PRELIMINARY STORMWATER REPORT FOR LAND USE SUBMITTAL

Herzog-Meier Volkswagen-Volvo New Service Building
4275 SW 139th Way
Beaverton, OR 97005

July 26, 2024

Prepared By:

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APPENDICES

I. OBJECTIVE

The objective of this report is to document the design of a stormwater management plan to capture, treat, and convey stormwater runoff from the proposed redevelopment in accordance with current City of Beaverton and Clean Water Services standards.

II. STORM METHODOLOGY

City of Beaverton and Clean Water Services design manuals were used in the design of proposed stormwater facilities. HydroCAD is used to model runoff and proposed stormwater management facilities for design of the stormwater system. The model output is included in the appendix.

III. REFERENCES:

City of Beaverton Engineering Design Manual (COB EDM)
City of Beaverton Development Code (COB DC)
Beaverton City Code (BCC)
Clean Water Services Design and Construction Standards (CWS DCS)
USDA NRCS Web Soil Survey Soil Map

IV. PROPOSED IMPROVEMENTS:

The proposed project consists of the redevelopment of approximately 1.48 acres of the Herzog Meier Volkswagen-Volvo facility at 4275 SW 139th Way. A new service building will be constructed in the northeast corner of the property, and a portion of the parking/vehicle storage area will be re-graded and re-paved. The property straddles Erickson Creek, which is piped. Much of the project is located within the Erickson Creek floodplain.

The project stormwater system incorporates multiple design approaches to meet water quality requirements. For on-site improvements, the new service building roof will be and areas of the existing parking lot will be conveyed to Contech StormFilter catch basins. A portion of the right-of-way will be managed via a street side vegetated planter basin.

An alternative approach is required to meet water quantity and hydromodification requirements. Due to the project's location within the floodplain and poor infiltration rates of site soils, infiltration facilities are not feasible. Further, underground detention facilities would not be functional for peak-flow matching due to the flood elevation in larger storm events. Therefore, the alternative approach to meet water quantity and hydromodification criteria coordinated with City staff is increasing above-grade flood storage for the 25-year design storm.

V. DESIGN & CONSTRUCTION STANDARDS:

Per Section 500 of the COB EDM, Beaverton has adopted the CWS DCS with Beaverton modifications. Therefore, the proposed development must provide stormwater management in accordance with CWS DCS. Per Chapter 3 of the CWS DCS, a Sensitive Area Pre-Screening Site Assessment service provider letter has been obtained from Clean Water Services and is included in the appendix of this report.

Chapter 4 of the CWS DCS – Runoff Treatment and Control – applies to this project.

Section 4.02 – Water Quantity Control for Conveyance Capacity

This section requires that each new development incorporate stormwater impact mitigation. Due to the project's location within the floodplain, a modification to this requirement is requested. See Stormwater Management: Water Quantity in this report for additional information.

Section 4.03 – Hydromodification Approach Requirements

4.03.1 General

This project is subject to hydromodification requirements as the development will create and/or modify over 1,000 square feet of impervious surface.

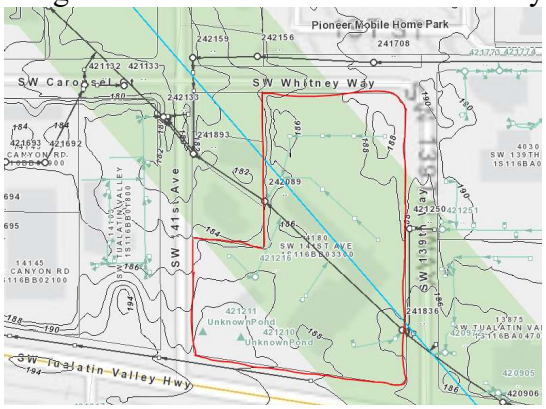
4.03.2 Hydromodification Assessment Requirement

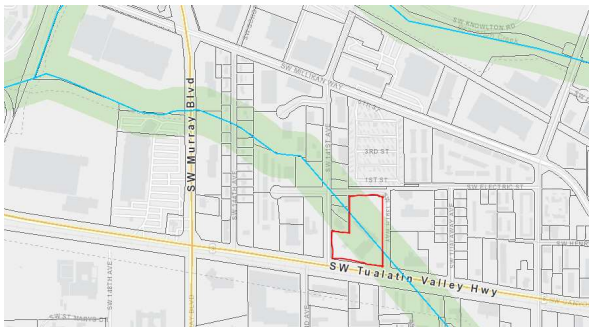
This project results in the addition and/or modification of more than 12,000 square feet of impervious surface and is not within an area with a District approved hydromodification sub-basin strategy. Therefore, a Hydromodification Assessment is required.

4.03.2 Hydromodification Assessment Methodology

4.03.3.a Risk Level

Images from the Clean Water Services Hydromod Planning Tool, site boundary in red:





As shown on the Hydromod Planning Tool, the risk level for this reach is Low (green).

4.03.3.b Development Class

This project is classified as a Developed Area.

4.03.3.c Project Size Category

The project size is classified as Medium, with proposed new and modified impervious surface area between 12,000 and 80,000 square feet.

4.03.4 Reach-Specific Risk Level Evaluation

No additional Receiving Reach conditions that may result in a different Risk Level than identified on the Hydromodification Map have been identified.

4.03.5 Hydromodification Approach Selection

TABLE 4-2
HYDROMODIFICATION APPROACH PROJECT CATEGORY TABLE

<table>
<tr><th>Development Class/ Risk Level</th><th>Small Project 1,000 – 12,000 SF</th><th>Medium Project >12,000 – 80,000 SF</th><th>Large Project > 80,000 SF</th></tr>
<tr><td>Expansion/High</td><td rowspan="6">Category 1</td><td rowspan="2">Category 3</td><td rowspan="4">Category 3</td></tr>
<tr><td>Expansion/ Moderate</td></tr>
<tr><td>Expansion/ Low</td><td>Category 2</td></tr>
<tr><td>Developed/ High</td><td>Category 3</td></tr>
<tr><td>Developed/ Moderate</td><td rowspan="2">Category 2</td><td rowspan="2">Category 2</td></tr>
<tr><td>Developed/ Low</td></tr>
</table>

This project is in Category 2, with a moderate anticipated risk. Any of the following options may be used to address hydromodification:

1. Infiltration facility, using the Standard Sizing, described in Section 4.08.5; or
2. Peak-Flow Matching Detention, using design criteria described in Section 4.08.6; or
3. Combination of Infiltration facility and Peak-Flow Matching Detention, using criteria described in Section 4.08.5 and 4.08.6; or
4. Any option listed in Category 3.

Due to the project's location within the floodplain, infiltration and underground detention is not feasible so a modification to this requirement is requested. See Stormwater Management: Water Quantity in this report for additional information.

Section 4.04 – Water Quality Treatment Requirements

4.04.1 General

This project must meet water quality requirements as the development will create and/or modify over 1,000 square feet of impervious surface.

4.04.2 Criteria for Requiring Implementation of a Water Quality Approach

The City of Beaverton is requiring a water quality approach for this project.

4.04.3 Required Treatment Design Efficiency

Stormwater quality approaches are required to remove 65% of the total phosphorous from the runoff of impervious areas. The Contech StormFilters proposed meet this treatment criterion and the proprietary system treatment requirements of 4.07.8.

Section 4.08 – Stormwater Management Approach Sizing

4.08.1 Impervious Area Used in Design

This section applies to this project as the development will create and/or modify over 1,000 square feet of impervious surface. For all development and redevelopment, stormwater management approaches shall be sized based on:

Quality: All new impervious surfaces and three times the modified impervious surface, up to the total existing impervious area on the site.

Quantity: All new and modified impervious area created by the development as required for conveyance capacity or hydromodification.

