STORM WATER FACILITIES

The site will be treated in a BayFilter Manhole and detain in a StormTech Chamber system. The BayFilter Manhole and isolator row of the StormTech Chambers will need to be maintained to ensure it functions properly.

INSPECTION/MAINTENANE SCHEDULE

For this O&M plan, a major storm event is defined as 1.0 inch of rain in 24 hours or more. All components of the storm system as described above must be inspected and maintained frequently or they will cease to function effectively. The facility owner shall keep a log, recording all inspection dates, observations, and maintenance activities. Receipts shall be saved when maintenance is performed and there is a record of expense.

BayFilter Manhole

- Annual inspections are required. It is recommended that the BayFilter Manhole be inspected every six (6) months when first installed.
- Maintenance should be performed per attached BayFilter Inspection and Maintenance Manual.

StormTech Chambers

- Annual inspections are required. It is recommended that the BayFilter Manhole be inspected every six (6) months when first installed.
- Maintenance should be performed per attached StormTech Isolator Row O&M Manual.

Source Control

Measures should be taken to prevent pollutants from mixing with stormwater. Typically, non-structural control measures include raking and removing leaves, sweeping, vacuum sweeping and limited controlled application of pesticides, herbicides and fertilizers.

Spill Prevention

Spill prevention measurements shall be exercised when handling substances that can contaminate stormwater. A spill prevention plan shall be implemented at all non-residential sites and in areas where there is likelihood of spill from hazardous materials. All homes contain a wide variety of toxic materials including gasoline for lawn mowers, antifreeze for cars, solvents, pesticides, and cleaning aids that can adversely affect stormwater if spilled. It is important to exercise caution when handling substances that can contaminate stormwater. Releases of pollutants shall be corrected as soon as identified.

Access
Access to the pervious concrete shall be safe and efficient. Egress and ingress routes shall be maintained to design standards. Roadways shall be maintained to accommodate size and weight of vehicles, if applicable. Obstacles preventing maintenance personnel and/or equipment access to the pervious concrete shall be removed.

Signage
Signage may serve to educate people about the importance or function of the sites pervious concrete. It may also discourage behaviors that adversely affect stormwater protection measures. If used at the site, broken or defaced signs shall be replaced or repaired.

Pollution Prevention
All sites shall implement best management practices to prevent hazardous wastes, litter, or excessive oil and sediment from contaminating stormwater. Non-drinking water quality concerns within Washington County limits may be forwarded to CWS at (503)681-5175, after hours at (503)681-3600.

Vectors (mosquitoes and rodents)
Stormwater facilities shall not harbor mosquito larvae or rats that pose a threat to public health or that undermine the facility structure. Monitor standing water for small wiggling sticks perpendicular to the water's surface. Note holes/burrows in and around facilities. Call Washington County Vector Control at 503-846-2904 for immediate assistance with eradicating vectors. Record time/date, weather, and site conditions when vector activity is observed.

ELEMENTS

This document contains the following information.

1. Maintenance Contact List
2. Construction Drawings
3. BayFilter Inspection & Maintenance Manual
4. StormTech Isolator Row O&M Manual
5. Sample Maintenance Logs
6. Private Stormwater Facilities Agreement

Record date, description, and contractor (if applicable) for all structural repairs, landscape maintenance, and facility cleanout activities

MAINTENANCE CONTACT LIST

Owner's Name CJRW, LLC
Contact Person Bob Barman

Phone No. (503)844-1340

Owner's Mailing Address

CJRW, LLC
PO Box 2092
Lake Oswego, OR 97035

Site Address 18450 NW West Union RD
Washington County, OR 97229

Site Legal Description or Tax Lot(s)

1N1 19BC 00500 & 00600

Party(ies) responsible for maintenance (only if different than owner).

Contact Name _____ Address _____

Company _____ _____

Phone No. ( ) _____ _____

Emergency/After -Hours Contact Information: Phone ( ) _____

Know what's below. Call before you dig.

STORM KEY NOTES

1. CONSTRUCT CATCH BASIN.
2. PROPOSED STORM DRAIN POINT OF CONNECTION FOR BUILDING ROOF DRAIN.
3. PROPOSED STORM DRAIN POINT OF CONNECTION FOR CANOPY ROOF DRAIN AT CANOPY COLUMNS.
4. INSTALL STORM DRAIN PIPING.
5. INSTALL STORM DRAIN CLEANOUT.
6. CONSTRUCT 60" WATER QUALITY MANHOLE.
7. CONSTRUCT 60" BAYFILTER MANHOLE (2-CARTRIDGE).
8. CONSTRUCT 60" STORM DRAIN MANHOLE.
9. PROPOSED ADS STORMTECH CHAMBER (SC740) DETENTION SYSTEM.
10. CONSTRUCT 60" FLOW CONTROL MANHOLE.

SANITARY SEWER KEY NOTES

1. CONSTRUCT CATCH BASIN.
2. PROPOSED SANITARY SEWER POINT OF CONNECTION AT BUILDING.
3. INSTALL SANITARY SEWER PIPING.
4. CONSTRUCT OIL STOP VALVE MANHOLE.
5. CONSTRUCT OIL WATER SEPARATOR VAULT WITH COALESCING MEDIA.
6. CONNECT TO EXISTING SANITARY SEWER MANHOLE.
7. CONSTRUCT 48" SANITARY SEWER MANHOLE OVER EXISTING SEWER MAIN.
8. FILL AND ABANDON EXISTING SANITARY SEWER MAIN IN PLACE.