4.08.2 Storm Events Used in Design

CWS DCS requires a water quality design storm of 0.36 inches in 4 hours. The COB EDM modifies this criteria to be 0.36 inches in 3 hours.

$$\text{Water Quality Flow (cfs)} = \frac{0.36 \text{ (in.)} \times \text{Area (sq. ft.)}}{12\text{(in/ft.)} (\mathbf{3} \text{ hr.}) (60 \text{ min/hr.}) (60 \text{ sec/min.})}$$

TABLE 4-4

Recurrence Interval	Total 24-Hour Precipitation Depth (water equivalent inches)
2-year	2.5
5-year	3.10
10-year	3.45
25-year	3.90

The above storm events are used in facility design for this project.

4.08.5 Standard Sizing

4.08.5.b.2.B

As a hydromodification volume alternative, a facility may be sized to store the entire runoff volume from the design storm and subsequently drain.

4.08.6 Peak-Flow Matching Hydraulic Design Criteria

Peak-flow matching detention design is assessed with the Santa Barbara Urban Hydrograph (SBUH) using HydroCAD. Target peak-flow matching rates for conveyance capacity (Table 4-6) and hydromodification (Table 4-7) are shown below.

TABLE 4-6

Post-Development Peak Runoff Rate	Pre-Development Peak Runoff Rate Target
2-year, 24-hour	2-year, 24-hour
10-year, 24-hour	10-year, 24-hour
25-year, 24-hour	25-year, 24-hour

TABLE 4-7

Post-Development Peak Runoff Rate	Pre-Development Peak Runoff Rate Target
2-year, 24-hour	50% of 2-year, 24-hour
5-year, 24-hour	5-year, 24 hour
10-year, 24-hour	10-year, 24-hour

Additionally, the proposed project includes modified impervious surfaces (redevelopment). Therefore, a CN of 75 must be used as the pre-development condition for all impervious surfaces. The CN for new impervious surfaces is based on actual Pre-Development site conditions. The stormwater basin maps detail the site impervious surface inventory. For a detailed analysis see the Water Quantity, Hydromodification, and Peak Flow Matching section below in this report.

Floodway and Floodplain Data

Floodway and floodplain data are from the FEMA Flood Insurance Study for Washington County, Oregon and Incorporated Areas, Flood Insurance Study Number 41067CV001B, revised October 19, 2018. The FEMA FIRM map 41067CO527F, revised October 19, 2018, shows Section J of Erickson Creek at the property site with a 100-year flood elevation of 187.7 (NAVD 88). The FIRMette map is included in the appendix for reference. As the project vertical datum is NGVD 29, the flood elevation is converted to NGVD 29. The National Geodetic Survey VERTCON datum conversion tool was used.

Vertical datum conversion: https://www.ngs.noaa.gov/cgi-bin/VERTCON/vert_con.prl

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Latitude:      45 29 25.000

Longitude: 122 49 12.500

NAVD 88 height:

Datum shift(NAVD 88 minus NGVD 29):    1.069 meter
```

1.069 meters = 3.507 feet

Therefore, the NGVD 100-year flood elevation is 184.2 feet.

VI. STORMWATER MANAGEMENT:

Water Quality:

Per CWS DCS 4.08.1 above, the impervious surface area required to be treated with this development is a function of new and modified impervious areas.

The proposed work includes, approximately:
New Impervious: 1962 sf
Modified Impervious: 21,328 sf +17,658 sf =38,986

Therefore, the water quality requirement for this site is the treatment of:
New Impervious (1962 sf) + 3 (38,986 sf) = 118,920 square feet impervious surface

However, a previous project on this site (As-Built AB2015-014, prepared by AXIS Design Group and Cardno WRG) provided water quality facilities for a portion of the site. An annotated drainage basin map from the "Floodplain/Water Quality Analysis" memorandum prepared by Cardno WRG, dated July 5, 2012 is included in the appendix for reference. The remaining site area that was not provided with water quality treatment as part of the 2012 project is approximately 115,608 square feet. Therefore, this project must provide water quality treatment for all remaining on-site impervious surfaces.

Per Section 530 of the COB EDM, surface water management facilities follow an order of precedence:

Table 530.1 – SWM Facility Order of Precedence

Order	Facility Type	Remarks
1st	Enhancement and/or Expansion of an Existing Public SWM Facility	See Subsection 530.B
2nd	New Public Vegetated SWM Facility, CWS D&C section 4.06.2, .3, & .4	Requires to be located in a tract for new development. For redevelopment, may be located in a recorded access easement if located outside of right-of-way.
3rd	Private Vegetated SWM Facility	Located on private property and serves only one legal lot. Privately owned and maintained by property owner.
4	Private Proprietary Treatment Facility	Located on private property and serves only one legal lot. Privately owned and maintained by property owner.
4th	Street-side LIDA Swale/Planter in the Public ROW	See additional requirements for LIDA SWM facilities constructed within the R-O-W below and adjustments to CWS D&C sections 4.06.6.8.b and 4.06.6.9.b above
5th	Public Proprietary Treatment Facility	Requires a recorded access easement if located outside of right-of-way. Requires a pre-design meeting. Approval must be documented in the land use conditions of approval
6th	Fee-in-lieu	See the current City of Beaverton SDC Fee Schedule

1st Order Facility: not feasible, as no existing public SWM facilities are in the vicinity.
2nd Order Facility: not feasible for on-site runoff, required for right-of-way runoff
3rd Order Facility: not feasible for on-site runoff given the existing site infrastructure
4th Order Facility: feasible for remaining on-site runoff – StormFilter catch basins

All of the new service building roof will be conveyed to a Contech StormFilter catch basin for water quality treatment. Originally a planter was proposed but in order the elevations were not able meet the COB code requiring FFE to be 3 ft above the overflow of a treatment planter, therefore the design has changed to treat the roof with a Contech StormFilter system . The existing building roof will also be conveyed to a Contech StormFilter catch basin for treatment. Paved surfaces in the parking/vehicle storage lot will be treated by Contech StormFilter catch basins. A roadside planter sized to provide water quality to an area equal to the re-developed impervious areas in the right-of-way is proposed.