WATER KEY NOTES

1. REMOVE EXISTING METER AND CONNECT NEW SERVICE LINE TO EXISTING SERVICE LINE.
2. INSTALL NEW WATER SERVICE LINE.
3. INSTALL NEW DOMESTIC WATER METER.
4. INSTALL NEW DOUBLE CHECK.
5. WATER SERVICE POINT OF CONNECTION TO BUILDING. SEE ARCHITECTURAL FOR EXACT LOCATION.
6. INSTALL NEW FIRE HYDRANT, LATERAL, AND VALVE. CONNECT TO EXISTING WATER MAIN. HYDRANT TO BE LOCATED AT FUTURE PLANTER STRIP.

UTILITY KEY NOTES

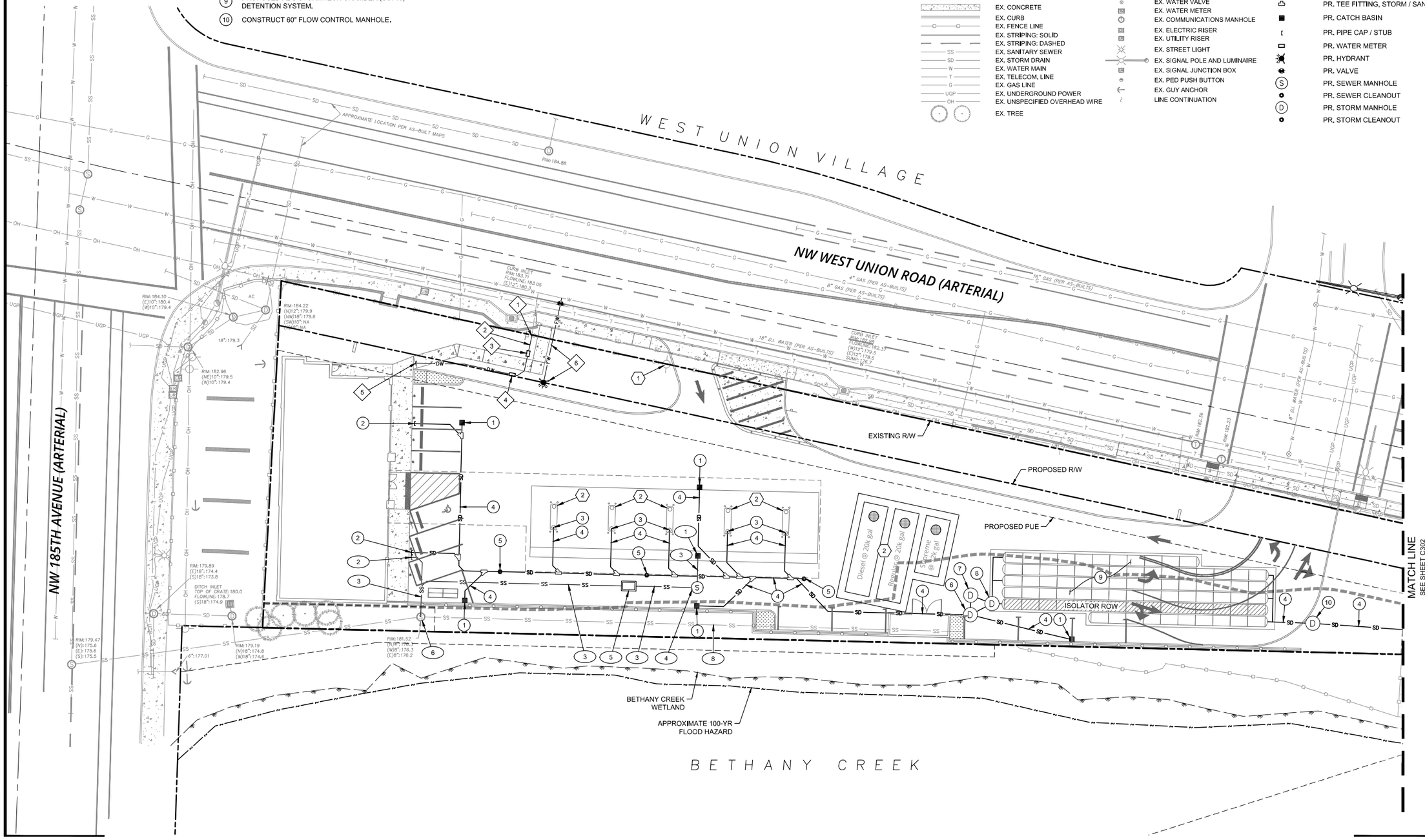
1. PROTECT EXISTING UTILITY POLE TO REMAIN.
2. SEE PETROLEUM PLANS FOR UNDERGROUND FUEL TANK AND PUMP INFORMATION

N
W E
S

SCALE: 1" = 20'
0 20 40 FT

LEGEND

- EX. BUILDING
- PROJECT BOUNDARY
- RIGHT-OF-WAY LINE
- RIGHT-OF-WAY CENTERLINE
- PR. RIGHT OF WAY
- PR. EASEMENT LINE
- EX. WETLAND BOUNDARY
- EX. VEGETATED CORRIDOR
- EX. CONCRETE
- EX. CURB
- EX. FENCE LINE
- EX. STRIPING: SOLID
- EX. STRIPING: DASHED
- EX. SANITARY SEWER
- EX. STORM DRAIN
- EX. WATER MAIN
- EX. TELECOM. LINE
- EX. GAS LINE
- EX. UNDERGROUND POWER
- EX. UNSPECIFIED OVERHEAD WIRE
- EX. TREE
- EX. SIGN
- EX. SANITARY MANHOLE
- EX. STORM MANHOLE
- EX. STORM INLET
- EX. CULVERT PIPE OUTLET
- EX. FIRE HYDRANT
- EX. WATER VALVE
- EX. WATER METER
- EX. COMMUNICATIONS MANHOLE
- EX. ELECTRIC RISER
- EX. UTILITY RISER
- EX. STREET LIGHT
- EX. SIGNAL POLE AND LUMINAIRE
- EX. SIGNAL JUNCTION BOX
- EX. PED PUSH BUTTON
- EX. GUY ANCHOR
- LINE CONTINUATION
- PR. STORM PIPE
- PR. SANITARY LATERAL
- PR. WATER DOMESTIC SERVICE
- PR. WATER FIRE SERVICE
- PR. WYE FITTING, STORM / SANITARY
- PR. TEE FITTING, STORM / SANITARY
- PR. CATCH BASIN
- PR. PIPE CAP / STUB
- PR. WATER METER
- PR. HYDRANT
- PR. VALVE
- PR. SEWER MANHOLE
- PR. SEWER CLEANOUT
- PR. STORM MANHOLE
- PR. STORM CLEANOUT