Per Section 510 of the COB EDM, water quality flow rates are determined by the following equation:

$$\text{Water Quality Flow (cfs)} = \frac{0.36\ (\text{in.}) \times \text{Area (sq. ft.)}}{12(\text{in/ft.})\ (\textbf{\textit{3}}\ \text{hr.})\ (60\ \text{min/hr.})\ (60\ \text{sec/min.})}$$

StormFilter Design:

Per Contech, an 18" StormFilter can treat 12,027 square feet and a 27" StormFilter can treat 18,040 square feet of impervious surface using the flow rate equation above. Refer to the drainage basin map for areas of impervious surfaces tributary to each water quality facility. The number and size of filters are shown on the map.

Off-Site Streetside LIDA Planter Design:

Per CWS DCS 4.09.11, structural infiltration planters are sized using Simplified LIDA Sizing per CWS DCS Section 4.08.4. Per CWS DCS 4.08.4.a, simplified sizing is used for facilities with a contributing impervious area no greater than 15,000 square feet (a 6% sizing factor for the water quality facility surface area). The street side planter is sized to manage a tributary impervious surface equal to the total new or redeveloped impervious surfaces that are part of this project. Refer to the Water Quality Basin Map for areas of impervious surfaces tributary to the street side planter.

Per Figure 530.1 above, the standard planter minimum elevation would be 184.5. However, due to the planter's proximity to the floodplain a variance to the minimum elevation is requested. As the gutter flowline elevation of the planter inlet is at 184.35, and a minimum freeboard of 2" is required above the 4" ponding depth, the proposed top of growing medium elevation is 183.92 (5" above the 10-year flood elevation).

Alternative water quality approaches were considered, including proprietary treatment. However, Beaverton only allows proprietary treatment in the right-of-way for projects located within the Beaverton Urban Renewal District or within Downtown Regional Center, Station Community, or Town Center land use designations or in situations meeting CWS 4.07.8.c. The project is not within the district or land use designations above, and the right-of-way runoff does not meet the criteria of CWS 4.07.8.c, so a street-side planter is the feasible, CWS Table 4-3 approvable water quality treatment approach.

Water Quantity, Hydromodification, & Peak Flow Matching:

Water quantity control is also required with this project. Per CWS standards, post-development runoff rates must be indexed to pre-development runoff rates per Table 4-6 to meet downstream conveyance requirements and per Table 4-7 to meet hydromodification requirements. A HydroCAD model was created to analyze the required design storms and is included in the appendix for reference.

TABLE 4-6

Post-Development Peak Runoff Rate	Pre-Development Peak Runoff Rate Target
2-year, 24-hour	2-year, 24-hour
10-year, 24-hour	10-year, 24-hour
25-year, 24-hour	25-year, 24-hour

TABLE 4-7

Post-Development Peak Runoff Rate	Pre-Development Peak Runoff Rate Target
2-year, 24-hour	50% of 2-year, 24-hour
5-year, 24-hour	5-year, 24 hour
10-year, 24-hour	10-year, 24-hour

For modeling water quantity, basins to be modified are compared to existing conditions in the same area, refer to the drainage basin maps. Existing drainage basins that will be provided with water quality treatment per this report but otherwise are not modified are not included in the water quantity analysis. A time of concentration of 5 minutes was used for both existing and proposed conditions, as the site is densely developed in both conditions. As required by CWS standards, a CN of 75 is used for existing impervious areas to be redeveloped which artificially lowers the pre-development peak runoff rate below actual existing conditions.

Due to the project's location within the floodplain and poor infiltration rates of site soils, infiltration facilities are not feasible. Further, underground detention facilities are not feasible as the crown of an underground detention facility would be below the flood elevation in larger storm events and therefore would not be functional for peak-flow matching. An alternative approach, increasing above-grade flood storage for the 25-year design storm, was coordinated with City staff.

Pre- and post-development stormwater runoff volume was calculated in accordance with CWS standards. Mirroring the intent of pre- and post-construction flow indexing, the runoff volumes and required increase in flood storage volume is tabulated below.

25-Year Storm Runoff Volume Tabulation:

Pre-Development Runoff Volume (cf)	Post-Development Runoff Volume (cf)	Required Flood Storage Increase (cf)
6,155 cf	11,507 cf	5,352 cf

As FEMA flood profiles include only 10, 50, 100, and 500-year storm events, the FEMA FIS data and the FEMA HEC-RAS model of Erickson Creek was employed to derive the 25-year flood elevation. This was accomplished by utilizing Hydro-CAD to replicate the 10-year FIS flow using the drainage area and hydrological parameters published in the FEMA FIS and then apply the 25-year 24-hour rain event to this model to develop the input 25-year hydrology for the HEC-RAS model. The 25-year flow rate for the basin was entered into the FEMA HEC-RAS model to establish the 25-year base flood elevation for the project site. The derived NGVD 25-year flood elevation is 183.87. The preliminary design shows that the required flood storage increase can be met and even slightly exceeded. Refer to the HydroCAD output and Flood Storage Analysis Map included in the appendix.

APPENDIX A

FEMA Flood Insurance Study Floodway Data and Flood Profiles

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
ERICKSON CREEK								
A	379	34	122	4.3	172.6	168.9[2]	169.4[2]	0.5
B	680	27	91	5.3	172.6	170.4[2]	170.7[2]	0.3
C	1,023	17	90	4.4	172.6	172.0[2]	172.5[2]	0.5
D	1,412	28	209	1.9	173.3	173.3	174.0	0.7
E	1,626	26	156	2.8	173.4	173.4	174.2	0.8
F	1,874	67	235	2.2	173.7	173.7	174.4	0.7
G	2,270	31	69	2.7	177.8	177.8	178.3	0.5
H	2,527	40	35	5.4	181.9	181.9	182.4	0.5
I	2,773	40	148	1.3	182.2	182.2	183.0	0.8
J	3,346	24	46	4.1	187.7	187.7	187.7	0.0
K	3,799	41	35	5.4	188.6	188.6	189.1	0.5
L	4,289	39	58	3.2	189.6	189.6	190.2	0.6
M	4,658	35	96	2.0	190.8	190.8	191.0	0.2
N	5,009	21	143	1.5	190.8	190.8	191.1	0.3
O	5,297	19	67	3.1	190.8	190.8	191.2	0.4
P	5,650	10	18	1.3	194.1	194.1	194.8	0.7
Q	5,914	9	22	1.0	194.5	194.5	195.5	1.0
R	6,215	5	18	1.7	197.3	197.3	198.0	0.7
S	6,452	7	10	5.9	198.0	198.0	198.9	0.9
T	6,781	34	204	0.8	198.9	198.9	199.9	1.0
U	6,897	33	178	1.0	198.9	198.9	199.9	1.0
V	7,086	52	220	0.7	199.0	199.0	200.0	1.0
W	7,410	39	155	1.0	199.1	199.1	200.0	0.9
X	7,617	40	147	1.2	199.2	199.2	200.1	0.9
Y	7,993	24	74	1.8	199.6	199.6	200.3	0.7
Z	8,330	15	41	3.9	200.2	200.2	200.8	0.6
AA	8,637	16	32	4.3	202.8	202.8	202.8	0.0

[1]Feet above confluence with Beaverton Creek

[2]Elevations computed without consideration of backwater effects from Beaverton Creek

TABLE 5