REGISTERED PROFESSIONAL ENGINEER
85017PE
OREGON
DEC. 17, 2013
JAMES EVERETT JOHNSTON
PRELIMINARY
EXPIRES: 06/30/21

PUBLISH DATE
JUNE 3, 2021

ISSUED FOR
LAND USE DOCUMENTS

REVISIONS

PRELIMINARY COMPOSITE UTILITY PLAN I
WEST UNION CHEVRON

CRJW, LLC
WASHINGTON COUNTY, OREGON

3J CONSULTING
CIVIL ENGINEERING
WATER RESOURCES
COMMUNITY PLANNING
9600 SW NIMBUS AVE., SUITE 100; BEAVERTON, OR 97008

PROJECT INFORMATION
3J PROJECT # | 18509
TAX LOT(S) | 1N119BC00(600,500)
LAND USE # | --
DESIGNED BY | JEJ
CHECKED BY | AJM

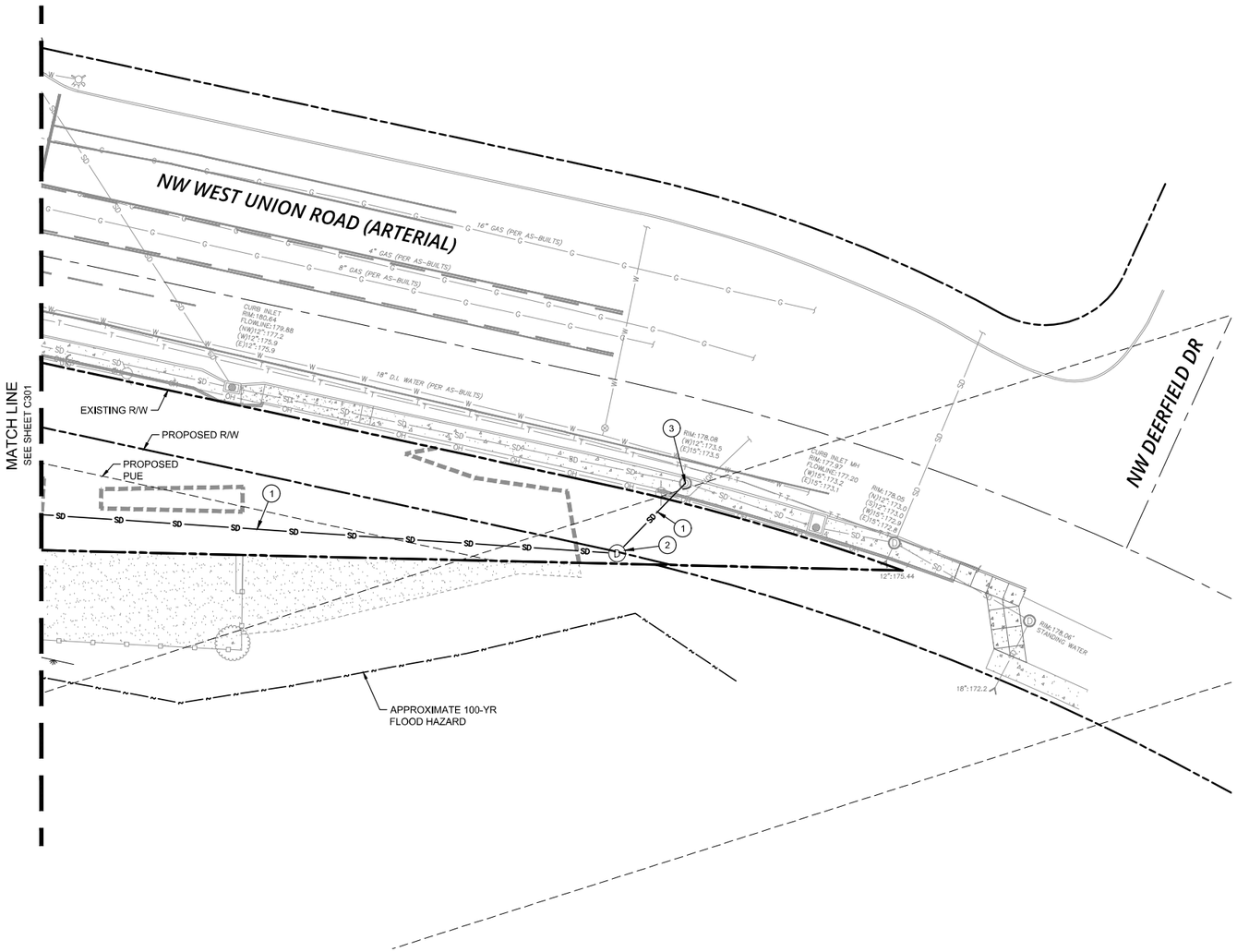
SHEET NUMBER
C301

P:\18509-WEST UNION CHEVRON\CAD\DDISHEETS\C300 UTILITY PLAN.DWG

Know what's below. Call before you dig.