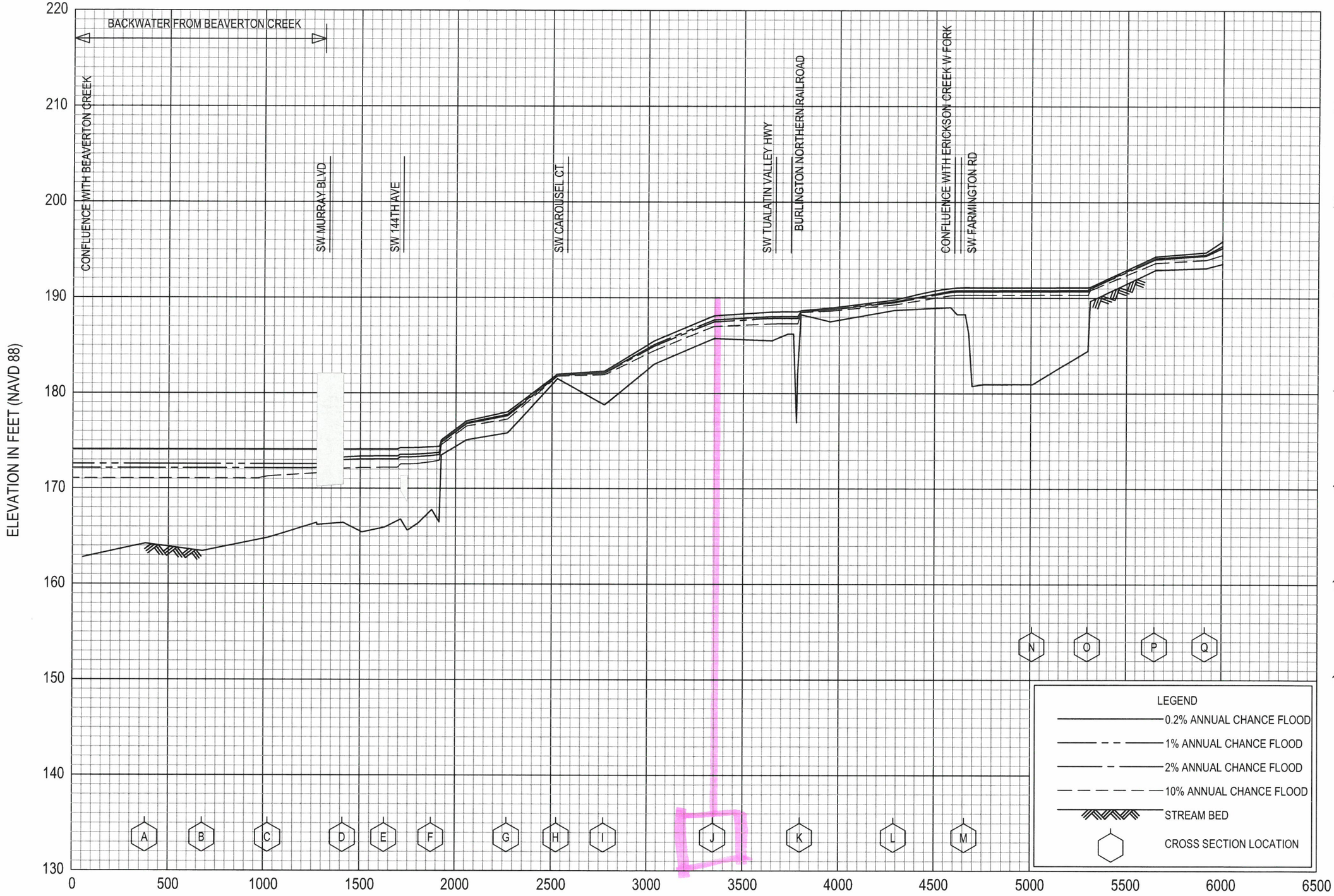
FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

ERICKSON CREEK



FLOOD PROFILES

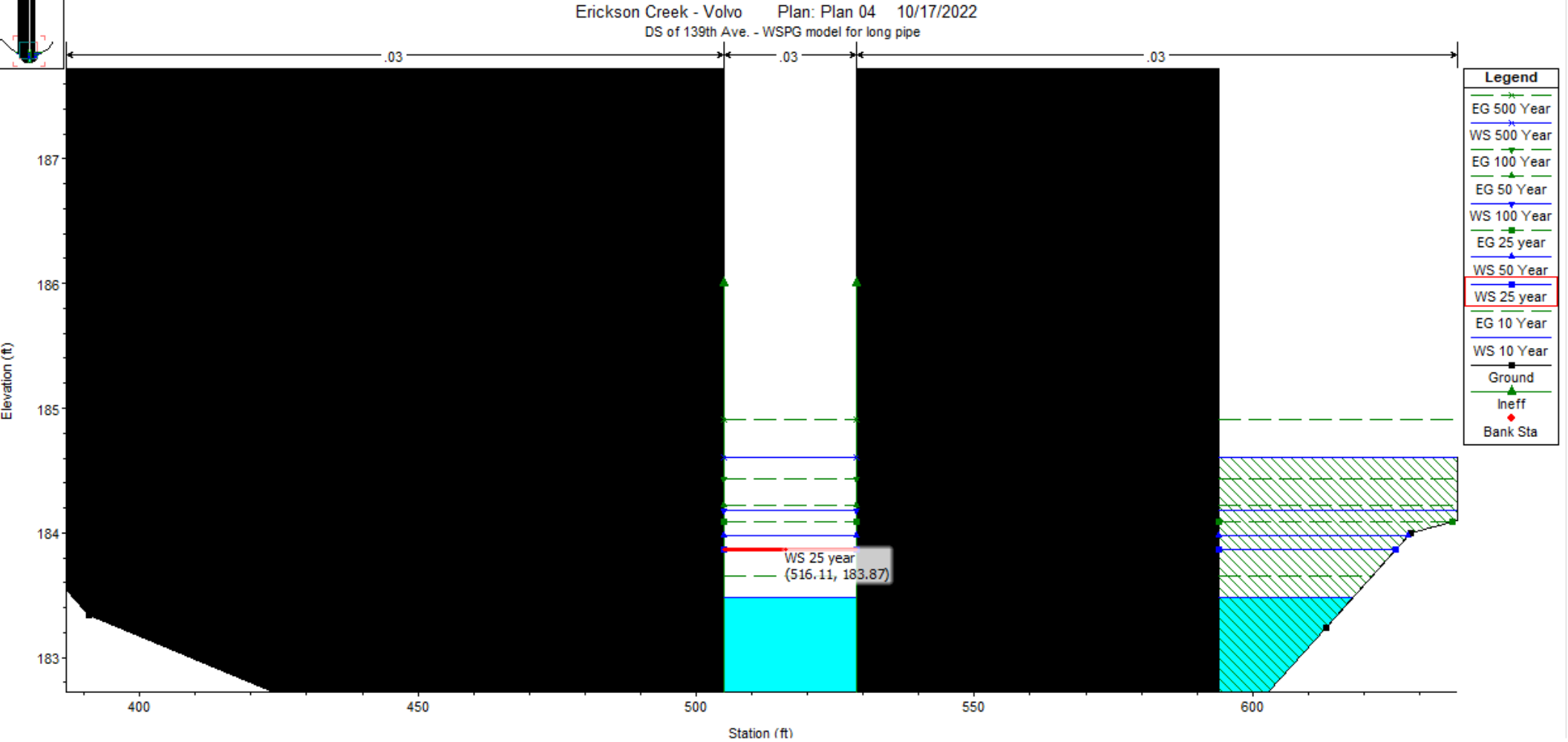
ERICKSON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

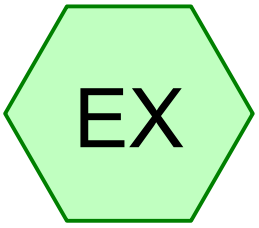
APPENDIX B

HEC RAS 25 YR Base Flood Output

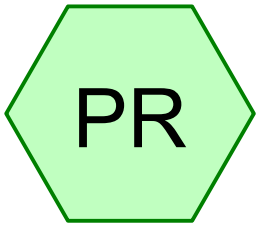

Erickson Creek - Volvo Plan: Plan 04 10/17/2022
DS of 139th Ave. - WSPG model for long pipe
.03
.03
.03
Legend
EG 500 Year
WS 500 Year
EG 100 Year
EG 50 Year
WS 100 Year
EG 25 year
WS 50 Year
WS 25 year
EG 10 Year
WS 10 Year
Ground
Ineff
Bank Sta
WS 25 year
(516.11, 183.87)
Elevation (ft)
187
186
185
184
183
400
450
500
550
600
Station (ft)

APPENDIX C

HydroCAD Output



Pre-Development



Post-Development

Subcat Reach Pond Link

Routing Diagram for E20-030 - Prelim HydroCAD - Area Comparison
Prepared by {enter your company name here}, Printed 7/30/2024

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
8,238	75	IImpervious ROW (EX)
21,328	75	Impervious On Site to be Redeveloped (EX)
8,749	98	Impervious ROW (PR)
23,290	98	Impervious on site (PR)
7,128	80	Pervios ROW (EX)
6,040	80	Pervious On Site (EX)
6,617	80	Pervious ROW (PR)
4,078	80	Pervious on site (PR)
85,468	**85**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
0	HSG C	
0	HSG D	
85,468	Other	EX, PR
85,468		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover
0	0	0	0	8,238	8,238	IImpervious ROW
0	0	0	0	21,328	21,328	Impervious On Site to be Redeveloped
0	0	0	0	8,749	8,749	Impervious ROW
0	0	0	0	23,290	23,290	Impervious on site
0	0	0	0	7,128	7,128	Pervios ROW
0	0	0	0	6,040	6,040	Pervious On Site
0	0	0	0	6,617	6,617	Pervious ROW
0	0	0	0	4,078	4,078	Pervious on site
0	**0**	**0**	**0**	**85,468**	**85,468**	**TOTAL AREA**

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX: Pre-Development Runoff Area=42,734 sf 0.00% Impervious Runoff Depth>1.73"
Tc=6.0 min CN=77/0 Runoff=0.377 cfs 6,155 cf

Subcatchment PR: Post-Development Runoff Area=42,734 sf 74.97% Impervious Runoff Depth>3.23"
Tc=6.0 min CN=80/98 Runoff=0.777 cfs 11,507 cf

Total Runoff Area = 85,468 sf Runoff Volume = 17,663 cf Average Runoff Depth = 2.48"
62.51% Pervious = 53,429 sf 37.49% Impervious = 32,039 sf

Summary for Subcatchment EX: Pre-Development

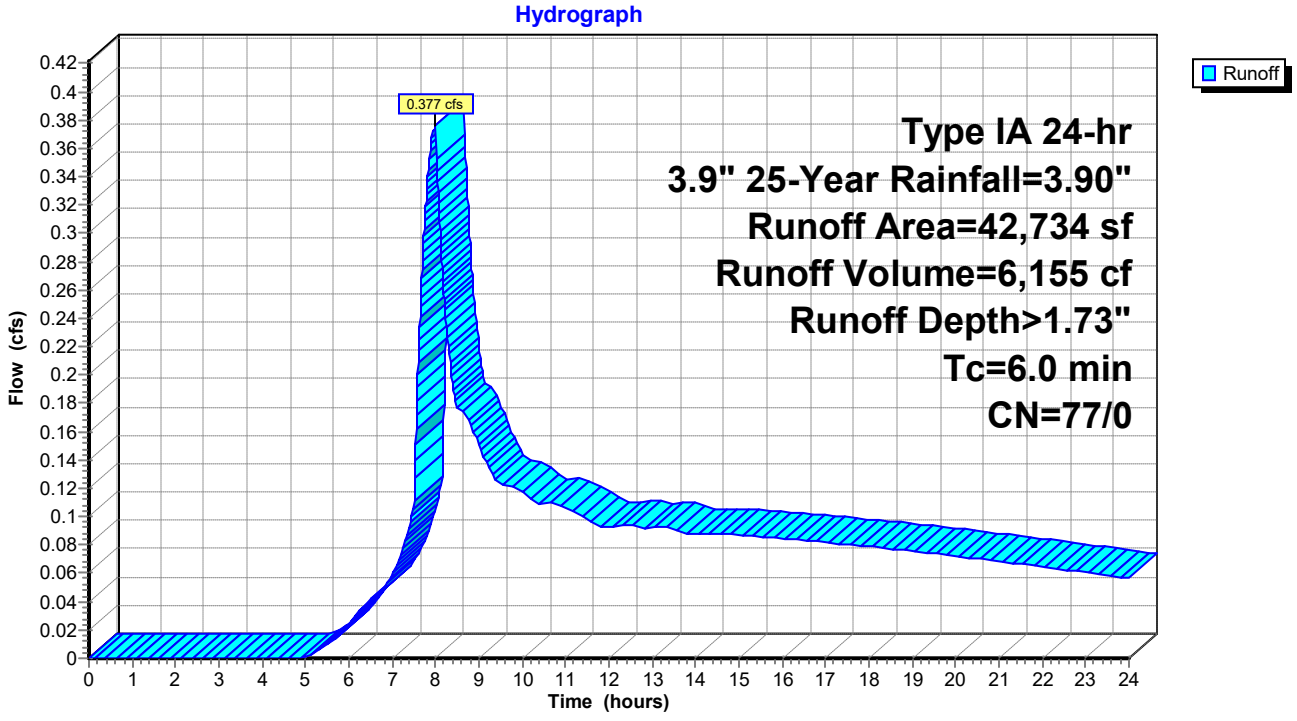
Runoff = 0.377 cfs @ 8.00 hrs, Volume= 6,155 cf, Depth> 1.73"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 3.9" 25-Year Rainfall=3.90"

	Area (sf)	CN	Description
*	21,328	75	Impervious On Site to be Redeveloped
*	6,040	80	Pervious On Site
*	8,238	75	IImpervious ROW
*	7,128	80	Pervios ROW
	42,734	77	Weighted Average
	42,734		100.00% Pervious Area

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

Subcatchment EX: Pre-Development



Summary for Subcatchment PR: Post-Development

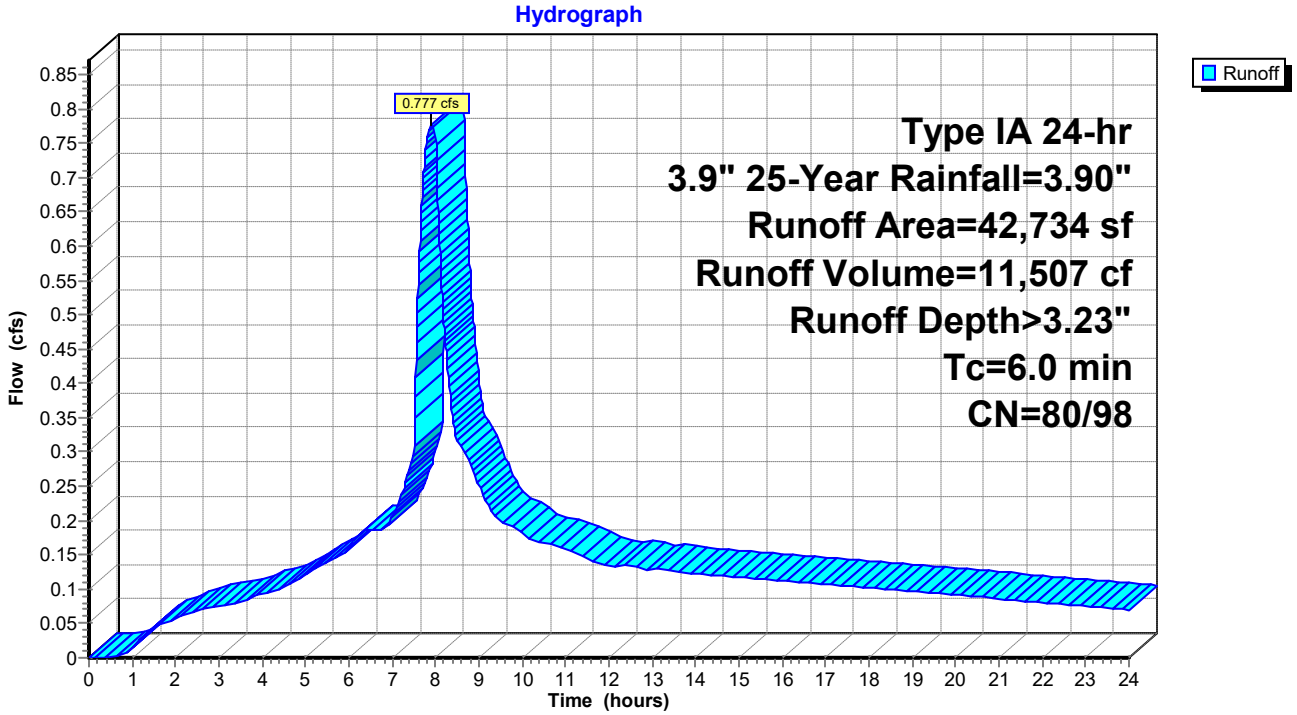
Runoff = 0.777 cfs @ 7.91 hrs, Volume= 11,507 cf, Depth> 3.23"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 3.9" 25-Year Rainfall=3.90"

	Area (sf)	CN	Description
*	23,290	98	Impervious on site
*	4,078	80	Pervious on site
*	8,749	98	Impervious ROW
*	6,617	80	Pervious ROW
	42,734	93	Weighted Average
	10,695		25.03% Pervious Area
	32,039		74.97% Impervious Area

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

Subcatchment PR: Post-Development



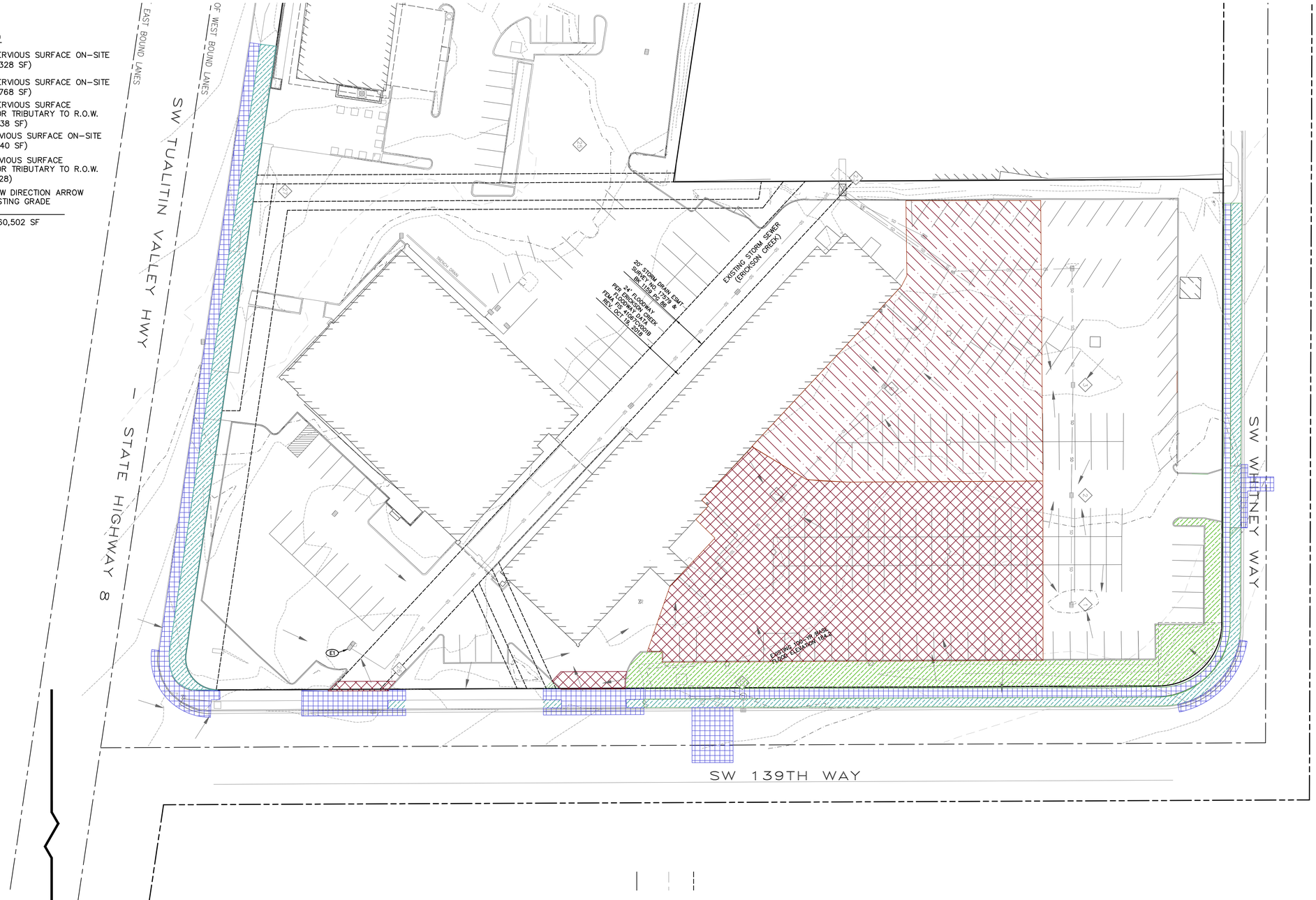
APPENDIX D

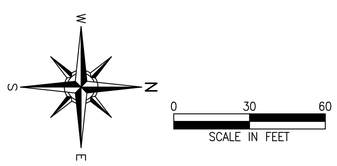
Drainage Basin Maps

LEGEND

- IMPERVIOUS SURFACE ON-SITE (21,328 SF)
- IMPERVIOUS SURFACE ON-SITE (17,768 SF)
- IMPERVIOUS SURFACE IN OR TRIBUTARY TO R.O.W. (8,238 SF)
- PERVIOUS SURFACE ON-SITE (6,040 SF)
- PERVIOUS SURFACE IN OR TRIBUTARY TO R.O.W. (7,128)
- FLOW DIRECTION ARROW EXISTING GRADE

TOTAL AREA 60,502 SF





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DATE: JULY 30, 2024

PROJECT NO. E20-030

HERZOG MEIER VOLKSWAGEN-VOLVO
4275 SW 139TH WAY
BEAVERTON, OREGON 97005

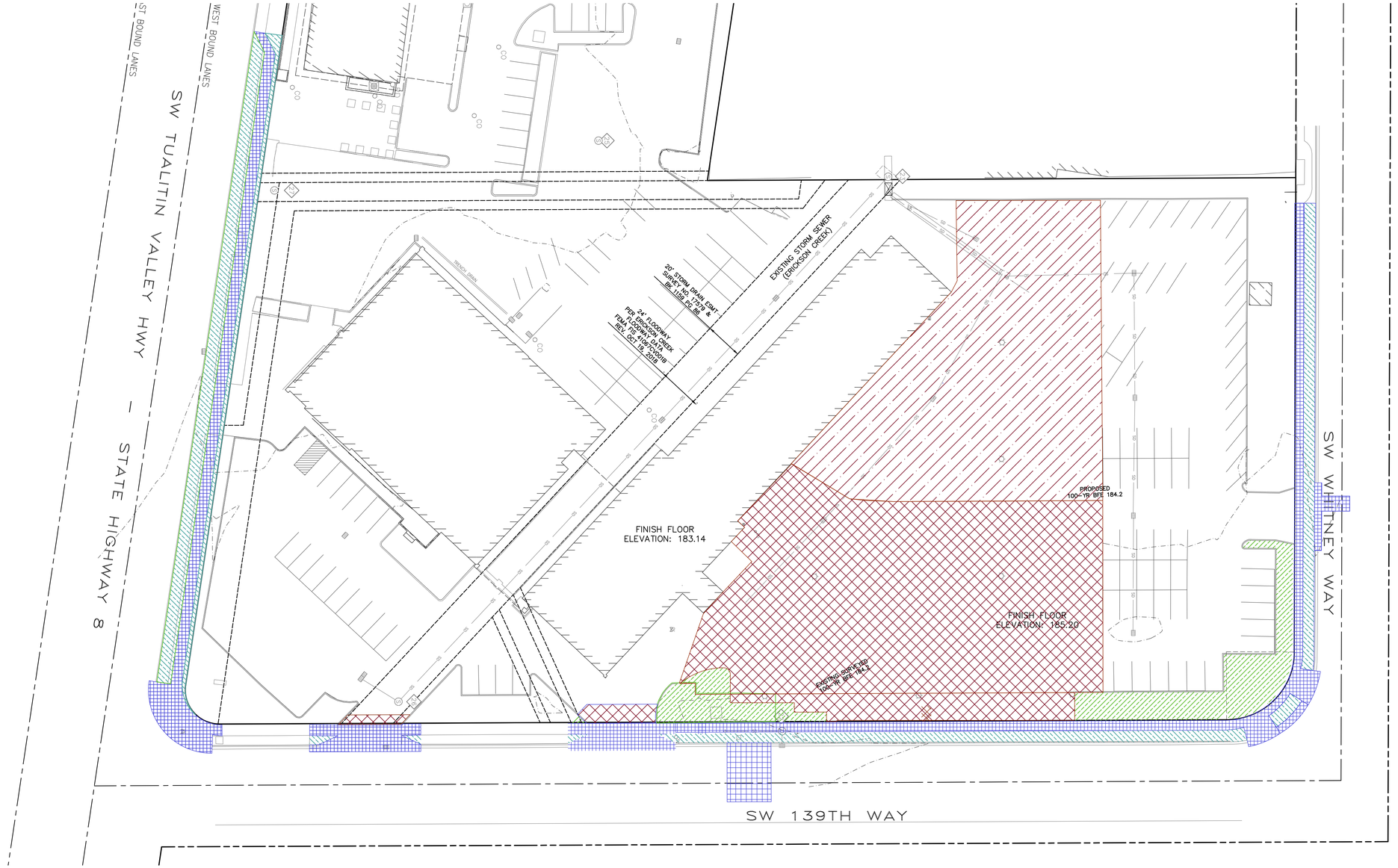
SURFACE INVENTORY MAP - PRE-DEVELOPMENT
HERZOG MEIER VW-VOLVO SERVICE BUILDING
BEAVERTON, OREGON 97055

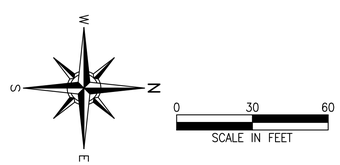
C1/3

LEGEND

- IMPERVIOUS SURFACE ON-SITE FOR SITE DEVELOPMENT (23,290 SF)
- IMPERVIOUS SURFACE ON-SITE FOR HYDROMODIFICATION (17,768 SF)
- IMPERVIOUS SURFACE IN OR TRIBUTARY TO R.O.W. (8,749 SF)
- PERVIOUS SURFACE ON-SITE (4,078 SF)
- PERVIOUS SURFACE IN OR TRIBUTARY TO R.O.W. (6,617)

TOTAL AREA 60,502 SF





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SURFACE INVENTORY MAP - POST-DEVELOPMENT
HERZOG MEIER VW-VOLVO SERVICE BUILDING
BEAVERTON, OREGON 97055

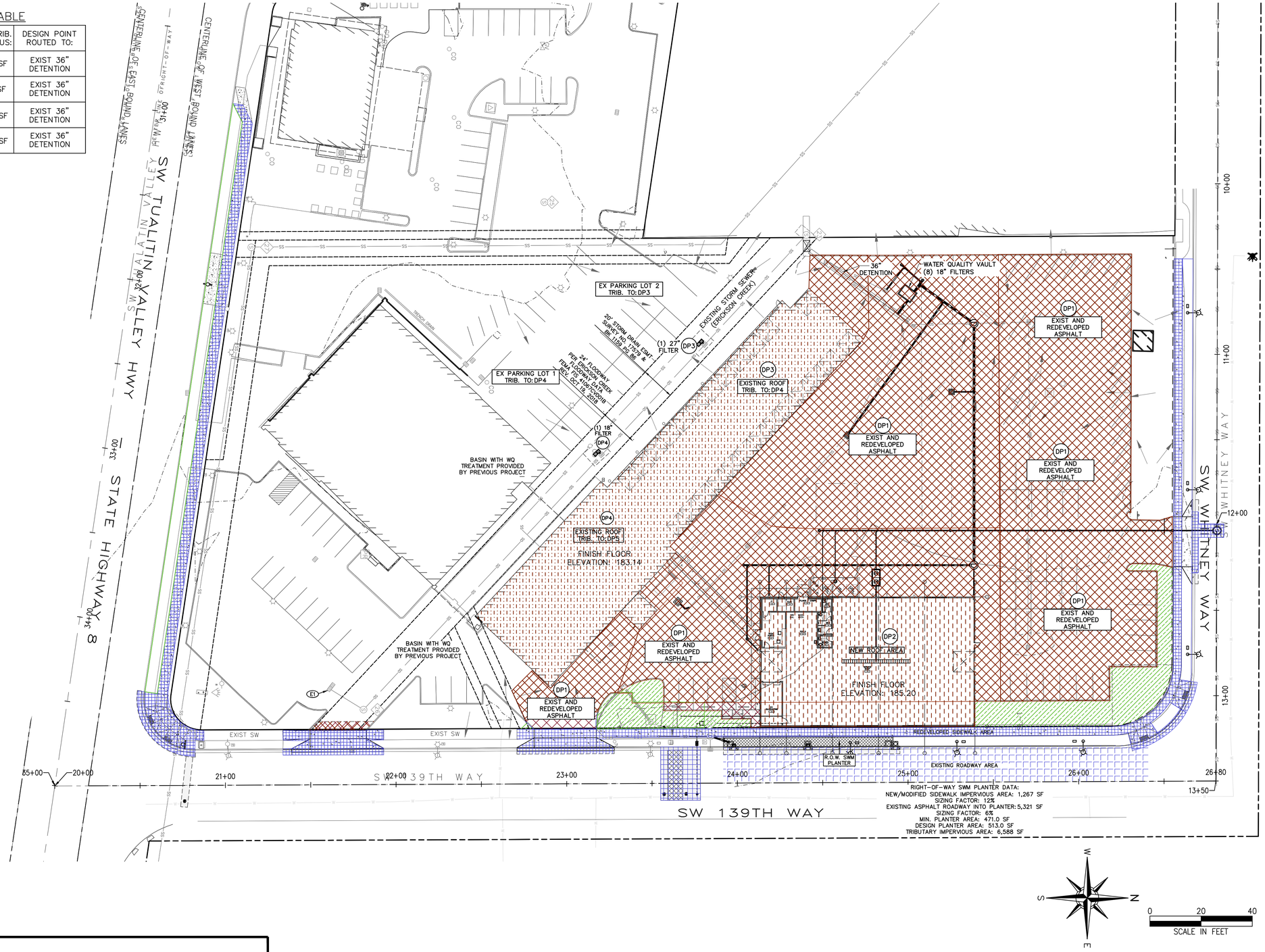
ON-SITE DRAINAGE BASIN DESIGN POINT TABLE

DP#	FACILITY POINT TREATMENT DESCRIPTION:	TRIBUTARY:	BASIN IMPERVIOUS:	TOTAL TRIB. IMPERVIOUS:	DESIGN POINT ROUTED TO:
DP1	WATER QUALITY VAULT	EXIST AND REDEVELOPED ASPHALT	56,611 SF	56,611 SF	EXIST 36" DETENTION
DP2	WATER QUALITY VAULT	NEW BUILDING	9,575 SF	9,575 SF	EXIST 36" DETENTION
DP3	NEW STORMFILTER CB	EX PARKING LOT 1 AND EXIST BUILDING	10,762 SF*	18,282 SF	EXIST 36" DETENTION
DP4	NEW STORMFILTER CB	EX PARKING LOT 1 AND EXIST BUILDING	9,076 SF*	16,596 SF	EXIST 36" DETENTION

* DENOTES BASIN AREA BASED ON THE "FLOODPLAIN/WATER QUALITY ANALYSIS" MEMORANDUM PREPARED BY CARDNO WRG, DATED JULY 5, 2012.

LEGEND

- EXIST AND REDEVELOPED ASPHALT (56,540 SF)
- NEW BUILDING (9,575 SF)
- EXIST BUILDING (15,040 SF)
- PERVIOUS SURFACE (4,040 SF)
- IMPERVIOUS SURFACE IN OR TRIBUTARY TO R.O.W.
- IMPERVIOUS SURFACE TRIBUTARY TO SWM PLANTER



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DATE: JULY 30, 2024

PROJECT NO. E20-030

HERZOG MEIER VOLKSWAGEN-VOLVO
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BEAVERTON, OREGON 97005

STORMWATER BASIN MAP
HERZOG MEIER VW-VOLVO SERVICE BUILDING
BEAVERTON, OREGON 97055

APPENDIX E

Annotated “Proposed Basin Delineations” map from the “Floodplain/Water Quality Analysis” memorandum prepared by Cardno WRG, dated July 5, 2012

DEVELOPED CATCHMENTS				
Catchment	Area (sf)	Area (acres)	Impervious Area (sf)	Pervious Area (sf)
1	12,652.56	0.29	9,666.17	2,986.39
2	7,628.41	0.18	7,129.83	498.58
3	10,927.33	0.25	9,372.54	1,554.79
4	8,688.40	0.20	5,409.80	3,278.60
5	5,820.40	0.13	4,926.28	894.12
6	7,206.00	0.17	7,206.00	0.00
7	15,018.20	0.34	13,512.93	1,505.27
8	9,640.00	0.22	7,626.29	2,013.71
9	14,989.06	0.34	14,989.06	0.00
10	13,460.09	0.31	10,762.08	2,698.01
11	9,579.60	0.22	9,076.42	503.18
12	16,236.57	0.37	16,236.57	0.00
13	14,677.10	0.34	11,170.23	3,506.87
14	16,022.23	0.37	14,082.91	1,939.32
15	10,842.40	0.25	10,200.90	641.50
16	5,735.00	0.13	5,735.00	0.00
17	18,448.82	0.42	16,136.28	2,312.54
18	100.00	0.00	100.00	0.00

BASINS MANAGED WITH PREVIOUS PROJECT

BASINS TO BE MANAGED WITH PROPOSED PROJECT
TOTAL AREA: APPROX. 115,608 SQ. FT

7/2/2012

0 40 80 160

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HERZOG-MEIER VW/VOLVO

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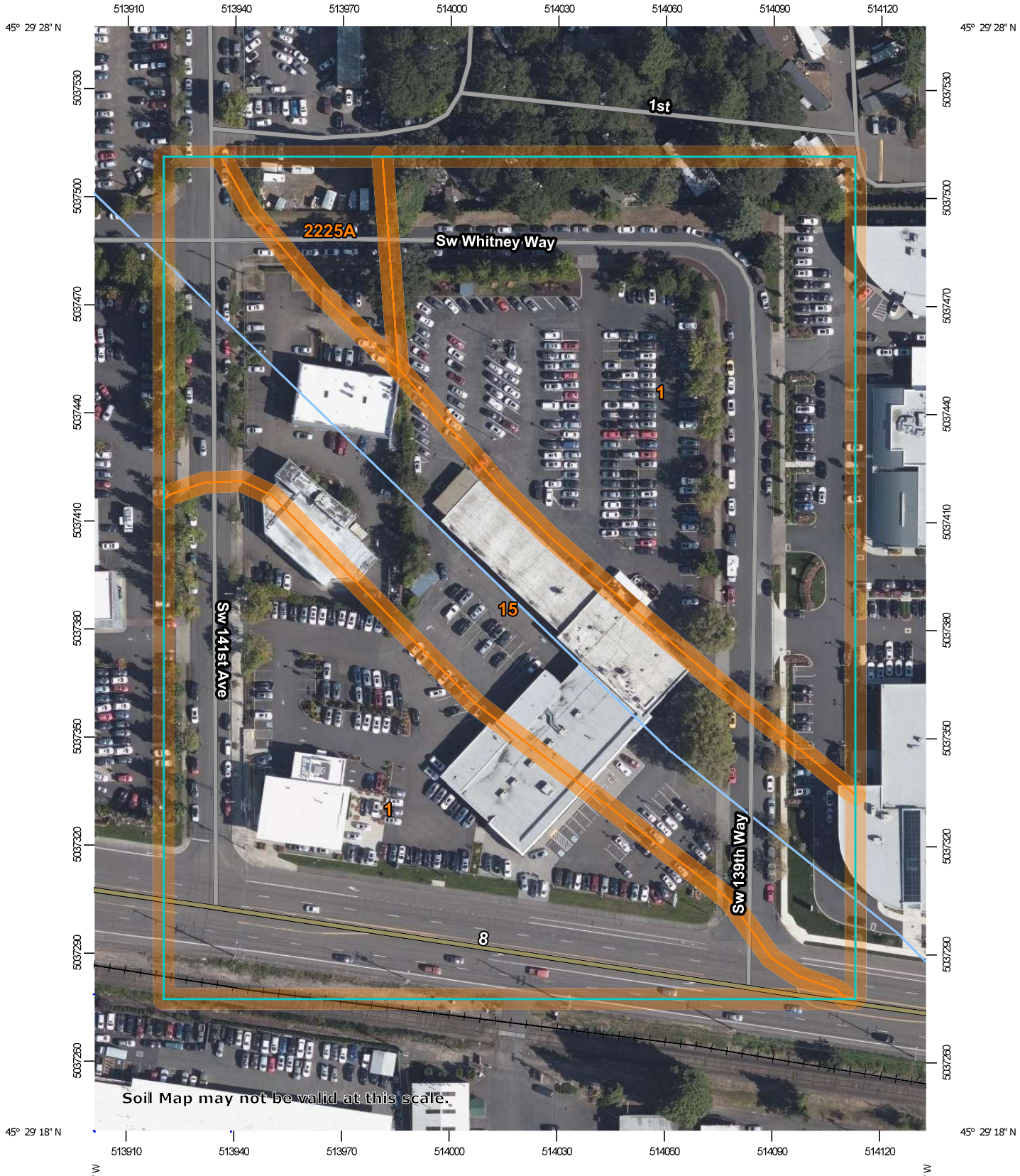
PROPOSED BASIN DELINEATIONS

APPENDIX F