STORM KEY NOTES

1. INSTALL STORM DRAIN PIPING.
2. CONSTRUCT 48" STORM MANHOLE.
3. CONNECT TO EXISTING SHALLOW STORM MANHOLE.



SCALE: 1" = 20'
0 20 40 FT

LEGEND

- EX. BUILDING
- PROJECT BOUNDARY
- RIGHT-OF-WAY LINE
- RIGHT-OF-WAY CENTERLINE
- PR. RIGHT OF WAY
- PR. EASEMENT LINE
- EX. CONCRETE
- EX. GRAVEL
- EX. VEGETATED CORRIDOR
- EX. CURB
- EX. FENCE LINE
- EX. STRIPING: SOLID
- EX. STRIPING: DASHED
- SD — EX. STORM DRAIN
- W — EX. WATER MAIN
- T — EX. TELECOM. LINE
- G — EX. GAS LINE
- UGP — EX. UNDERGROUND POWER
- OH — EX. UNSPECIFIED OVERHEAD WIRE
- EX. TREE
- S — EX. SANITARY MANHOLE
- D — EX. STORM MANHOLE
- EX. STORM INLET
- EX. CULVERT PIPE OUTLET
- EX. FIRE HYDRANT
- EX. WATER VALVE
- EX. GUY ANCHOR
- LINE CONTINUATION
- SD — PR. STORM PIPE
- D — PR. STORM MANHOLE

REGISTERED PROFESSIONAL ENGINEER
85017PE
OREGON
DEC. 17, 2019
JAE EVERETT JOHNSTON
PRELIMINARY
EXPIRES: 06/30/21

PUBLISH DATE
JUNE 3, 2021

ISSUED FOR
LAND USE DOCUMENTS

REVISIONS

PRELIMINARY COMPOSITE UTILITY PLAN II

WEST UNION CHEVRON

CRJW, LLC
WASHINGTON COUNTY, OREGON

3J CONSULTING
CIVIL ENGINEERING
WATER RESOURCES
COMMUNITY PLANNING
9600 SW NIMBUS AVE., SUITE 100; BEAVERTON, OR 97008

PROJECT INFORMATION

3J PROJECT #	18509
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DESIGNED BY	JEJ
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SHEET NUMBER
C302

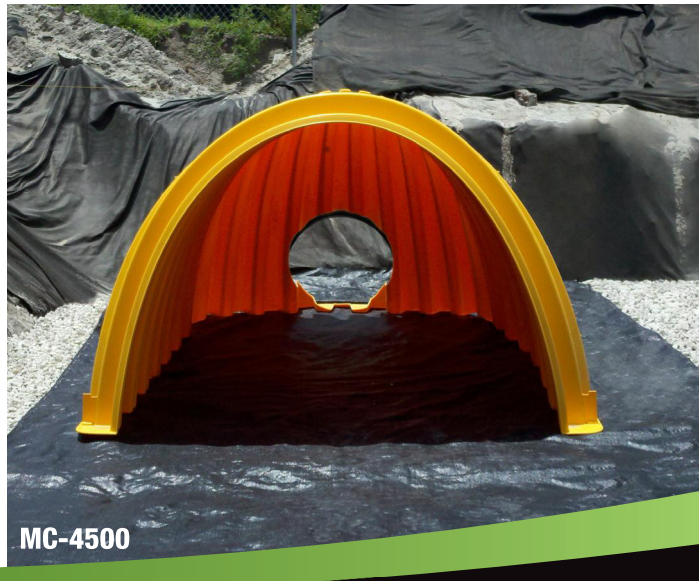
P:\18509-WEST UNION CHEVRON\CAD\DD\SHEETS\C300 UTILITY PLAN.DWG

StormTech®
Detention • Retention • Water Quality
An ADS company

Isolator® Row O&M Manual


SC-740


MC-3500


MC-4500

THE MOST **ADVANCED** NAME IN WATER MANAGEMENT SOLUTIONS™

ADS®

THE ISOLATOR® ROW

INTRODUCTION

An important component of any Stormwater Pollution Prevention Plan is inspection and maintenance. The StormTech Isolator Row is a technique to inexpensively enhance Total Suspended Solids (TSS) and Total Phosphorus (TP) removal with easy access for inspection and maintenance.

THE ISOLATOR ROW

The Isolator Row is a row of StormTech chambers, either SC-160, SC-310, SC-310-3, SC-740, DC-780, MC-3500 or MC-4500 models, that is surrounded with filter fabric and connected to a closely located manhole for easy access. The fabric-wrapped chambers provide for settling and filtration of sediment as storm water rises in the Isolator Row and ultimately passes through the filter fabric. The open bottom chambers and perforated sidewalls (SC-310, SC- 310-3 and SC-740 models) allow storm water to flow both vertically and horizontally out of the chambers. Sediments are captured in the Isolator Row protecting the storage areas of the adjacent stone and chambers from sediment accumulation.

A woven geotextile fabric is placed between the stone and the Isolator Row chambers. The woven geotextile provides a media for stormwater filtration, a durable surface for maintenance, prevents scour of the underlying stone and remains intact during high pressure jetting. A non-woven fabric is placed over the chambers to provide a filter media for flows passing through the perforations in the sidewall of the chamber. The non-woven fabric is not required over the SC-160, DC-780, MC-3500 or MC-4500 models as these chambers do not have perforated side walls.

The Isolator Row is typically designed to capture the “first flush” and offers the versatility to be sized on a volume basis or flow rate basis. An upstream manhole provides access to the Isolator Row and typically includes a high flow weir. When flow rates or volumes exceed the Isolator Row weir capacity the water will flow over the weir and discharge through a manifold to the other chambers.

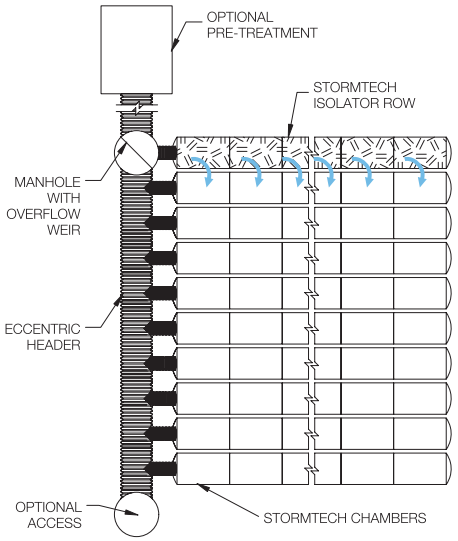
Another acceptable design uses one open grate inlet structure. Using a “high/low” design (low invert elevation on the Isolator Row and a higher invert elevation on the manifold) an open grate structure can provide the advantages of the Isolator Row by creating a differential between the Isolator Row and manifold thus allowing for settlement in the Isolator Row.

The Isolator Row may be part of a treatment train system. The design of the treatment train and selection of pretreatment devices by the design engineer is often driven by regulatory requirements. Whether pretreatment is used or not, the Isolator Row is recommended by StormTech as an effective means to minimize maintenance requirements and maintenance costs.

Note: See the StormTech Design Manual for detailed information on designing inlets for a StormTech system, including the Isolator Row.

Looking down the Isolator Row from the manhole opening, woven geotextile is shown between the chamber and stone base.

StormTech Isolator Row with Overflow Spillway (not to scale)



ISOLATOR ROW INSPECTION/MAINTENANCE

INSPECTION

The frequency of inspection and maintenance varies by location. A routine inspection schedule needs to be established for each individual location based upon site specific variables. The type of land use (i.e. industrial, commercial, residential), anticipated pollutant load, percent imperviousness, climate, etc. all play a critical role in determining the actual frequency of inspection and maintenance practices.

At a minimum, StormTech recommends annual inspections. Initially, the Isolator Row should be inspected every 6 months for the first year of operation. For subsequent years, the inspection should be adjusted based upon previous observation of sediment deposition.

The Isolator Row incorporates a combination of standard manhole(s) and strategically located inspection ports (as needed). The inspection ports allow for easy access to the system from the surface, eliminating the need to perform a confined space entry for inspection purposes.

If upon visual inspection it is found that sediment has accumulated, a stadia rod should be inserted to determine the depth of sediment. When the average depth of sediment exceeds 3 inches throughout the length of the Isolator Row, clean-out should be performed.

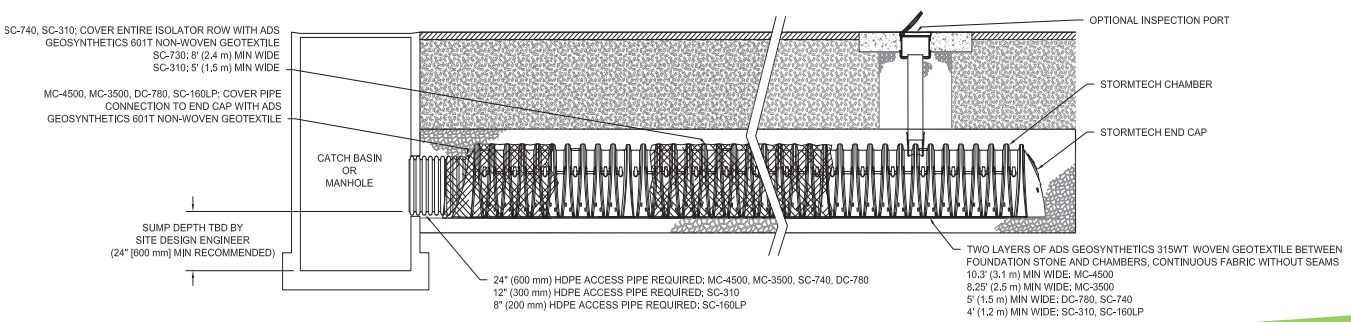
MAINTENANCE

The Isolator Row was designed to reduce the cost of periodic maintenance. By “isolating” sediments to just one row, costs are dramatically reduced by eliminating the need to clean out each row of the entire storage bed. If inspection indicates the potential need for maintenance, access is provided via a manhole(s) located on the end(s) of the row for cleanout. If entry into the manhole is required, please follow local and OSHA rules for a confined space entries.

Maintenance is accomplished with the JetVac process. The JetVac process utilizes a high pressure water nozzle to propel itself down the Isolator Row while scouring and suspending sediments. As the nozzle is retrieved, the captured pollutants are flushed back into the manhole for vacuuming. Most sewer and pipe maintenance companies have vacuum/JetVac combination vehicles. Selection of an appropriate JetVac nozzle will improve maintenance efficiency. Fixed nozzles designed for culverts or large diameter pipe cleaning are preferable. Rear facing jets with an effective spread of at least 45” are best. Most JetVac reels have 400 feet of hose allowing maintenance of an Isolator Row up to 50 chambers long. **The JetVac process shall only be performed on StormTech Isolator Rows that have AASHTO class 1 woven geotextile (as specified by StormTech) over their angular base stone.**

StormTech Isolator Row (not to scale)

Note: Non-woven fabric is only required over the inlet pipe connection into the end cap for SC-160LP, DC-780, MC-3500 and MC-4500 chamber models and is not required over the entire Isolator Row.



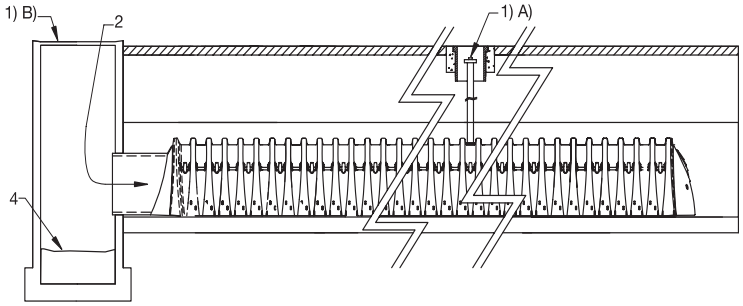
ISOLATOR ROW STEP BY STEP MAINTENANCE PROCEDURES

STEP 1
Inspect Isolator Row for sediment.
- A) Inspection ports (if present)
  - i. Remove lid from floor box frame
  - ii. Remove cap from inspection riser
  - iii. Using a flashlight and stadia rod,measure depth of sediment and record results on maintenance log.
  - iv. If sediment is at or above 3 inch depth, proceed to Step 2. If not, proceed to Step 3.
- B) All Isolator Rows
  - i. Remove cover from manhole at upstream end of Isolator Row
  - ii. Using a flashlight, inspect down Isolator Row through outlet pipe
    1. Mirrors on poles or cameras may be used to avoid a confined space entry
    2. Follow OSHA regulations for confined space entry if entering manhole
  - iii. If sediment is at or above the lower row of sidewall holes (approximately 3 inches), proceed to Step 2. If not, proceed to Step 3.

STEP 2
Clean out Isolator Row using the JetVac process.
- A) A fixed floor cleaning nozzle with rear facing nozzle spread of 45 inches or more is preferable
- B) Apply multiple passes of JetVac until backflush water is clean
- C) Vacuum manhole sump as required

STEP 3
Replace all caps, lids and covers, record observations and actions.

STEP 4
Inspect & clean catch basins and manholes upstream of the StormTech system.



SAMPLE MAINTENANCE LOG

Date	Stadia Rod Readings		Sediment Depth (1)–(2)	Observations/Actions	Inspector
	Fixed point to chamber bottom (1)	Fixed point to top of sediment (2)			
3/15/11	6.3 ft	none		New installation. Fixed point is CI frame at grade	DJM
9/24/11		6.2	0.1 ft	Some grit felt	SM
6/20/13		5.8	0.5 ft	Mucky feel, debris visible in manhole and in Isolator Row, maintenance due	NV
7/7/13	6.3 ft		0	System jetted and vacuumed	DJM

StormTech Detention • Retention • Water Quality
An ADS company

Advanced Drainage Systems, Inc.
4640 Trueman Blvd., Hilliard, OH 43026
1-800-821-6710 www.ads-pipe.com

BAYFILTER™ INSPECTION AND MAINTENANCE MANUAL

The BayFilter system requires periodic maintenance to continue operating at the design efficiency. The maintenance process is comprised of the removal and replacement of each BayFilter cartridge, vertical drain down module; and the cleaning of the vault or manhole with a vacuum truck.

The maintenance cycle of the BayFilter system will be driven mostly by the actual solids load on the filter. The system should be periodically monitored to be certain it is operating correctly. Since stormwater solids loads can be variable, it is possible that the maintenance cycle could be more or less than the projected duration.

BayFilter systems in volume-based applications are designed to treat the WQv in 24 to 48 hours initially. Late in the operational cycle of the BayFilter, the flow rate will diminish as a result of occlusion. When the drain down exceeds the regulated standard, maintenance should be performed.

When a BayFilter system is first installed, it is recommended that it be inspected every six (6) months. When the filter system exhibits flows below design levels the system should be maintained. Filter cartridge replacement should also be considered when sediment levels are at or above the level of the manifold system. Please contact the BaySaver Technologies Engineering Department for maintenance cycle estimations or assistance at **1.800.229.7283**.

BayFilter System Cleanout

Vactor Truck Maintenance

Jet Vactoring Through Access Hatch

Maintenance Procedures

1. Contact BaySaver Technologies for replacement filter cartridge pricing and availability at 1-800-229-7283.
2. Remove the manhole covers and open all access hatches.
3. Before entering the system make sure the air is safe per OSHA Standards or use a breathing apparatus. Use low O_2, high CO, or other applicable warning devices per regulatory requirements.
4. Using a vacuum truck remove any liquid and sediments that can be removed prior to entry.
5. Remove the hold down bars. Using a small lift or the boom of the vacuum truck, remove used cartridges by lifting them out.
6. Any cartridges that cannot be readily lifted can be easily slid along the floor to a location they can be lifted via a boom lift.
7. When all the cartridges have been removed, it is now practical to remove the balance of the solids and water. Loosen the stainless clamps on the Fernco couplings for the manifold and remove the drain pipes as well. Carefully cap the manifold and the Ferncos and rinse the floor, washing away the balance of any remaining collected solids.
8. Clean the manifold pipes, inspect, and reinstall.
9. Install the exchange cartridges, reinstall the hold down bars and close all covers.
10. The used cartridges may be sent back to BaySaver Technologies for recycling.

For more information please see the BaySaver website at www.baysaver.com or contact 1-800-229-7283.

Manifold Tee View of a Cleaned System

Cartridge Hoist Point

*THE MOST **ADVANCED** NAME IN WATER MANAGEMENT SOLUTIONS™*

Advanced Drainage Systems, Inc.
4640 Trueman Blvd., Hilliard, OH 43026
1-800-821-6710 www.ads-pipe.com

SAMPLE MAINTENANCE LOG BAYFILTER MANHOLE:

Month: Year: Initial & Date	BayFilter Manhole	Notes
January		
February		
March		
April		
May		
June		
July		
August		
September		
October		
November		
December		

SAMPLE MAINTENANCE LOG STORMTECH CHAMBERS:

Month: Year: Initial & Date	StormTech Chambers	Notes
January		
February		
March		
April		
May		
June		
July		
August		
September		
October		
November		
December		

City of Hillsboro Public Works Department
4415 NE 30th Avenue, 2nd floor
Hillsboro, OR, 97124

DATE: 06/11/2021
ATTENTION: Ashley Baggett
FROM: Joseph Conner
RE: Private Surface Water Management Facilities Agreement(s)

Please find enclosed the Private Surface Water Management Facilities Agreement (s) for the following:

Project Name: West Union Chevron

Permit #: PUPXX-XXXXX

I attest the Private Surface Water Management Facilities Agreement (s) meets the following requirements:

☐ The Agreement is printed single sided.

☐ The blanks within the Agreement are completed.

☐ The Exhibit name matches what is listed on the Agreement.

☐ The Agreement and Exhibit does not include any grey highlighting.

☐ The Exhibit is: Properly labeled, legible, font size is 8 or larger, clearly identifies the stormwater facility, and printed on 8.5x11 paper.

☐ The Agreement is signed and notarized. Signature and Title are on the same page.

Sincerely,

Joseph Conner
(503)681-5048 x214
joe.conner@3j-consulting.com

After Recording Return to:
City of Hillsboro
Attn: City Recorders Office
150 E Main Street
Hillsboro, OR 97123-4028

PRIVATE SURFACE WATER MANAGEMENT FACILITIES AGREEMENT

This Agreement is made and entered into this [Type here] day of [Type here] 20 [Type here], by and between the City of Hillsboro and Hillsboro School District (Owner).

Legal property description of the property subject to this agreement:
[Type here]

RECITALS

A. Developer has constructed or will develop the Facilities listed below. (List the type of private surface water management facilities to be constructed or previously existing on the subject property and the quantity of each type.)

Facility type (list each)		**Quantity:**
	BayFilter Manhole	1
	StormTech Chamber	1

B. The Facilities enable development of property while mitigating the impacts of additional surface water and pollutants associated with stormwater runoff prior to discharge from the property to the public stormwater system. The consideration for this Agreement is connection to the public surface water management system.

C. The Facilities are designed in accordance with The City of Hillsboro's Design and Construction Standards to treat and/or detain surface water runoff.

D. Failure to inspect and maintain the Facilities can result in an unacceptable impact to the public surface water management system.

NOW, THEREFORE, it is agreed by and between the parties as follows:

1. OWNER INSPECTIONS The City of Hillsboro shall provide Owner or designee an Operations and Maintenance Plan (O&M Plan) for each Facility. Owner or designee agrees to operate, inspect, and maintain each Facility in accordance with the current O&M Plan and any subsequent modifications to the Plan. Owner or designee shall

maintain a log of inspection activities. The log shall be available to the City upon request or during City's inspections.

a. The private developer and/or owner chose to meet the surface water treatment requirements for the new impervious surface created through the construction of the private surface water management facilities listed in (A) above. As these new facilities were necessary to meet the development requirements identified within the Land Use Conditions of Approval: DR-073-18 Permit Number PUP19-00002 , sheet number(s) C311, C323 & C334 the property owner thereby agrees to maintain these private facility(s) per the requirements of this agreement as described in the Operations and Maintenance Plan for each facility.

b. Routine inspection and maintenance of the above said private stormwater facilities shall be performed annually by the property owner or their designee per fiscal year (July 1 – June 30) for each individual private surface water management facility listed under (A) above and shown on (Exhibit 1) on the described property, per the Clean Water Services Low Impact Development Approaches Handbook for the maintenance of this type of facility.

c. Attached Exhibits
    i. Exhibit 1: Map of all Private Surface Water Management Facility(s) to be maintained privately

2. DEFICIENCIES All aspects in which the Facilities fail to satisfy the O&M Plan shall be noted as "Deficiencies".

3. OWNER CORRECTIONS All Deficiencies shall be corrected at Owner's or designee's expense within thirty (30) days after completion of the inspection. If more than 30 days is reasonably needed to correct a Deficiency, Owner or designee shall have a reasonable period to correct the Deficiency so long as the correction is commenced within the 30-day period and is diligently prosecuted to completion.

4. CITY INSPECTIONS Owner or designee grants the City of Hillsboro the right to enter the subject property to inspect the Facilities. The City will endeavor to give ten (10) days prior written notice to Owner or designee, except that no notice shall be required in case of an emergency. The City shall determine whether Deficiencies need to be corrected. Owner or designee (at the address provided at the end of this Agreement, or such other address as Owner or designee may designate in writing to the City) will be notified in writing through the US Mail of the Deficiencies and shall make corrections within 30 days of the date of the notice.

5. CITY CORRECTIONS If correction of all City of Hillsboro identified Deficiencies is not completed within thirty (30) days after notification by the City, the City shall have the right to have any Deficiencies corrected. The City (i) shall have access to the Facilities for the purpose of correcting such Deficiencies and (ii) shall bill Owner or designee for all costs reasonably incurred by the City for work performed to correct the Deficiencies (City Correction Costs) following Owner's or designee's failure to correct any Deficiencies in the Facilities. Owner or designee shall pay the City of Hillsboro the City Correction Costs within thirty (30) days of the date of the invoice. Owner or designee understands and agrees that upon non-payment, the City Correction Costs shall be secured by a lien on the Property for the City Correction Cost amount plus interest and penalties.

6. EMERGENCY MEASURES If at any time the City of Hillsboro reasonably determines that the Facilities create any imminent threat to public health, safety or welfare, the City may immediately and without prior notice to Owner or designee take measures reasonably designed to remedy the threat. The City shall provide notice of the threat and the measures taken to Owner or designee as soon as reasonably practicable, and charge Owner or designee for the cost of these corrective measures.

7. FORCE AND EFFECT This Agreement has the same force and effect as any deed covenant running with the land and shall benefit and bind all owners of the Property present and future, and their heirs, successors and assigns.

8. AMENDMENTS The terms of this Agreement may be amended only by mutual agreement of the parties. Any amendments shall be in writing, shall refer specifically to this Agreement, and shall be valid only when executed by the owners or designee of the Property, the City and recorded in the Official Records of the county where the Property is located.

9. PREVAILING PARTY In any action brought by either party to enforce the terms of this Agreement, the prevailing party shall be entitled to recover all costs, including reasonable attorney's fees as may be determined by the court having jurisdiction, including any appeal.

10. SEVERABILITY The invalidity of any section, clause, sentence, or provision of this Agreement shall not affect the validity of any other part of this Agreement, which can be given effect without such invalid part or parts.

IN WITNESS WHEREOF, Owner and the City of Hillsboro have signed this Agreement.

NOTARIZE DOCUMENT BELOW

(Owner/Representative with signature authority)

_____

By: _____
Bob Barman
CJRW, LLC

STATE OF_____)
) ss.
County of _____

The foregoing instrument is acknowledged before me this _____ day of _____, 20___

by_____as (title)_____

of (Company)_____ **(Location)**_____,.

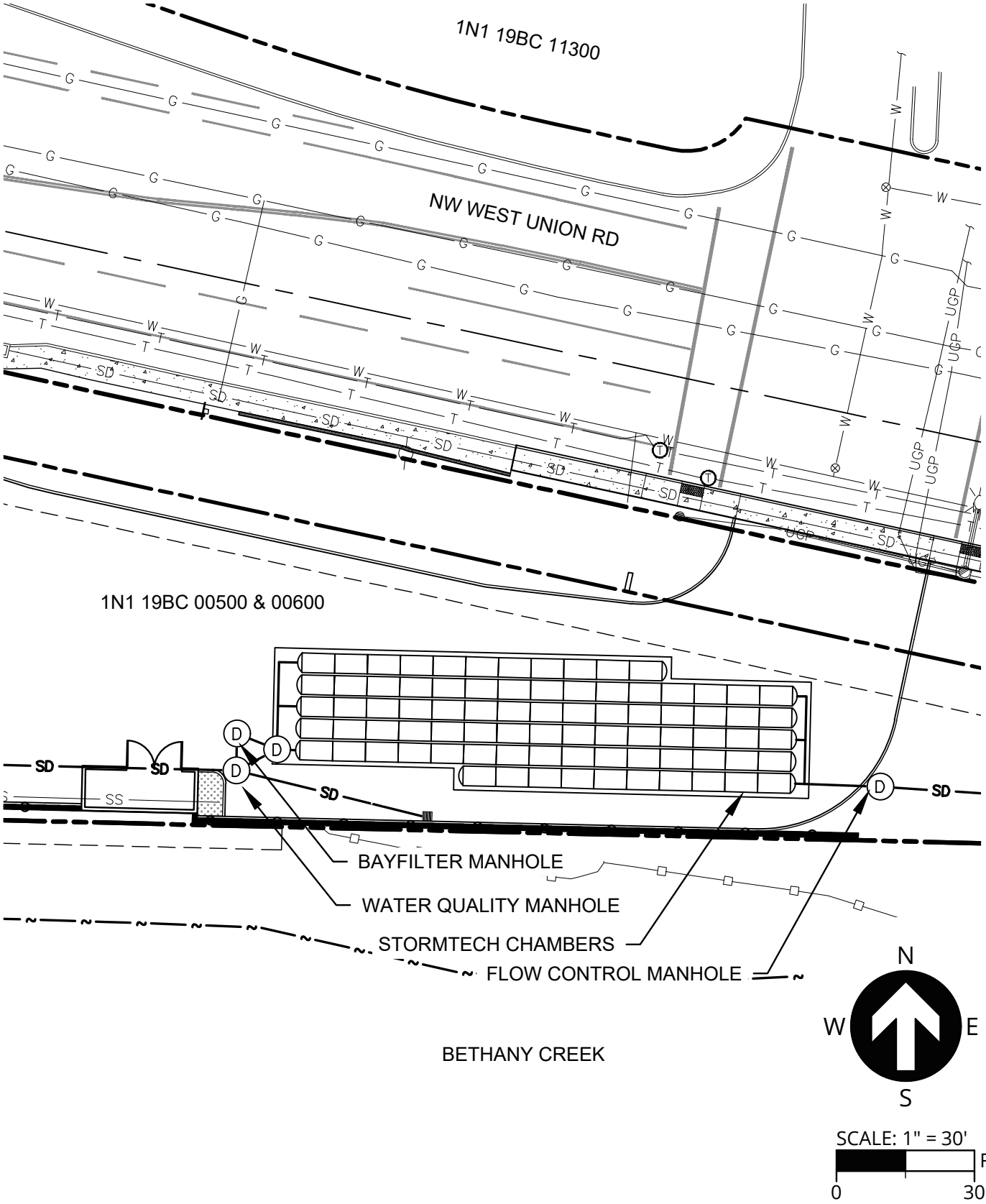
_____
Notary Public for Oregon

City of Hillsboro

By: _____

Thomas E. Arnold

Its: Public Works Director



6/03/2021

3J CONSULTING

CIVIL ENGINEERING | WATER RESOURCES | LAND USE PLANNING

WEST UNION CHEVRON

OPERATIONS & MAINTENANCE

EXHIBIT 1