USDA Web Soil Survey Map

Custom Soil Resource Report
Soil Map



Map Scale: 1:1,490 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 20 40 80 120

Feet
0 50 100 200 300

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

Washington County, Oregon

1—Aloha silt loam

Map Unit Setting

National map unit symbol: 21x8
Elevation: 150 to 250 feet
Mean annual precipitation: 40 to 60 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 160 to 210 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Aloha and similar soils: 90 percent
Minor components: 1 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Aloha

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Old loamy alluvium

Typical profile

H1 - 0 to 8 inches: silt loam
H2 - 8 to 46 inches: silt loam
H3 - 46 to 65 inches: silt loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 18 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 11.8 inches)

Interpretive groups

Land capability classification (irrigated): 2w
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C/D
Forage suitability group: Somewhat Poorly Drained (G002XY005OR)
Hydric soil rating: No

Minor Components

Huberly

Percent of map unit: 1 percent
Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear

Across-slope shape: Linear
Hydric soil rating: Yes

15—Dayton silt loam

Map Unit Setting

National map unit symbol: 21xn
Elevation: 150 to 400 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Dayton and similar soils: 90 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Dayton

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Old alluvium

Typical profile

H1 - 0 to 16 inches: silt loam
H2 - 16 to 39 inches: clay
H3 - 39 to 60 inches: silty clay loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: 12 to 24 inches to abrupt textural change
Natural drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 0 to 24 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Available water storage in profile: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): 4w
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: D
Forage suitability group: Poorly Drained (G002XY006OR)
Hydric soil rating: Yes

Minor Components

Verboort

Percent of map unit: 2 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

2225A—Huberly silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2sv3y
Elevation: 150 to 260 feet
Mean annual precipitation: 39 to 51 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Huberly and similar soils: 90 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Huberly

Setting

Landform: Swales on terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Silty glaciolacustrine deposits

Typical profile

A - 0 to 8 inches: silt loam
BAg - 8 to 15 inches: silt loam
Btg - 15 to 25 inches: silt loam
2Btx1 - 25 to 38 inches: silt loam
2Btx2 - 38 to 59 inches: silt loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: About 38 inches to fragipan
Natural drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.01 to 0.01 in/hr)
Depth to water table: About 0 to 8 inches
Frequency of flooding: None
Frequency of ponding: None

Available water storage in profile: Low (about 5.7 inches)

Interpretive groups

Land capability classification (irrigated): 3w
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C/D
Forage suitability group: Poorly Drained (G002XY006OR)
Hydric soil rating: Yes

Minor Components

Verboort

Percent of map unit: 3 percent
Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes