BARGHAUSEN

PRELIMINARY STORMWATER SITE PLAN

PREPARED BY

FREEMAN LOGISTICS

JASON MCARDEL

PREPARED FOR	CLIENT ADDRESS
VECTOR DEVELOPMENT COMPANY	11411 NE 124TH ST, SUITE 190 KIRKLAND, WA 98034

SITE ADDRESS	PROJECT NO.	DATE	JURISDICTION
22ND AVE NW AND 82ND AVE E, PUYALLUP, WA	21585	12/20/2024	PIERCE COUNTY

PROJECT ENGINEER'S CERTIFICATION

"I hereby state that this Preliminary Stormwater Site Plan for Freeman Logistics has been prepared by me or under my supervision and meets the standards of care and expertise that is usual and customary in this community for professional engineers. I understand that the City of Puyallup and City of Fife does not and will not assume liability for the sufficiency, suitability, or performance of drainage facilities prepared by me."

Jason McArdel, PE, Senior Civil Project Manager

TABLE OF CONTENTS

Tab 1.0

1.0 ANALYSIS OF THE MINIMUM REQUIREMENTS

1.0 ANALYSIS OF THE MINIMUM REQUIREMENTS

This is a new development project where Minimum Requirements #1 through #9 are applicable. Please see the applicable flow charts to determine the minimum requirements.

Minimum Requirement No. 1: Preparation of Stormwater Site Plan.

Response: This Stormwater Site Plan prepared for the project meets the requirements of Minimum Requirement No. 1.

Minimum Requirement No. 2: Construction Stormwater Pollution Prevention Plan.

Response: A Construction Stormwater Pollution Prevention Plan is provided within section 8.0 of this report.

Minimum Requirement No. 3: Source Control of Pollution.

Response: Available and reasonable Source Control BMPs will be applied to this project for the type of source control pollution being produced on this project site.

Minimum Requirement No. 4: Preservation of Natural Drainage Systems and Outfalls.

Response: The project site is predominantly flat farmland with very slight gradient. Most of the site drains toward the northwest corner and outfalls through an existing 12" concrete culvert under Freeman Road. The downstream from this point includes approximately 1,500 feet of open channel, followed by several thousand feet of tight-line conveyance to the west toward the Fife oxbow wetland. The proposed development will alter the outfall from the site, pumping stormwater directly to the existing storm system along N Levee Road. From here, the stormwater runoff is ultimately conveyed to the Puyallup River. The Puyallup River receiving water is the same with either discharge path. The change of discharge location is necessary due to the project inability to obtain discharge rights from land owners along the natural discharge route.

Minimum Requirement No. 5: On-Site Stormwater Management.

Response: On-Site Stormwater Management is achieved by collecting storm water through catch basins and routing to one of three underground detention facilities. Stormwater is treated through a Modular Wetland per Enhanced water quality standards. After treatment, stormwater is pumped to the proposed outfall, within an existing structure approximately 3/4 miles from the project site. Stormwater for an offsite area to the south of the parcels near Levee Road is mitigated using infiltration which provides an LID benefit to the project. Please see Section 5.0 Permanent Stormwater Control Plan for the full narrative describing feasibility of LID BMPs.

Minimum Requirement No. 6: Runoff Treatment.

Response: Runoff treatment is proposed using the enhanced water quality standard, as required for commercial land uses.

Minimum Requirement No. 7: Flow Control.

Response: The proposal uses detention vaults and an offsite infiltration trench to store and release stormwater in accordance with the Flow Control Performance Standard. Please see Section 5.0 Permanent Stormwater Control Plan for additional details and calculations.

Minimum Requirement No. 8: Wetlands Protection.

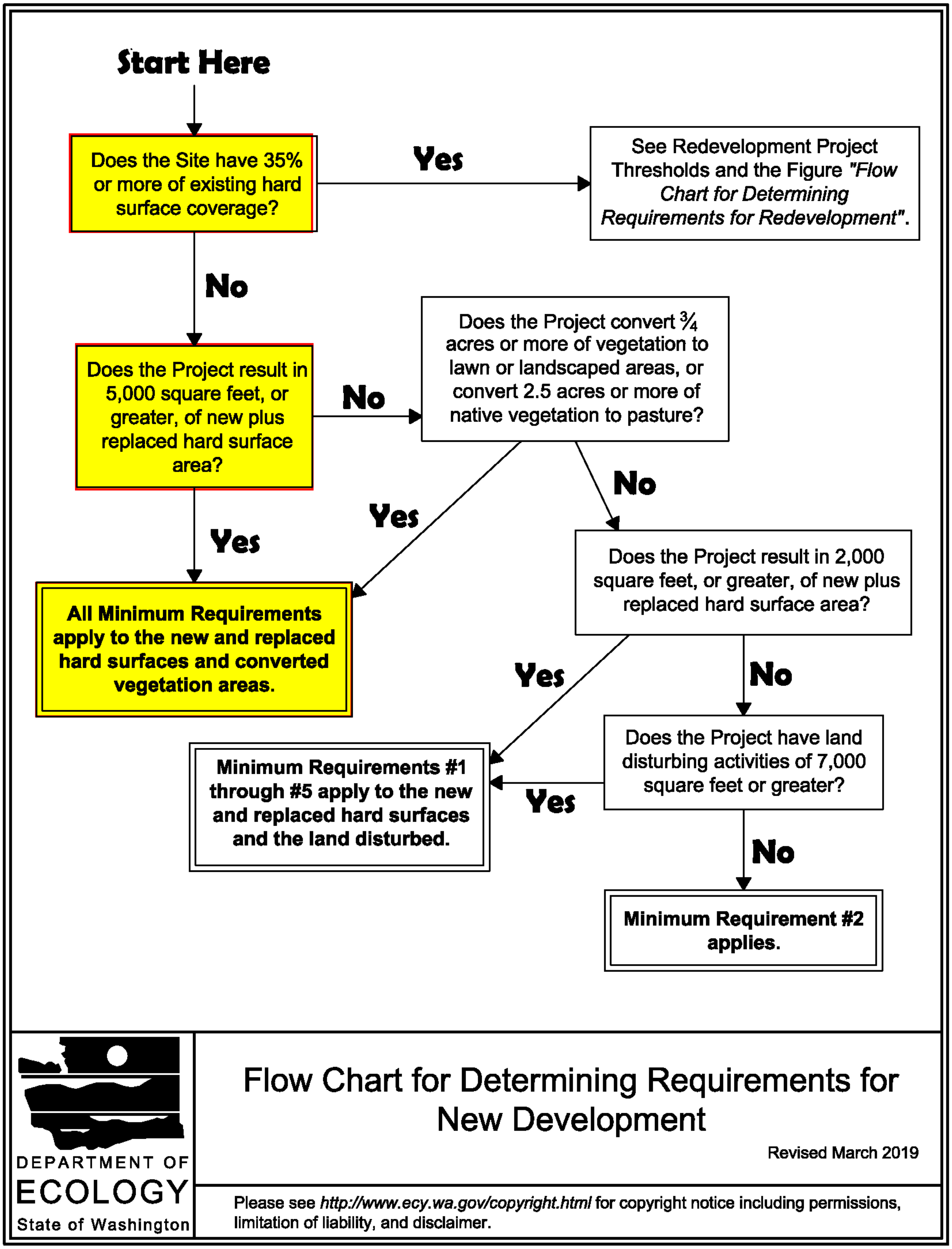
Response: There is a single wetland onsite in the north end. The wetland is only 1,218 square feet in area. Compensatory mitigation is proposed onsite which will allow filling this wetland. Additionally, there is an adjacent creek and wetlands offsite to the northeast with buffers extending onsite. Proposed mitigation includes buffer enhancement within the impacted site area. Refer to the Critical Areas report by Anchor QEA in Section 6.0.

Minimum Requirement No. 9: Operation and Maintenance.

Response: An Operations and Maintenance Manual is provided within this stormwater site plan. See section 9.0 for more details.

MINIMUM REQUIREMENT FLOW CHARTS

Figure I-3.1: Flow Chart for Determining Requirements for New Development



Tab 2.0

2.0 PROJECT OVERVIEW

2.0 PROJECT OVERVIEW

Freeman Logistics is an approximately 24.05-acre development located in the northeast and southeast corners of the 22nd Ave NW and Freeman Road /East (also known as 82nd Ave E) intersection, Puyallup, Washington, within a portion of Section 17, Township 20 North, Range 4 East, and a portion of section 20, Township 20 North, Range 4 East, Willamette Meridian, City of Puyallup, Pierce County, Washington. The site is comprised of 15 parcels plus the right-of-way dedication to improve 22nd Ave NW to the east of Freeman Road East. Please see the attached Vicinity Map on the following pages of the report.

Under existing conditions, this site is lightly developed, consisting of farmland and scattered single-family houses. Housing is concentrated in the middle of the site and along the southwestern border. The site is very flat and does not have well defined drainage. No manmade drainage structures exist within the site interior. There exists a shallow 12" concrete culvert in the northwest corner where stormwater is conveyed offsite under Freeman Road to the west. Per the geotechnical report prepared for the project, the soil on site is alluvial type loamy to sandy loam. The soil has minimal infiltration potential. The project site has a high-water table, approximately 2-9 feet below the existing grade, varying with the season and location. Vegetation is predominantly pasture in the north, prior crop use in the south, plus a few scattered trees and lawn adjacent the single-family homes. The frontage roads, Freeman Road East and 22nd Ave NW, are narrow two-lane roads with no curbing. The north end of Freeman Road includes a roadside ditch along the west side which receives drainage from the site via the 12" culvert.

The developed site will include two commercial warehouse-type buildings with dock high loading, associated parking, storm drainage facilities, utilities, and frontage improvements.

Frontage improvements along Freeman Road East and 22nd Ave NW include widening the road pavement and installing a two-way left turn lane, curb & gutter, planter strip, sidewalk, street trees, lighting, and stormwater facilities per city standards. Right-of-way dedication along Freeman Road is proposed to create a 35-ft wide half street on the project side.

In total the improvements onsite plus frontage area is 25.59 acres. The impervious coverage after development will be approximately 80%.

Summary of Land Coverage Areas

Land Use Category	Area (square feet)	Area (acres)
New Asphalt/Concrete	450,621	10.34
New buildings	504,023	11.57
New landscape/lawn	160,298	3.68
Total	1,114,942	25.59

This stormwater site plan is prepared in accordance with the 2019 Department of Ecology Stormwater Manual for Western Washington, as adopted by the City of Puyallup. The parcel area and adjacent frontage improvements are designed using catch basins and conveyance pipes which direct storm runoff to underground detention facilities. The flow control standard will be achieved for all target surfaces. Stormwater treatment is via proprietary water quality facilities which meet the Enhanced treatment standard. Mitigated flows will be conveyed to a lift station which will pump stormwater to a discharge point offsite to the southeast.

Stormwater runoff from the offsite Freeman Road and Levee Road intersection improvements is mitigated separately. This runoff is directed to StormFilter catch basins for treatment, then conveyed to a below-ground infiltration facility. The majority of runoff goes into the ground. Excess runoff is safely conveyed to the natural discharge point adjacent the road. See Section 5.0 for more information.

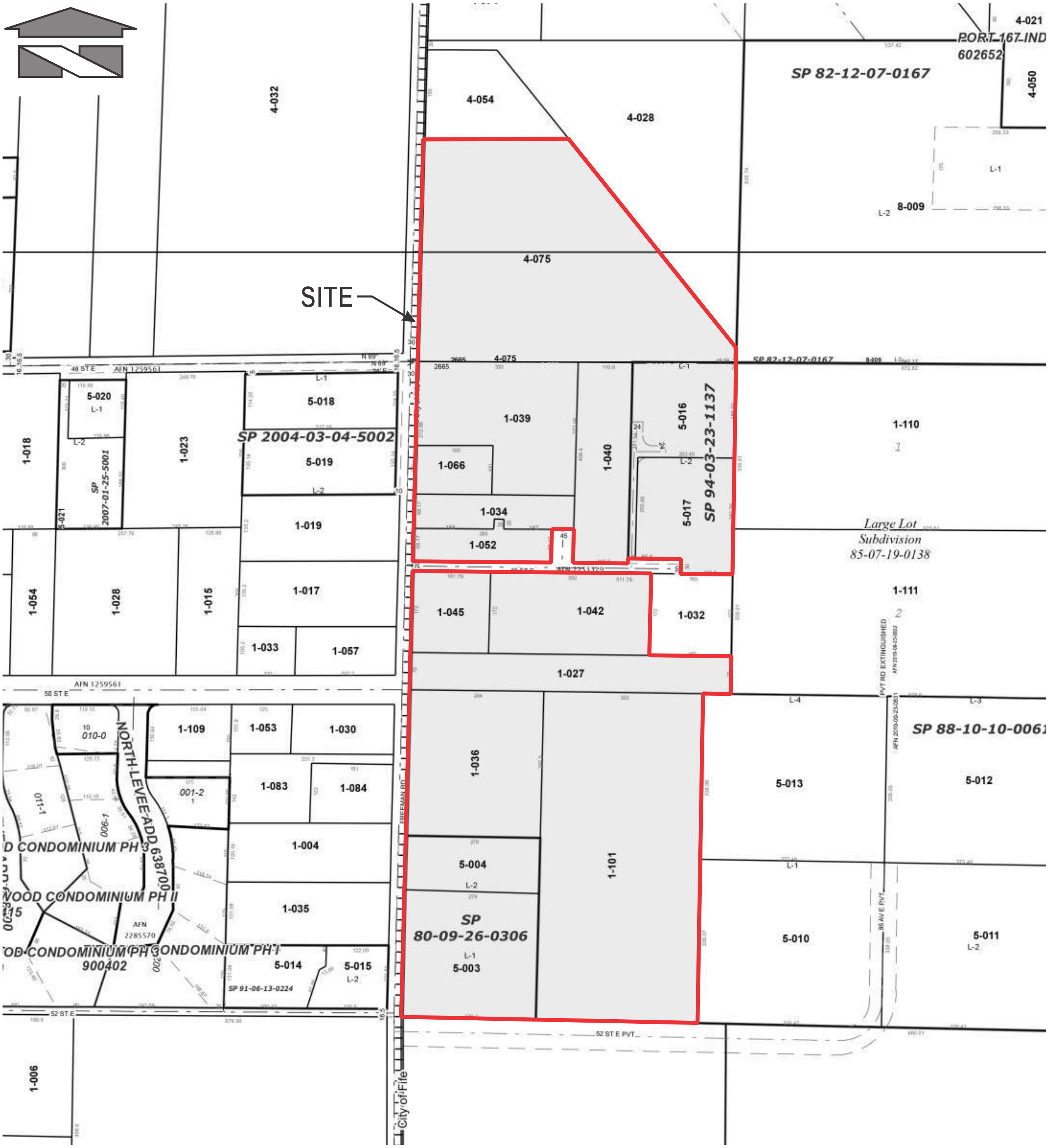
VICINITY MAP

REFERENCE: MapQuest (2022)

Scale: *Horizontal:* ***N.T.S.*** *Vertical:* ***N/A***	*For:* Freeman Road Logistics Fife, Washington	Job Number 21585
Barghausen Consulting Engineers, Inc. 18215 72nd Avenue South Kent, WA 98032 425.251.6222 **barghausen.com**	*Title:* VICINITY MAP	DATE: 09/01/22

P:\21000s\21585\exhibit\graphics\21585 vmap.cdr

ASSESSOR MAP



REFERENCE: Pierce County Department of Assessments (Feb. 2021)

Scale:
Horizontal: **N.T.S.** Vertical: **N/A**

For:
Freeman Road Logistics
Fife, Washington

Job Number
21585

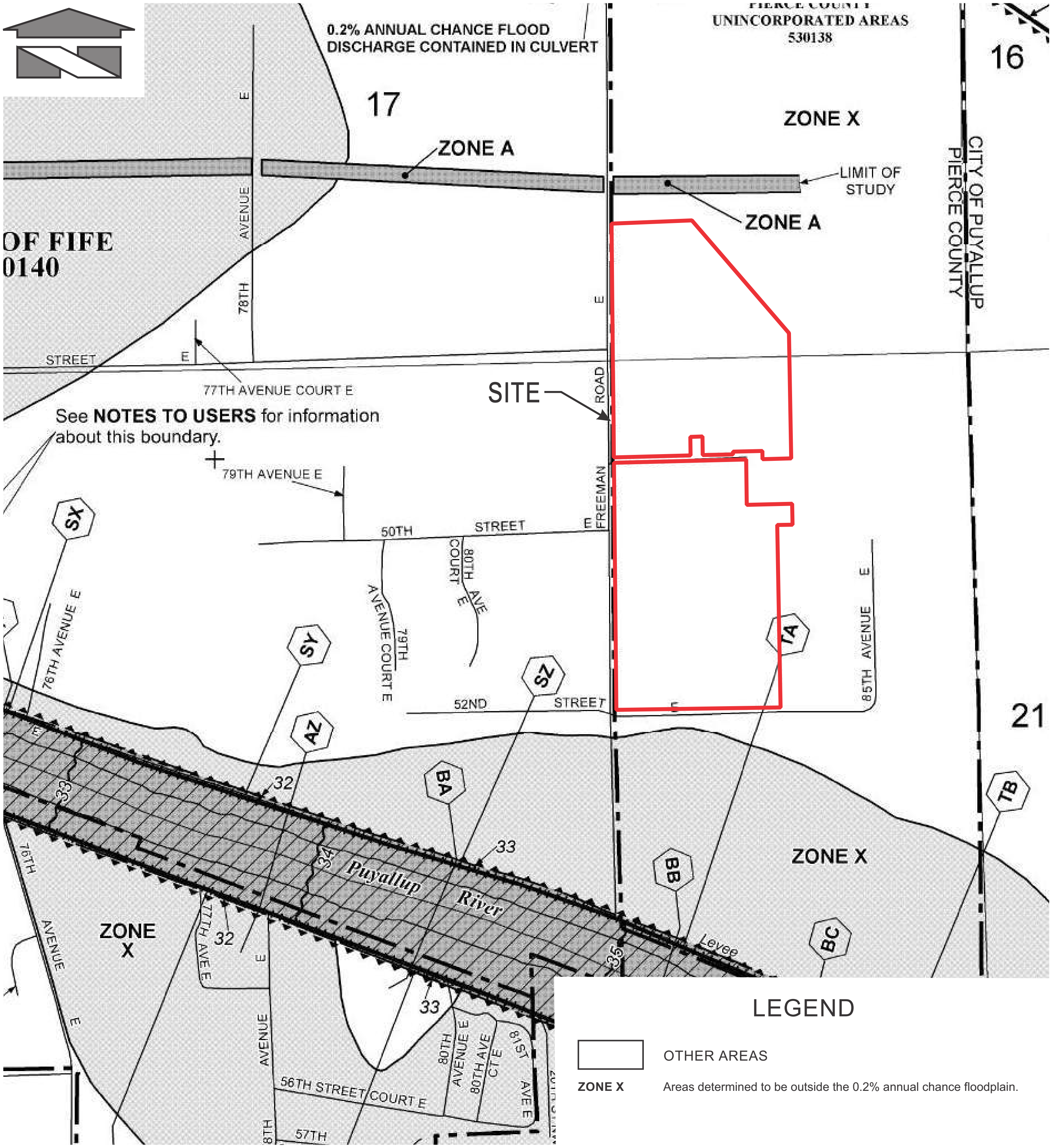
Barghausen
Consulting Engineers, Inc.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222 **barghausen.com**

Title:
ASSESSOR MAP

DATE: 09/01/22

P:\21000s\21585\exhibit\graphics\21585 amap.cdr

FEMA MAP



REFERENCE: Federal Emergency Management Agency (Portion of Map 53053C0329E, March 2017)

Scale: Horizontal: N.T.S. Vertical: N/A	For: Freeman Road Logistics Fife, Washington	Job Number 21585
Barghausen Consulting Engineers, Inc. 18215 72nd Avenue South Kent, WA 98032 425.251.6222 barghausen.com	Title: FEMA MAP	DATE: 09/01/22

P:\21000s\21585\exhibit\graphics\21585 fema.cdr

SOILS MAP

REFERENCE: USDA, Natural Resources Conservation Service

LEGEND:	HSG
42A = Sultan silt loam	C/D
31A = Puyallup fine sandy loam	A

Scale:
Horizontal: **N.T.S.** Vertical: **N/A**

For:
Freeman Road Logistics
Fife, Washington

Job Number
21585

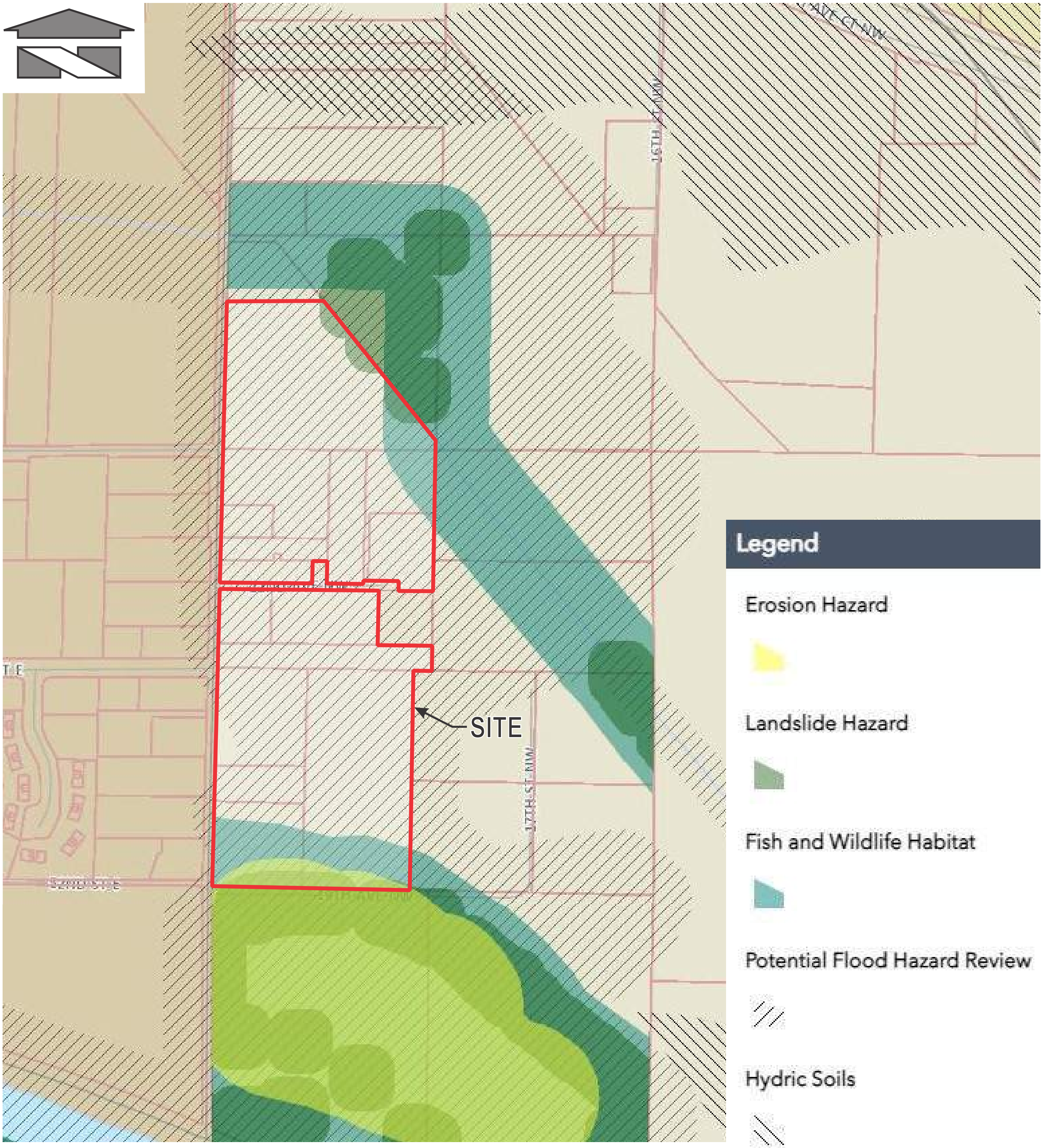
Barghausen
Consulting Engineers, Inc.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222 **barghausen.com**

Title:
SOIL SURVEY MAP

DATE: 09/01/22

P:\21000s\21585\exhibit\graphics\21585 soil.cdr

SENSITIVE AREAS MAP



REFERENCE: Pierce County PublicGIS

Scale: Horizontal: **N.T.S.** Vertical: **N/A**	For: Freeman Road Logistics Fife, Washington	Job Number 21585
Barghausen Consulting Engineers, Inc. 18215 72nd Avenue South Kent, WA 98032 425.251.6222 **barghausen.com**	Title: SENSITIVE AREAS MAP	DATE: 09/01/22

P:\21000s\21585\exhibit\graphics\21585 sens.cdr

Tab 3.0

3.0 EXISTING CONDITIONS SUMMARY

3.0 EXISTING CONDITIONS SUMMARY

Under existing conditions, the project site consists of farmland and scattered single-family houses. The Geotechnical report (included as a separate document in this submittal) and Soil Survey Map indicates that the site is mainly comprised of Alluvium. Further discussion of the soils can be found in the soils report prepared for this project. A soils map has also been provided. The site has very little slope and poorly defined drainage. A 12” culvert at the northwest site corner appears to be the primary outlet point for the majority of site runoff. There are no water features onsite. Vegetation is predominantly pasture in the north, prior crop use in the south, plus a few scattered trees and lawn adjacent the single-family homes. A small (±1,200 sf) wetland is located onsite in the northeast. Offsite wetlands are located offsite to the east and south. Refer to the Critical Areas Report prepared for the project for more information, included in Section 6.0 of this report. The existing frontage roads are small two-lane roads with minimal shoulders and no storm conveyance.

EXISTING CONDITIONS MAP

EXISTING CONDITIONS

OF

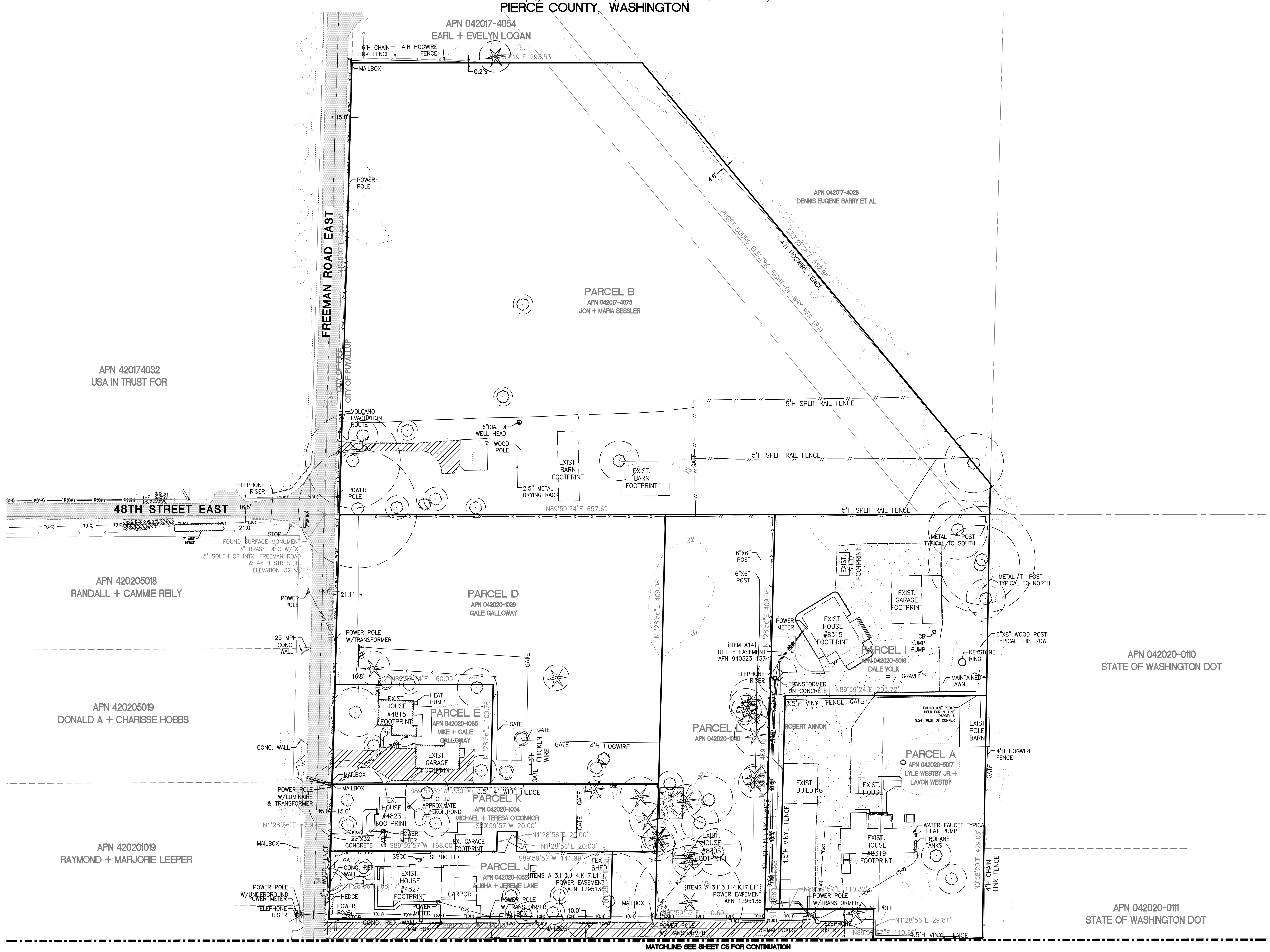
FREEMAN LOGISTICS

PTNS. OF THE SE1/4, OF SEC. 17, TWP. 20 N., RGE 4 EAST, W. M.
AND PTNS. OF THE NE1/4, OF SEC. 20, TWP. 20 N., RGE 4 EAST, W. M.
PIERCE COUNTY, WASHINGTON

N

0 25' 50' 100'

SCALE: 1"=50'



LEGEND

(NOTE: NOT ALL SYMBOLS MAY APPEAR ON THE MAP)

- SURVEY MONUMENT (AS NOTED)
- SECTION CORNER (AS NOTED)
- SET REBAR/CAP (LS#45789 OR #41282)
- FOUND REBAR/CAP (AS NOTED)
- SET 2"X2" HUB/TACK LINE STAKE
- MAG/WASHER OR LEAD/TACK (AS NOTED)
- LUMINAIRE (LUM.)
- YARD LIGHT
- ORNAMENTAL LIGHT
- POWER METER (PM)
- POWER POLE (PP)
- JUNCTION BOX (AS NOTED)
- TELEPHONE MANHOLE (TM)
- TELEPHONE RISER (TR)
- CATCH BASIN (CB)
- STORM MANHOLE (SDMH)
- SANITARY SEWER MANHOLE (SSMH)
- GAS METER (GM)
- GAS VALVE (GV)
- WATER VALVE (WV)
- FAUCET
- FIRE HYDRANT(FH)
- WATER MANHOLE
- WATER METER (WM)
- WELL
- SIGN
- IRRIGATION VALVE (IV)
- DIRECTIONAL ARROW
- MAILBOX (MB)
- CHAIN LINK FENCE
- WOOD FENCE
- HOGWIRE FENCE
- VINYL FENCE
- WATER LINE
- GAS LINE
- TELEPHONE LINE (OH) OR (UG)
- POWER LINE (OH) OR (UG)
- STORM LINE
- SEWER LINE
- ROCKERY
- KEYSTONE WALL
- DECIDUOUS TREE
- CONIFEROUS TREE
- TREE DRIPLINE
- CONCRETE
- GRAVEL/SAND (AS NOTED)
- ASPHALT
- BUILDING LINE
- ROCK
- MATCH LINE

ABBREVIATIONS

(R#)	REFERENCE SURVEYS
(OH)	OVERHEAD
(UG)	UNDERGROUND
(TYP)	TYPICAL
(C)	CALCULATED
(M)	MEASURED
(GIS)	GEOGRAPHICAL INFORMATION SYSTEMS
(REF)	PER REFERENCE INFORMATION
(H)	HIGH
(IV)	IRRIGATION VALVE

APPROVED

BY ____________________
CITY OF PUYALLUP
DEVELOPMENT ENGINEERING

DATE ____________________

NOTE: THIS APPROVAL IS VOID AFTER 180 DAYS FROM APPROVAL DATE. THE CITY WILL NOT BE RESPONSIBLE FOR ERRORS AND/OR OMISSIONS ON THESE PLANS. FIELD CONDITIONS MAY DICTATE CHANGES TO THESE PLANS AS DETERMINED BY THE DEVELOPMENT ENGINEERING MANAGER.

No.	Date	By	Ckd.	Appr.	Revision
5	12/02/24	DTC	JSM	JSM	SEPA RESUBMITTAL

Title: **EXISTING CONDITIONS** FOR FREEMAN LOGISTICS

For: VECTOR DEVELOPMENT COMPANY
11411 NE 124TH STREET
SUITE 190
KIRKLAND, WA 98034

Scale: Horizontal 1"=50' Vertical N/A

Designed JSM
Drawn DTC
Checked JSM
Approved JSM
Date 12/5/24

Barghausen Consulting Engineers, Inc.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222
barghausen.com

Job Number 21585

Sheet C4 of 44

P:\21000s\21585\engineering\SEPA SET\21585-EX.dwg 12/5/2024 9:41 AM DCASEY

EXISTING CONDITIONS

OF

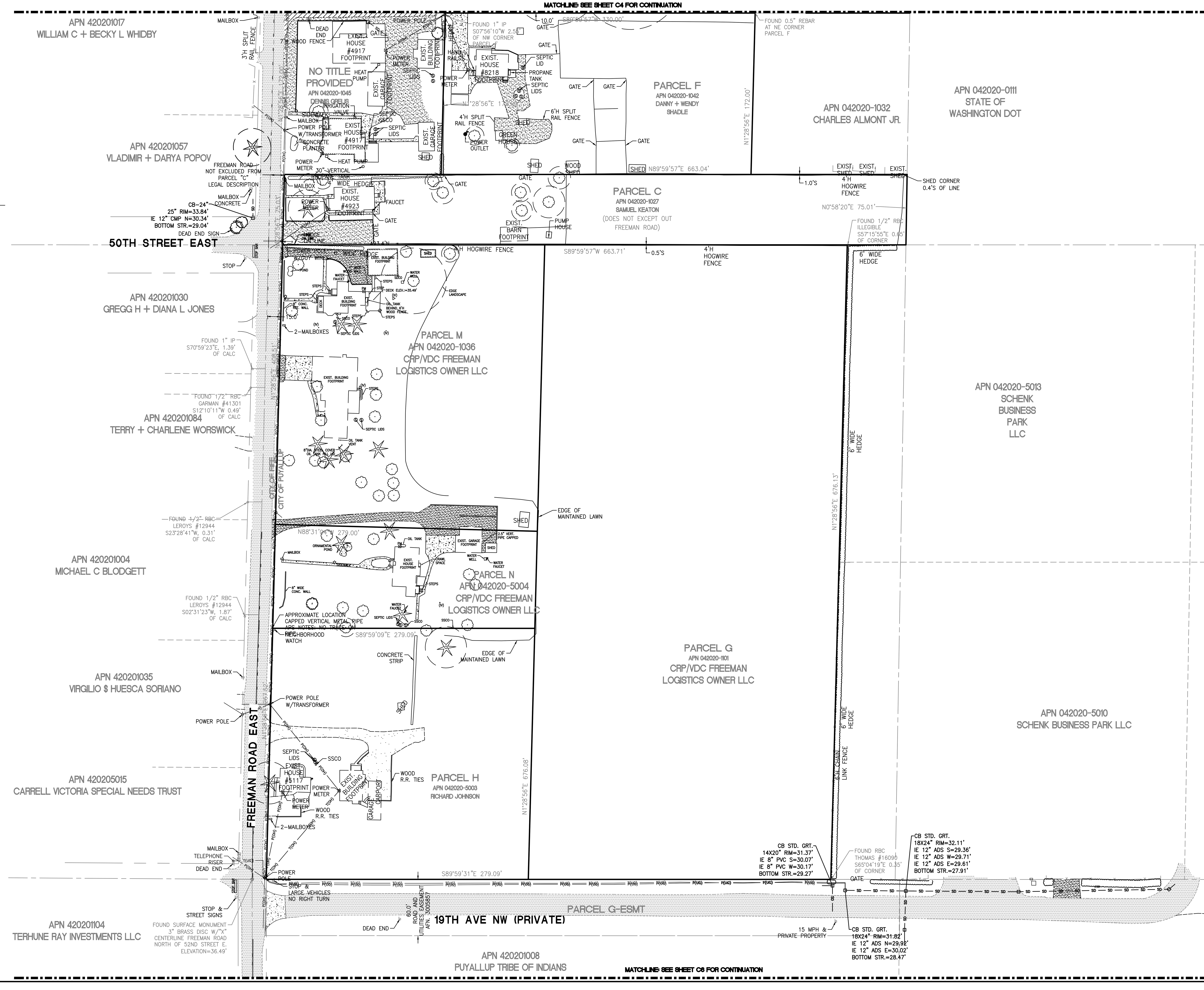
FREEMAN LOGISTICS

PTNS. OF THE SE1/4, OF SEC. 17, TWP. 20 N., RGE 4 EAST, W. M.
AND PTNS. OF THE NE1/4, OF SEC. 20, TWP. 20 N., RGE 4 EAST, W. M.
PIERCE COUNTY, WASHINGTON

N

0 25' 50' 100'
SCALE: 1"=50'

MATCHLINE: SEE SHEET C4 FOR CONTINUATION



MATCHLINE: SEE SHEET C6 FOR CONTINUATION

LEGEND

(NOTE: NOT ALL SYMBOLS MAY APPEAR ON THE MAP)

- SURVEY MONUMENT (AS NOTED)
- SECTION CORNER (AS NOTED)
- SET REBAR/CAP (LS#45789 OR #41282)
- FOUND REBAR/CAP (AS NOTED)
- SET 2"X2" HUB/TACK LINE STAKE
- MAG/WASHER OR LEAD/TACK (AS NOTED)
- LUMINAIRE (LUM.)
- YARD LIGHT
- ORNAMENTAL LIGHT
- POWER METER (PM)
- POWER POLE (PP)
- JUNCTION BOX (AS NOTED)
- TELEPHONE MANHOLE (TM)
- TELEPHONE RISER (TR)
- CATCH BASIN (CB)
- STORM MANHOLE (SDMH)
- SANITARY SEWER MANHOLE (SSMH)
- GAS METER (GM)
- GAS VALVE (GV)
- WATER VALVE (WV)
- FAUCET
- FIRE HYDRANT(FH)
- WATER MANHOLE
- WATER METER (WM)
- WELL
- SIGN
- IRRIGATION VALVE (IV)
- DIRECTIONAL ARROW
- MAILBOX (MB)
- CHAIN LINK FENCE
- WOOD FENCE
- HOGWIRE FENCE
- VINYL FENCE
- WATER LINE
- GAS LINE
- TELEPHONE LINE (OH) OR (UG)
- POWER LINE (OH) OR (UG)
- STORM LINE
- SEWER LINE
- ROCKERY
- KEYSTONE WALL
- DECIDUOUS TREE
- CONIFEROUS TREE
- TREE DRIPLINE
- CONCRETE
- GRAVEL/SAND (AS NOTED)
- ASPHALT
- BUILDING LINE
- ROCK
- MATCH LINE

ABBREVIATIONS

(R#)	REFERENCE SURVEYS
(OH)	OVERHEAD
(UG)	UNDERGROUND
(TYP)	TYPICAL
(C)	CALCULATED
(M)	MEASURED
(GIS)	GEOGRAPHICAL INFORMATION SYSTEMS
(REF)	PER REFERENCE INFORMATION
(H)	HIGH
(IV)	IRRIGATION VALVE

APPROVED

BY ____________
CITY OF PUYALLUP
DEVELOPMENT ENGINEERING

DATE ____________

NOTE: THIS APPROVAL IS VOID AFTER 180 DAYS FROM APPROVAL DATE. THE CITY WILL NOT BE RESPONSIBLE FOR ERRORS AND/OR OMISSIONS ON THESE PLANS. FIELD CONDITIONS MAY DICTATE CHANGES TO THESE PLANS AS DETERMINED BY THE DEVELOPMENT ENGINEERING MANAGER.

No.	Date	By	Ckd.	Appr.	Revision
5	12/02/24	DTC	JSM	JSM	SEPA RESUBMITTAL

Title: EXISTING CONDITIONS FOR FREEMAN LOGISTICS

For: VECTOR DEVELOPMENT COMPANY
11411 NE 124TH STREET
SUITE 190
KIRKLAND, WA 98034

Scale: Horizontal 1"=50' Vertical N/A

Designed JSM
Drawn DTC
Checked JSM
Approved JSM
Date 12/5/24

Barghausen Consulting Engineers, Inc.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222
barghausen.com

Job Number 21585

Sheet C5 of 44

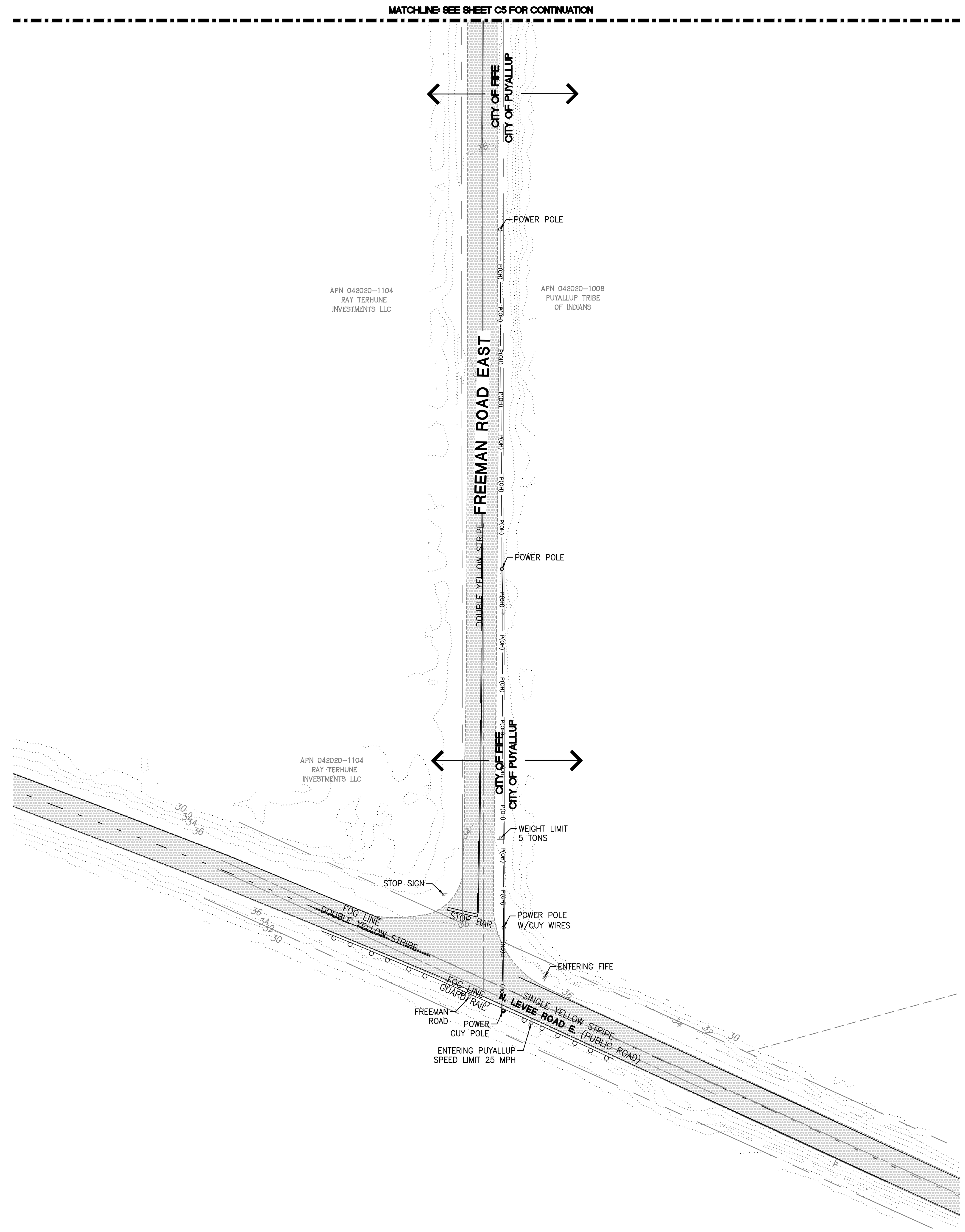
P:\21000s\21585\engineering\SEPA SET\21585-EX.dwg 12/5/2024 9:41 AM DCASEY

EXISTING CONDITIONS
OF
FREEMAN LOGISTICS

PTNS. OF THE SE1/4, OF SEC. 17, TWP. 20 N., RGE 4 EAST, W. M.
AND PTNS. OF THE NE1/4, OF SEC. 20, TWP. 20 N., RGE 4 EAST, W. M.
PIERCE COUNTY, WASHINGTON

N

0 25' 50' 100'
SCALE: 1"=50'



LEGEND

(NOTE: NOT ALL SYMBOLS MAY APPEAR ON THE MAP)

- SURVEY MONUMENT (AS NOTED)
- SECTION CORNER (AS NOTED)
- SET REBAR/CAP (LS#45789 OR #41282)
- FOUND REBAR/CAP (AS NOTED)
- SET 2"X2" HUB/TACK LINE STAKE
- MAG/WASHER OR LEAD/TACK (AS NOTED)
- LUMINAIRE (LUM.)
- YARD LIGHT
- ORNAMENTAL LIGHT
- POWER METER (PM)
- POWER POLE (PP)
- JUNCTION BOX (AS NOTED)
- TELEPHONE MANHOLE (TM)
- TELEPHONE RISER (TR)
- CATCH BASIN (CB)
- STORM MANHOLE (SDMH)
- SANITARY SEWER MANHOLE (SSMH)
- GAS METER (GM)
- GAS VALVE (GV)
- WATER VALVE (WV)
- FAUCET
- FIRE HYDRANT(FH)
- WATER MANHOLE
- WATER METER (WM)
- WELL
- SIGN
- IRRIGATION VALVE (IV)
- DIRECTIONAL ARROW
- MAILBOX (MB)
- CHAIN LINK FENCE
- WOOD FENCE
- HOGWIRE FENCE
- VINYL FENCE
- WATER LINE
- GAS LINE
- TELEPHONE LINE (OH) OR (UG)
- POWER LINE (OH) OR (UG)
- STORM LINE
- SEWER LINE
- ROCKERY
- KEYSTONE WALL
- DECIDUOUS TREE
- CONIFEROUS TREE
- TREE DRIPLINE
- CONCRETE
- GRAVEL/SAND (AS NOTED)
- ASPHALT
- BUILDING LINE
- ROCK
- MATCH LINE

ABBREVIATIONS

(R#)	REFERENCE SURVEYS
(OH)	OVERHEAD
(UG)	UNDERGROUND
(TYP)	TYPICAL
(C)	CALCULATED
(M)	MEASURED
(GIS)	GEOGRAPHICAL INFORMATION SYSTEMS
(REF)	PER REFERENCE INFORMATION
(H)	HIGH
(IV)	IRRIGATION VALVE

APPROVED

BY ____________
CITY OF PUYALLUP
DEVELOPMENT ENGINEERING

DATE ____________

NOTE: THIS APPROVAL IS VOID AFTER 180 DAYS FROM APPROVAL DATE. THE CITY WILL NOT BE RESPONSIBLE FOR ERRORS AND/OR OMISSIONS ON THESE PLANS. FIELD CONDITIONS MAY DICTATE CHANGES TO THESE PLANS AS DETERMINED BY THE DEVELOPMENT ENGINEERING MANAGER.

No.	Date	By	Ckd.	Appr.	Revision
5	12/02/24	DTC	JSM	JSM	SEPA RESUBMITTAL

Title: EXISTING CONDITIONS FOR FREEMAN LOGISTICS

For: VECTOR DEVELOPMENT COMPANY
11411 NE 124TH STREET
SUITE 190
KIRKLAND, WA 98034

Scale: Horizontal 1"=50' Vertical N/A

Designed JSM
Drawn DTC
Checked JSM
Approved JSM
Date 12/5/24

Barghausen Consulting Engineers, Inc.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222
barghausen.com

Job Number 21585

Sheet C6 of 44

P:\21000s\21585\engineering\SEPA SET\21585-EX.dwg 12/5/2024 9:41 AM DCASEY

Tab 4.0

4.0 OFF-SITE ANALYSIS REPORT

4.0 OFF-SITE ANALYSIS REPORT

Onsite Description

The project site lies in a very flat section of the valley which has historically been used mostly for agriculture. The soils are fine grained alluvial deposits. Infiltration potential is minimal per the geotechnical engineering report. High seasonal groundwater and low infiltration rates are the main concerns regarding feasibility of infiltration facilities.

The topography does not have a consistent gradient, with the southern half generally trending to the northeast, while the north of the site generally slopes to the northwest. There are no drainage devices onsite and all drainage consists of sheet flow and shallow concentrated flow. The outlet point for the majority of runoff from the site is a 12" concrete culvert which crosses under Freeman Road at the northwest property corner. Some runoff appears to drain offsite along the east edge of the property into an adjacent agricultural ditch just offsite. This ditch routes flows north and then west and eventually crosses Freeman Road about 200' north of the project site, where the two downstream paths merge.

Upstream Description

There does not appear to be an upstream basin tributary to the site under typical drainage conditions. The Schenk property (Parcels 042020-5010, -5011, -5012, -5013) to the SE of the site has a private drainage system which collects runoff. The undeveloped properties immediately east and northeast of the site drain to the agricultural ditch which routes flow north and then west away from the subject property. Properties to the north are graded away from the site. Freeman road is higher than surrounding grade and prevents runoff from single family properties to the west. The parcel to the south is located at a lower elevation and separated from the site by 19th Ave NW. The site does not typically receive runoff from surrounding properties.

During heavy winter storm events, the site experiences a small amount of overtopping from the adjacent agricultural ditch to the east. Stormwater which overtops the ditch sheet flows northwest across the north site edge and then leaves the site via the main 12" outlet pipe crossing Freeman Road. This condition appears to be infrequent and does not present a significant flooding or erosion hazard to the site.

Downstream Description

Stormwater runoff from the site initially takes one of two paths. The majority of runoff leaves the NW site corner through a shallow 12" concrete culvert and crosses under Freeman Road to the west. From there, runoff travels in a roadside vegetated ditch along the west side of Freeman Road north for approximately 230 feet. The ditch then joins a larger agricultural ditch which flows to the west through private property. The agricultural ditch has approximately 3' depth, 3' bottom width, variable side slopes, and relatively smooth bottom. A second runoff path involves sheet flow leaving the site along the east and then entering the same agricultural ditch at a further point upstream. The ditch then travels north and west around neighboring properties and rejoins the main downstream path at the approximate 1/4-mile point. The site is effectively a single threshold discharge area.

After merging in the agricultural ditch on the west side of Freeman Road, runoff from the site continues to the west across private property for 1/4 mile until approximately 78th Ave East. The observable portion of this ditch appears to have relatively consistent characteristics and no obstructions. From 78th Ave, the downstream path meanders through several developed commercial/industrial properties in a general westward progression through manmade conveyance elements. The size and type of the conveyance elements vary along this stretch. Most of the system is tight-lined (36-inch to 48-inch diameter pipe). The commercial properties west of 78th Ave appear to be equipped with onsite detention systems to mitigate stormwater flow rates. The downstream system eventually crosses under 70th Ave East in a 48-inch pipe and then outlets to the oxbow wetland located between 54th Ave E and 70th Ave E. The oxbow is approximately 1.25 miles downstream of the project site.

Due to difficulties with obtaining rights to discharge stormwater into the natural discharge location, the project is proposing to pump stormwater to another route. Stormwater detention and treatment systems will be located onsite. After treatment, flows will be conveyed to a central lift station located near the west-central part of the site. Stormwater will be pumped south on Freeman Rd, then west on N Levee Rd, then connect to existing conveyance infrastructure near the intersection of N Levee Rd and Industrial Parkway. From this connection point, the existing City of Puyallup stormwater system gravity conveys to the west, ultimately out falling to the Puyallup River through an existing 84-inch culvert. This existing system has been deemed to have sufficient capacity to convey the proposed conditions. This route will ultimately outfall to the same receiving water as the natural discharge, the Puyallup River.

See the preliminary conveyance calculations at the end of this section. The developed basin includes all the proposed development where stormwater will be detained and conveyed to a public lift station, approximately 1,119,637 square feet of surface. The stormwater discharge line is proposed to terminate at an existing storm structure at the northeast intersection of N. Levee Road and Industrial Parkway, approximately 4,070 linear feet in total. The outfall structure is labeled as, "Ex. SDMH #4" on the conveyance calculations. From here, stormwater is conveyed by gravity to the east, for approximately 3/4 of a mile, until ultimately discharging into the Puyallup River through an 84-inch culvert.

Existing storm elevations were determined by record drawings and publicly available data. Tributary areas (catchments) to each existing storm junction were derived from available data from Puyallup GIS maps and data. Due to the presence of existing detention facilities upstream of the analyzed storm section, land use coefficients were determined to be equal to the historic, forested condition (green areas on the *N Levee Rd Conveyance* exhibit). Areas on N Levee Rd that flow to the storm system are not detained and therefore use impervious land use coefficients (yellow areas on the *N Levee Rd Conveyance* exhibit). For conservatism, the outfall is modeled to be approximately 85% full, with the hydraulic grade line set at 1-foot below the crown of the existing 84-inch culvert. The conveyance model confirms the capacity of the downstream path during the 100-year recurrence storm event.

Frontage Description and Downstream – Levee Rd

Frontage improvements are required to the south of the project on Freeman Road between 19th Ave NW and Levee Rd. The improvements include widening the travel lanes and creating an additional turn pocket for the southbound traffic on Freeman Rd at the intersection with Levee Rd. The area receiving improvements is in the NW corner of the intersection corresponding to Pierce County TPN. 0420201104. The existing road is elevated versus surrounding grade. There is no existing storm infrastructure in place, therefore stormwater runoff sheets off the roadway into the parcel area. The land on the private parcel is depressed relative to surrounding topography on all sides and is also heavily vegetated including trees. There is no observed runoff path.

Terra Associates provided seasonal groundwater monitoring for the above referenced parcel. A memo is provided with this submittal, dated May 31, 2024, which indicates a seasonal high elevation between approximately 21.8 and 22.2. Carolyn Decker of Terra Associates also provided an additional memo indicating the preliminary long-term design infiltration rate of 0.2 inches per hour (not part groundwater memo).

Based on the observed topography and soils information, stormwater runoff from the existing road surface is assumed to primarily infiltrate into the native soils near the road edge. There is no downstream path of stormwater runoff leaving the adjacent parcel.

OFFSITE ANALYSIS BASIN MAPS

No.	Date	By	Ckd.	Appr.	Revision

Designed JSM
Drawn DTC
Checked JSM
Approved
Date 12/9/24

Scale:
Horizontal 1"=250'
Vertical

Barghausen Consulting Engineers, LLC.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222 barghausen.com

For: VECTOR DEVELOPMENT COMPANY

Title: N LEVEE RD CONVEYANCE

Job Number 21585

Sheet 1 of 1

No.	Date	By	Ckd.	Appr.	Revision

Designed JSM
Drawn DTC
Checked JSM
Approved
Date 12/5/24

Scale:
Horizontal 1"=250'
Vertical

Barghausen Consulting Engineers, LLC.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222 barghausen.com

For: VECTOR DEVELOPMENT COMPANY

Title: DOWNSTREAM EXHIBIT

Job Number 21585

Sheet 1 of 1

OFFSITE CONVEYANCE CALCULATIONS

Autodesk® Storm and Sanitary Analysis 2024 - Version 13.6.323 (Build 0)

****
Project Description
****
File Name .... 21585-M-PRLM CALC-N LEVEE STORM-2024-12-09.SPF

****
Analysis Options
****
Flow Units .... cfs
Subbasin Hydrograph Method. Santa Barbara UH
Time of Concentration...... SCS TR-55
Link Routing Method .... Hydrodynamic
Storage Node Exfiltration.. None
Starting Date SEP-13-2024 00:00:00
Ending Date SEP-14-2024 00:00:00
Report Time Step 00:00:10

****
Element Count
****
Number of rain gages 1
Number of subbasins 29
Number of nodes 22
Number of links 21

****
Raingage Summary
****

Gage ID	Data Source	Data Type	Recording Interval min
100-YEAR_PC	TS-01	CUMULATIVE	15.00

****
Subbasin Summary
****

Subbasin ID	Total Area acres	Imperv. Area %	Raingage
LEVEE_CB#1	0.12	100.00	100-YEAR_PC
LEVEE_CB#1_FOREST	2.07	0.00	100-YEAR_PC
LEVEE_CB#2	0.18	100.00	100-YEAR_PC
LEVEE_CB#2_FOREST	2.22	0.00	100-YEAR_PC
LEVEE_CB#3	0.09	100.00	100-YEAR_PC
LEVEE_CB#3_FOREST	1.67	0.00	100-YEAR_PC
LEVEE_CB#4	0.20	100.00	100-YEAR_PC
LEVEE_SDMH#10	0.16	100.00	100-YEAR_PC
LEVEE_SDMH#11	0.20	100.00	100-YEAR_PC
LEVEE_SDMH#12	0.12	100.00	100-YEAR_PC
LEVEE_SDMH#13	0.11	100.00	100-YEAR_PC
LEVEE_SDMH#14	0.23	100.00	100-YEAR_PC
LEVEE_SDMH#15	0.18	100.00	100-YEAR_PC
LEVEE_SDMH#16	0.19	100.00	100-YEAR_PC
LEVEE_SDMH#17	0.28	100.00	100-YEAR_PC
LEVEE_SDMH#18	0.19	100.00	100-YEAR_PC
LEVEE_SDMH#19	0.15	100.00	100-YEAR_PC
LEVEE_SDMH#4	0.17	100.00	100-YEAR_PC

LEVEE_SDMH#5	0.09	100.00	100-YEAR_PC
LEVEE_SDMH#6	0.12	100.00	100-YEAR_PC
LEVEE_SDMH#7	0.09	100.00	100-YEAR_PC
LEVEE_SDMH#8	0.04	100.00	100-YEAR_PC
LEVEE_SDMH#9	0.09	100.00	100-YEAR_PC
Sub-EX. SDMH #11	12.58	0.00	100-YEAR_PC
Sub-EX. SDMH #12	2.57	0.00	100-YEAR_PC
Sub-EX. SDMH #13	10.81	0.00	100-YEAR_PC
Sub-EX. SDMH #17	16.73	0.00	100-YEAR_PC
Sub-EX. SDMH #4	45.12	0.00	100-YEAR_PC
Sub-EX_SDMH#20	182.00	0.00	100-YEAR_PC

****
Node Summary
****

Node ID	Element Type	Invert Elevation ft	Maximum Elev. ft	Ponded Area ft²	External Inflow
EX. CB #1	JUNCTION	33.00	34.88	100.00	
EX. CB #2	JUNCTION	32.59	34.48	100.00	
EX. CB #3	JUNCTION	32.07	33.95	100.00	
EX. SDMH #10	JUNCTION	32.57	37.36	100.00	
EX. SDMH #11	JUNCTION	32.08	36.87	100.00	
EX. SDMH #12	JUNCTION	31.60	36.39	100.00	
EX. SDMH #13	JUNCTION	31.42	36.96	100.00	
EX. SDMH #14	JUNCTION	31.04	36.58	100.00	
EX. SDMH #15	JUNCTION	30.58	36.12	100.00	
EX. SDMH #16	JUNCTION	30.27	35.81	100.00	
EX. SDMH #17	JUNCTION	29.90	35.44	100.00	
EX. SDMH #18	JUNCTION	29.43	35.51	100.00	
EX. SDMH #19	JUNCTION	28.98	35.06	100.00	
EX. SDMH #20	JUNCTION	25.16	37.91	100.00	
EX. SDMH #4	JUNCTION	34.55	38.75	0.00	
EX. SDMH #5	JUNCTION	34.08	38.87	100.00	
EX. SDMH #6	JUNCTION	33.70	39.09	100.00	
EX. SDMH #7	JUNCTION	33.07	40.36	100.00	
EX. SDMH #8	JUNCTION	32.95	37.74	100.00	
EX. SDMH #9	JUNCTION	32.78	37.58	100.00	
EX.CB#4	JUNCTION	31.65	33.53	100.00	
Out-1Pipe - (62)	OUTFALL	25.05	32.05	0.00	

****
Link Summary
****

Link ID	From Node	To Node	Element Type	Length ft	Slope %	Manning's Roughness
Pipe - (43)	EX. SDMH #4	EX. SDMH #5	CONDUIT	105.2	0.4468	0.0120
Pipe - (44)	EX. SDMH #5	EX. SDMH #6	CONDUIT	144.9	0.2622	0.0120
Pipe - (45)	EX. SDMH #6	EX. SDMH #7	CONDUIT	250.3	0.2517	0.0120
Pipe - (46)	EX. SDMH #7	EX. SDMH #8	CONDUIT	79.5	0.2000	0.0120
Pipe - (47)	EX. SDMH #8	EX. SDMH #9	CONDUIT	111.4	0.2000	0.0120
Pipe - (48)	EX. SDMH #9	EX. SDMH #10	CONDUIT	140.5	0.2000	0.0120
Pipe - (49)	EX. SDMH #10	EX. SDMH #11	CONDUIT	328.4	0.2000	0.0120
Pipe - (50)	EX. SDMH #11	EX. SDMH #12	CONDUIT	321.2	0.2000	0.0120
Pipe - (51)	EX. SDMH #12	EX. SDMH #13	CONDUIT	121.5	0.2000	0.0120
Pipe - (52)	EX. SDMH #13	EX. SDMH #14	CONDUIT	250.0	0.2000	0.0120
Pipe - (53)	EX. SDMH #14	EX. SDMH #15	CONDUIT	306.5	0.2000	0.0120
Pipe - (54)	EX. SDMH #15	EX. SDMH #16	CONDUIT	206.8	0.2000	0.0120
Pipe - (55)	EX. SDMH #16	EX. SDMH #17	CONDUIT	250.4	0.2000	0.0120
Pipe - (56)	EX. SDMH #17	EX. SDMH #18	CONDUIT	311.4	0.2000	0.0120
Pipe - (57)	EX. SDMH #18	EX. SDMH #19	CONDUIT	300.8	0.2000	0.0120
Pipe - (58)	EX. SDMH #19	EX. SDMH #20	CONDUIT	213.0	0.2000	0.0120
Pipe - (59)	EX. CB #1	EX. CB #2	CONDUIT	192.3	0.2110	0.0120

Pipe - (60)	EX. CB #2	EX. CB #3	CONDUIT	249.9	0.2110	0.0120
Pipe - (61)	EX.CB#4	EX. SDMH #20	CONDUIT	89.0	0.2110	0.0120
Pipe - (62)	EX. SDMH #20	Out-1Pipe - (62)	CONDUIT	105.5	0.2000	0.0220
Pipe - (63)	EX. CB #3	EX.CB#4	CONDUIT	198.8	0.2110	0.0120

****
Cross Section Summary
****

Link ID	Shape	Depth/ Diameter ft	Width ft	No. of Barrels	Cross Sectional Area ft²	Full Flow Hydraulic Radius ft	Design Flow Capacity cfs
Pipe - (43)	CIRCULAR	2.50	2.50	1	4.91	0.63	29.70
Pipe - (44)	CIRCULAR	2.50	2.50	1	4.91	0.63	22.76
Pipe - (45)	CIRCULAR	2.50	2.50	1	4.91	0.63	22.29
Pipe - (46)	CIRCULAR	2.50	2.50	1	4.91	0.63	19.87
Pipe - (47)	CIRCULAR	2.50	2.50	1	4.91	0.63	19.87
Pipe - (48)	CIRCULAR	2.50	2.50	1	4.91	0.63	19.87
Pipe - (49)	CIRCULAR	2.50	2.50	1	4.91	0.63	19.87
Pipe - (50)	CIRCULAR	2.50	2.50	1	4.91	0.63	19.87
Pipe - (51)	CIRCULAR	2.50	2.50	1	4.91	0.63	19.87
Pipe - (52)	CIRCULAR	3.00	3.00	1	7.07	0.75	32.31
Pipe - (53)	CIRCULAR	3.00	3.00	1	7.07	0.75	32.31
Pipe - (54)	CIRCULAR	3.00	3.00	1	7.07	0.75	32.31
Pipe - (55)	CIRCULAR	3.00	3.00	1	7.07	0.75	32.31
Pipe - (56)	CIRCULAR	3.00	3.00	1	7.07	0.75	32.31
Pipe - (57)	CIRCULAR	3.50	3.50	1	9.62	0.88	48.74
Pipe - (58)	CIRCULAR	3.50	3.50	1	9.62	0.88	48.74
Pipe - (59)	CIRCULAR	1.00	1.00	1	0.79	0.25	1.77
Pipe - (60)	CIRCULAR	1.00	1.00	1	0.79	0.25	1.77
Pipe - (61)	CIRCULAR	1.00	1.00	1	0.79	0.25	1.77
Pipe - (62)	CIRCULAR	7.00	7.00	1	38.48	1.75	168.82
Pipe - (63)	CIRCULAR	1.00	1.00	1	0.79	0.25	1.77

************************* Runoff Quantity Continuity *************************	Volume acre-ft	Depth inches

```
Total Precipitation ......        93.644         4.031
Surface Runoff ...........        41.036         1.766
Continuity Error (%) .....         0.000


**************************        Volume        Volume
Flow Routing Continuity          acre-ft      Mgallons
**************************     ---------     ---------
External Inflow ..........         0.211         0.069
External Outflow .........        41.021        13.367
Initial Stored Volume ....         0.038         0.012
Final Stored Volume ......         0.270         0.088
Continuity Error (%) .....        -0.000


******************************************
Composite Curve Number Computations Report
******************************************

----------------------
Subbasin LEVEE_CB#1
----------------------
                                                          Area          Soil
Soil/Surface Description                                (acres)         Group          CN
-----------------------------------------------------------------------------------------
Composite Area & Weighted CN                               0.12                     98.00

-----------------------------
Subbasin LEVEE_CB#1_FOREST
-----------------------------
                                                          Area          Soil
Soil/Surface Description                                (acres)         Group          CN
-----------------------------------------------------------------------------------------
Composite Area & Weighted CN                               2.07                     76.00

----------------------
Subbasin LEVEE_CB#2
----------------------
                                                          Area          Soil
Soil/Surface Description                                (acres)         Group          CN
-----------------------------------------------------------------------------------------
Composite Area & Weighted CN                               0.18                     98.00

-----------------------------
Subbasin LEVEE_CB#2_FOREST
-----------------------------
                                                          Area          Soil
Soil/Surface Description                                (acres)         Group          CN
-----------------------------------------------------------------------------------------
Composite Area & Weighted CN                               2.22                     76.00

----------------------
Subbasin LEVEE_CB#3
----------------------
                                                          Area          Soil
Soil/Surface Description                                (acres)         Group          CN
-----------------------------------------------------------------------------------------
Composite Area & Weighted CN                               0.09                     98.00

-----------------------------
Subbasin LEVEE_CB#3_FOREST
-----------------------------
                                                          Area          Soil
Soil/Surface Description                                (acres)         Group          CN
-----------------------------------------------------------------------------------------
Composite Area & Weighted CN                               1.67                     76.00
```

Subbasin LEVEE_CB#4

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.20		98.00

Subbasin LEVEE_SDMH#10

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.16		98.00

Subbasin LEVEE_SDMH#11

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.20		98.00

Subbasin LEVEE_SDMH#12

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.12		98.00

Subbasin LEVEE_SDMH#13

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.11		98.00

Subbasin LEVEE_SDMH#14

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.23		98.00

Subbasin LEVEE_SDMH#15

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.18		98.00

Subbasin LEVEE_SDMH#16

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.19		98.00

Subbasin LEVEE_SDMH#17

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.28		98.00

Subbasin LEVEE_SDMH#18

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.19		98.00

Subbasin LEVEE_SDMH#19

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.15		98.00

Subbasin LEVEE_SDMH#4

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.17		98.00

Subbasin LEVEE_SDMH#5

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.09		98.00

Subbasin LEVEE_SDMH#6

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.12		98.00

Subbasin LEVEE_SDMH#7

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.09		98.00

Subbasin LEVEE_SDMH#8

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.04		98.00

Subbasin LEVEE_SDMH#9

Soil/Surface Description	Area (acres)	Soil Group	CN

```
Composite Area & Weighted CN                                0.09                   98.00

----------------------------
Subbasin Sub-EX. SDMH #11
----------------------------
                                                           Area          Soil
Soil/Surface Description                                 (acres)         Group          CN
-----------------------------------------------------------------------------------------
Composite Area & Weighted CN                               12.58                   76.00

----------------------------
Subbasin Sub-EX. SDMH #12
----------------------------
                                                           Area          Soil
Soil/Surface Description                                 (acres)         Group          CN
-----------------------------------------------------------------------------------------
Composite Area & Weighted CN                                2.57                   76.00

----------------------------
Subbasin Sub-EX. SDMH #13
----------------------------
                                                           Area          Soil
Soil/Surface Description                                 (acres)         Group          CN
-----------------------------------------------------------------------------------------
Composite Area & Weighted CN                               10.81                   76.00

----------------------------
Subbasin Sub-EX. SDMH #17
----------------------------
                                                           Area          Soil
Soil/Surface Description                                 (acres)         Group          CN
-----------------------------------------------------------------------------------------
Composite Area & Weighted CN                               16.73                   76.00

---------------------------
Subbasin Sub-EX. SDMH #4
---------------------------
                                                           Area          Soil
Soil/Surface Description                                 (acres)         Group          CN
-----------------------------------------------------------------------------------------
Composite Area & Weighted CN                               45.12                   76.00

--------------------------
Subbasin Sub-EX_SDMH#20
--------------------------
                                                           Area          Soil
Soil/Surface Description                                 (acres)         Group          CN
-----------------------------------------------------------------------------------------
Composite Area & Weighted CN                              182.00                   76.00

**************************************
Runoff Coefficient Computations Report
**************************************

----------------------
Subbasin LEVEE_CB#1
----------------------
                                                            Area         Soil       Runoff
Soil/Surface Description                                  (acres)        Group      Coeff.
------------------------------------------------------------------------------------------
-                                                           5.00           -          0.72
Composite Area & Weighted Runoff Coeff.                     5.00                      0.72

-----------------------------
Subbasin LEVEE_CB#1_FOREST
-----------------------------
                                                            Area         Soil       Runoff
```

Soil/Surface Description	(acres)	Group	Coeff.
-	2.07	-	0.72
Composite Area & Weighted Runoff Coeff.	2.07		0.72

Subbasin LEVEE_CB#2

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.18	-	0.72
Composite Area & Weighted Runoff Coeff.	0.18		0.72

Subbasin LEVEE_CB#2_FOREST

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	2.22	-	0.72
Composite Area & Weighted Runoff Coeff.	2.22		0.72

Subbasin LEVEE_CB#3

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.09	-	0.72
Composite Area & Weighted Runoff Coeff.	0.09		0.72

Subbasin LEVEE_CB#3_FOREST

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	1.67	-	0.72
Composite Area & Weighted Runoff Coeff.	1.67		0.72

Subbasin LEVEE_CB#4

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.20	-	0.72
Composite Area & Weighted Runoff Coeff.	0.20		0.72

Subbasin LEVEE_SDMH#10

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.16	-	0.72
Composite Area & Weighted Runoff Coeff.	0.16		0.72

Subbasin LEVEE_SDMH#11

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.20	-	0.72
Composite Area & Weighted Runoff Coeff.	0.20		0.72

Subbasin LEVEE_SDMH#12

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.12	-	0.72
Composite Area & Weighted Runoff Coeff.	0.12		0.72

Subbasin LEVEE_SDMH#13

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.11	-	0.72
Composite Area & Weighted Runoff Coeff.	0.11		0.72

Subbasin LEVEE_SDMH#14

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.23	-	0.72
Composite Area & Weighted Runoff Coeff.	0.23		0.72

Subbasin LEVEE_SDMH#15

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.18	-	0.72
Composite Area & Weighted Runoff Coeff.	0.18		0.72

Subbasin LEVEE_SDMH#16

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.19	-	0.72
Composite Area & Weighted Runoff Coeff.	0.19		0.72

Subbasin LEVEE_SDMH#17

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.28	-	0.72
Composite Area & Weighted Runoff Coeff.	0.28		0.72

Subbasin LEVEE_SDMH#18

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.19	-	0.72
Composite Area & Weighted Runoff Coeff.	0.19		0.72

Subbasin LEVEE_SDMH#19

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.15	-	0.72
Composite Area & Weighted Runoff Coeff.	0.15		0.72

Subbasin LEVEE_SDMH#4

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.17	-	0.72
Composite Area & Weighted Runoff Coeff.	0.17		0.72

Subbasin LEVEE_SDMH#5

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.09	-	0.72
Composite Area & Weighted Runoff Coeff.	0.09		0.72

Subbasin LEVEE_SDMH#6

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.12	-	0.72
Composite Area & Weighted Runoff Coeff.	0.12		0.72

Subbasin LEVEE_SDMH#7

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.09	-	0.72
Composite Area & Weighted Runoff Coeff.	0.09		0.72

Subbasin LEVEE_SDMH#8

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.04	-	0.72
Composite Area & Weighted Runoff Coeff.	0.04		0.72

Subbasin LEVEE_SDMH#9

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.09	-	0.72
Composite Area & Weighted Runoff Coeff.	0.09		0.72

Subbasin Sub-EX. SDMH #11

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	13.01	-	0.50

Composite Area & Weighted Runoff Coeff.	13.01		0.50

Subbasin Sub-EX. SDMH #12

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	2.57	-	0.50
Composite Area & Weighted Runoff Coeff.	2.57		0.50

Subbasin Sub-EX. SDMH #13

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	10.81	-	0.50
Composite Area & Weighted Runoff Coeff.	10.81		0.50

Subbasin Sub-EX. SDMH #17

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	16.73	-	0.50
Composite Area & Weighted Runoff Coeff.	16.73		0.50

Subbasin Sub-EX. SDMH #4

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	19.19	-	0.50
Composite Area & Weighted Runoff Coeff.	19.19		0.50

Subbasin Sub-EX_SDMH#20

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	182.00	-	0.72
Composite Area & Weighted Runoff Coeff.	182.00		0.72

****
SCS TR-55 Time of Concentration Computations Report
****

Sheet Flow Equation

```
Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where:

Tc = Time of Concentration (hrs)
n  = Manning's Roughness
Lf = Flow Length (ft)
P  = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)
```

Shallow Concentrated Flow Equation

```
        V  = 16.1345 * (Sf^0.5) (unpaved surface)
        V  = 20.3282 * (Sf^0.5) (paved surface)
        V  = 15.0 * (Sf^0.5) (grassed waterway surface)
        V  = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
        V  = 9.0 * (Sf^0.5) (cultivated straight rows surface)
        V  = 7.0 * (Sf^0.5) (short grass pasture surface)
        V  = 5.0 * (Sf^0.5) (woodland surface)
        V  = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
        Tc = (Lf / V) / (3600 sec/hr)

        Where:

        Tc = Time of Concentration (hrs)
        Lf = Flow Length (ft)
        V  = Velocity (ft/sec)
        Sf = Slope (ft/ft)

Channel Flow Equation
---------------------

        V  = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
        R  = Aq / Wp
        Tc = (Lf / V) / (3600 sec/hr)

        Where:

        Tc = Time of Concentration (hrs)
        Lf = Flow Length (ft)
        R  = Hydraulic Radius (ft)
        Aq = Flow Area (ft²)
        Wp = Wetted Perimeter (ft)
        V  = Velocity (ft/sec)
        Sf = Slope (ft/ft)
        n  = Manning's Roughness

----------------------
Subbasin LEVEE_CB#1
----------------------

        User-Defined TOC override (minutes):      5.00

-----------------------------
Subbasin LEVEE_CB#1_FOREST
-----------------------------

        User-Defined TOC override (minutes):     15.00

----------------------
Subbasin LEVEE_CB#2
----------------------

        User-Defined TOC override (minutes):      5.00

-----------------------------
Subbasin LEVEE_CB#2_FOREST
-----------------------------

        User-Defined TOC override (minutes):     15.00

----------------------
Subbasin LEVEE_CB#3
----------------------

        User-Defined TOC override (minutes):      5.00

-----------------------------
```

```
Subbasin LEVEE_CB#3_FOREST
-----------------------------

        User-Defined TOC override (minutes):     15.00

----------------------
Subbasin LEVEE_CB#4
----------------------

        User-Defined TOC override (minutes):      5.00

-------------------------
Subbasin LEVEE_SDMH#10
-------------------------

        User-Defined TOC override (minutes):      5.00

-------------------------
Subbasin LEVEE_SDMH#11
-------------------------

        User-Defined TOC override (minutes):      5.00

-------------------------
Subbasin LEVEE_SDMH#12
-------------------------

        User-Defined TOC override (minutes):      5.00

-------------------------
Subbasin LEVEE_SDMH#13
-------------------------

        User-Defined TOC override (minutes):      5.00

-------------------------
Subbasin LEVEE_SDMH#14
-------------------------

        User-Defined TOC override (minutes):      5.00

-------------------------
Subbasin LEVEE_SDMH#15
-------------------------

        User-Defined TOC override (minutes):      5.00

-------------------------
Subbasin LEVEE_SDMH#16
-------------------------

        User-Defined TOC override (minutes):      5.00

-------------------------
Subbasin LEVEE_SDMH#17
-------------------------

        User-Defined TOC override (minutes):      5.00

-------------------------
Subbasin LEVEE_SDMH#18
-------------------------

        User-Defined TOC override (minutes):      5.00

-------------------------
Subbasin LEVEE_SDMH#19
```

```
-------------------------

        User-Defined TOC override (minutes):      5.00

------------------------
Subbasin LEVEE_SDMH#4
------------------------

        User-Defined TOC override (minutes):      5.00

------------------------
Subbasin LEVEE_SDMH#5
------------------------

        User-Defined TOC override (minutes):      5.00

------------------------
Subbasin LEVEE_SDMH#6
------------------------

        User-Defined TOC override (minutes):      5.00

------------------------
Subbasin LEVEE_SDMH#7
------------------------

        User-Defined TOC override (minutes):      5.00

------------------------
Subbasin LEVEE_SDMH#8
------------------------

        User-Defined TOC override (minutes):      5.00

------------------------
Subbasin LEVEE_SDMH#9
------------------------

        User-Defined TOC override (minutes):      5.00

----------------------------
Subbasin Sub-EX. SDMH #11
----------------------------

        User-Defined TOC override (minutes):     15.00

----------------------------
Subbasin Sub-EX. SDMH #12
----------------------------

        User-Defined TOC override (minutes):     15.00

----------------------------
Subbasin Sub-EX. SDMH #13
----------------------------

        User-Defined TOC override (minutes):     15.00

----------------------------
Subbasin Sub-EX. SDMH #17
----------------------------

        User-Defined TOC override (minutes):     15.00

---------------------------
Subbasin Sub-EX. SDMH #4
---------------------------
```

User-Defined TOC override (minutes): 15.00

Subbasin Sub-EX_SDMH#20

User-Defined TOC override (minutes): 30.00

****
Subbasin Runoff Summary
****

Subbasin ID	Total Precip in	Total Runoff in	Peak Runoff cfs	Weighted Curve Number	Time of Concentration days	Time of Concentration hh:mm:ss
LEVEE_CB#1	4.03	3.80	0.12	98.000	0	00:05:00
LEVEE_CB#1_FOREST	4.03	1.75	0.64	76.000	0	00:15:00
LEVEE_CB#2	4.03	3.80	0.17	98.000	0	00:05:00
LEVEE_CB#2_FOREST	4.03	1.75	0.69	76.000	0	00:15:00
LEVEE_CB#3	4.03	3.80	0.09	98.000	0	00:05:00
LEVEE_CB#3_FOREST	4.03	1.75	0.52	76.000	0	00:15:00
LEVEE_CB#4	4.03	3.80	0.19	98.000	0	00:05:00
LEVEE_SDMH#10	4.03	3.80	0.16	98.000	0	00:05:00
LEVEE_SDMH#11	4.03	3.80	0.19	98.000	0	00:05:00
LEVEE_SDMH#12	4.03	3.80	0.12	98.000	0	00:05:00
LEVEE_SDMH#13	4.03	3.80	0.11	98.000	0	00:05:00
LEVEE_SDMH#14	4.03	3.80	0.22	98.000	0	00:05:00
LEVEE_SDMH#15	4.03	3.80	0.17	98.000	0	00:05:00
LEVEE_SDMH#16	4.03	3.80	0.18	98.000	0	00:05:00
LEVEE_SDMH#17	4.03	3.80	0.27	98.000	0	00:05:00
LEVEE_SDMH#18	4.03	3.80	0.18	98.000	0	00:05:00
LEVEE_SDMH#19	4.03	3.80	0.15	98.000	0	00:05:00
LEVEE_SDMH#4	4.03	3.80	0.16	98.000	0	00:05:00
LEVEE_SDMH#5	4.03	3.80	0.09	98.000	0	00:05:00
LEVEE_SDMH#6	4.03	3.80	0.12	98.000	0	00:05:00
LEVEE_SDMH#7	4.03	3.80	0.08	98.000	0	00:05:00
LEVEE_SDMH#8	4.03	3.80	0.04	98.000	0	00:05:00
LEVEE_SDMH#9	4.03	3.80	0.09	98.000	0	00:05:00
Sub-EX. SDMH #11	4.03	1.75	3.91	76.000	0	00:15:00
Sub-EX. SDMH #12	4.03	1.75	0.80	76.000	0	00:15:00
Sub-EX. SDMH #13	4.03	1.75	3.36	76.000	0	00:15:00
Sub-EX. SDMH #17	4.03	1.75	5.20	76.000	0	00:15:00
Sub-EX. SDMH #4	4.03	1.75	14.03	76.000	0	00:15:00
Sub-EX_SDMH#20	4.03	1.74	47.06	76.000	0	00:30:00

****
Node Depth Summary
****

Node ID	Average Depth Attained ft	Maximum Depth Attained ft	Maximum HGL Attained ft	Time of Max Occurrence days	Time of Max Occurrence hh:mm	Total Flooded Volume acre-in	Total Time Flooded minutes	Retention Time hh:mm:ss
EX. CB #1	0.22	0.93	33.93	0	08:12	0	0	0:00:00
EX. CB #2	0.33	1.26	33.86	0	08:12	0	0	0:00:00
EX. CB #3	0.40	1.33	33.40	0	08:12	0	0	0:00:00
EX. SDMH #10	0.87	3.43	36.01	0	08:15	0	0	0:00:00
EX. SDMH #11	1.00	3.44	35.52	0	08:15	0	0	0:00:00
EX. SDMH #12	1.07	3.15	34.75	0	08:16	0	0	0:00:00
EX. SDMH #13	1.03	2.87	34.28	0	08:16	0	0	0:00:00

EX. SDMH #14	1.02	2.87	33.91	0	08:16	0	0	0:00:00
EX. SDMH #15	1.12	2.90	33.49	0	08:17	0	0	0:00:00
EX. SDMH #16	1.22	2.87	33.14	0	08:17	0	0	0:00:00
EX. SDMH #17	1.44	2.85	32.75	0	08:17	0	0	0:00:00
EX. SDMH #18	1.73	2.60	32.03	0	08:17	0	0	0:00:00
EX. SDMH #19	2.09	2.58	31.56	0	08:17	0	0	0:00:00
EX. SDMH #20	5.86	10.33	35.49	0	00:00	0	0	0:00:00
EX. SDMH #4	0.69	3.09	37.64	0	08:15	0	0	0:00:00
EX. SDMH #5	0.77	3.32	37.40	0	08:15	0	0	0:00:00
EX. SDMH #6	0.74	3.43	37.13	0	08:15	0	0	0:00:00
EX. SDMH #7	0.96	3.68	36.75	0	08:15	0	0	0:00:00
EX. SDMH #8	0.93	3.58	36.53	0	08:15	0	0	0:00:00
EX. SDMH #9	0.91	3.50	36.29	0	08:15	0	0	0:00:00
EX.CB#4	0.42	1.04	32.69	0	08:11	0	0	0:00:00
Out-1Pipe - (62)	5.95	5.95	31.00	0	00:00	0	0	0:00:00

****
Node Flow Summary
****

Node ID	Element Type	Maximum Lateral Inflow cfs	Peak Inflow cfs	Time of Peak Inflow Occurrence days	hh:mm	Maximum Flooding Overflow cfs	Time of Peak Flooding Occurrence days	hh:mm
EX. CB #1	JUNCTION	0.73	0.73	0	08:15	0.00		
EX. CB #2	JUNCTION	0.83	1.54	0	08:14	0.00		
EX. CB #3	JUNCTION	0.58	2.12	0	08:14	0.00		
EX. SDMH #10	JUNCTION	0.16	14.46	0	08:15	0.00		
EX. SDMH #11	JUNCTION	4.05	18.48	0	08:15	0.00		
EX. SDMH #12	JUNCTION	0.88	19.35	0	08:15	0.00		
EX. SDMH #13	JUNCTION	3.44	22.77	0	08:15	0.00		
EX. SDMH #14	JUNCTION	0.22	22.84	0	08:15	0.00		
EX. SDMH #15	JUNCTION	0.17	22.86	0	08:16	0.00		
EX. SDMH #16	JUNCTION	0.18	22.94	0	08:16	0.00		
EX. SDMH #17	JUNCTION	5.39	28.18	0	08:16	0.00		
EX. SDMH #18	JUNCTION	0.18	28.29	0	08:17	0.00		
EX. SDMH #19	JUNCTION	0.15	34.90	0	00:01	0.00		
EX. SDMH #20	JUNCTION	47.05	239.75	0	00:00	0.00		
EX. SDMH #4	JUNCTION	14.14	14.14	0	08:15	0.00		
EX. SDMH #5	JUNCTION	0.09	14.18	0	08:15	0.00		
EX. SDMH #6	JUNCTION	0.12	14.25	0	08:15	0.00		
EX. SDMH #7	JUNCTION	0.08	14.30	0	08:15	0.00		
EX. SDMH #8	JUNCTION	0.04	14.31	0	08:15	0.00		
EX. SDMH #9	JUNCTION	0.09	14.36	0	08:15	0.00		
EX.CB#4	JUNCTION	0.19	2.27	0	08:11	0.00		
Out-1Pipe - (62)	OUTFALL	0.00	239.75	0	00:00	0.00		

****
Outfall Loading Summary
****

Outfall Node ID	Flow Frequency (%)	Average Flow cfs	Peak Inflow cfs
Out-1Pipe - (62)	100.00	24.50	239.75
System	100.00	24.50	239.75

****
Link Flow Summary

****

Link ID	Element Type	Time of Peak Flow Occurrence days hh:mm	Maximum Velocity Attained ft/sec	Length Factor	Peak Flow during Analysis cfs	Design Flow Capacity cfs	Ratio of Maximum /Design Flow	Ratio of Maximum Flow Depth	Total Time Surcharged minutes	Reported Condition
Pipe - (43)	CONDUIT	0 08:15	3.74	1.00	14.12	29.70	0.48	1.00	13	SURCHARGED
Pipe - (44)	CONDUIT	0 08:15	3.54	1.00	14.17	22.76	0.62	1.00	16	SURCHARGED
Pipe - (45)	CONDUIT	0 08:15	3.06	1.00	14.24	22.29	0.64	1.00	19	SURCHARGED
Pipe - (46)	CONDUIT	0 08:15	2.91	1.00	14.28	19.87	0.72	1.00	26	SURCHARGED
Pipe - (47)	CONDUIT	0 08:15	2.91	1.00	14.30	19.87	0.72	1.00	26	SURCHARGED
Pipe - (48)	CONDUIT	0 08:15	2.92	1.00	14.35	19.87	0.72	1.00	26	SURCHARGED
Pipe - (49)	CONDUIT	0 08:15	2.95	1.00	14.46	19.87	0.73	1.00	26	SURCHARGED
Pipe - (50)	CONDUIT	0 08:15	3.76	1.00	18.48	19.87	0.93	1.00	29	SURCHARGED
Pipe - (51)	CONDUIT	0 08:15	3.94	1.00	19.34	19.87	0.97	1.00	20	SURCHARGED
Pipe - (52)	CONDUIT	0 08:15	3.41	1.00	22.69	32.31	0.70	0.96	0	Calculated
Pipe - (53)	CONDUIT	0 08:16	3.32	1.00	22.74	32.31	0.70	0.96	0	Calculated
Pipe - (54)	CONDUIT	0 08:16	3.27	1.00	22.82	32.31	0.71	0.96	0	Calculated
Pipe - (55)	CONDUIT	0 08:17	3.30	1.00	22.94	32.31	0.71	0.95	0	Calculated
Pipe - (56)	CONDUIT	0 08:17	4.18	1.00	28.17	32.31	0.87	0.91	0	Calculated
Pipe - (57)	CONDUIT	0 08:17	3.70	1.00	28.28	48.74	0.58	0.74	0	Calculated
Pipe - (58)	CONDUIT	0 00:01	8.00	1.00	34.90	48.74	0.72	0.72	0	Calculated
Pipe - (59)	CONDUIT	0 08:17	1.44	1.00	0.74	1.77	0.42	0.96	0	Calculated
Pipe - (60)	CONDUIT	0 08:14	1.97	1.00	1.54	1.77	0.87	1.00	18	SURCHARGED
Pipe - (61)	CONDUIT	0 08:11	8.87	1.00	2.27	1.77	1.28	0.82	0	> CAPACITY
Pipe - (62)	CONDUIT	0 00:00	7.56	1.00	239.75	168.82	1.42	0.92	0	> CAPACITY
Pipe - (63)	CONDUIT	0 08:14	2.70	1.00	2.12	1.77	1.20	1.00	13	SURCHARGED

****
Highest Flow Instability Indexes
****

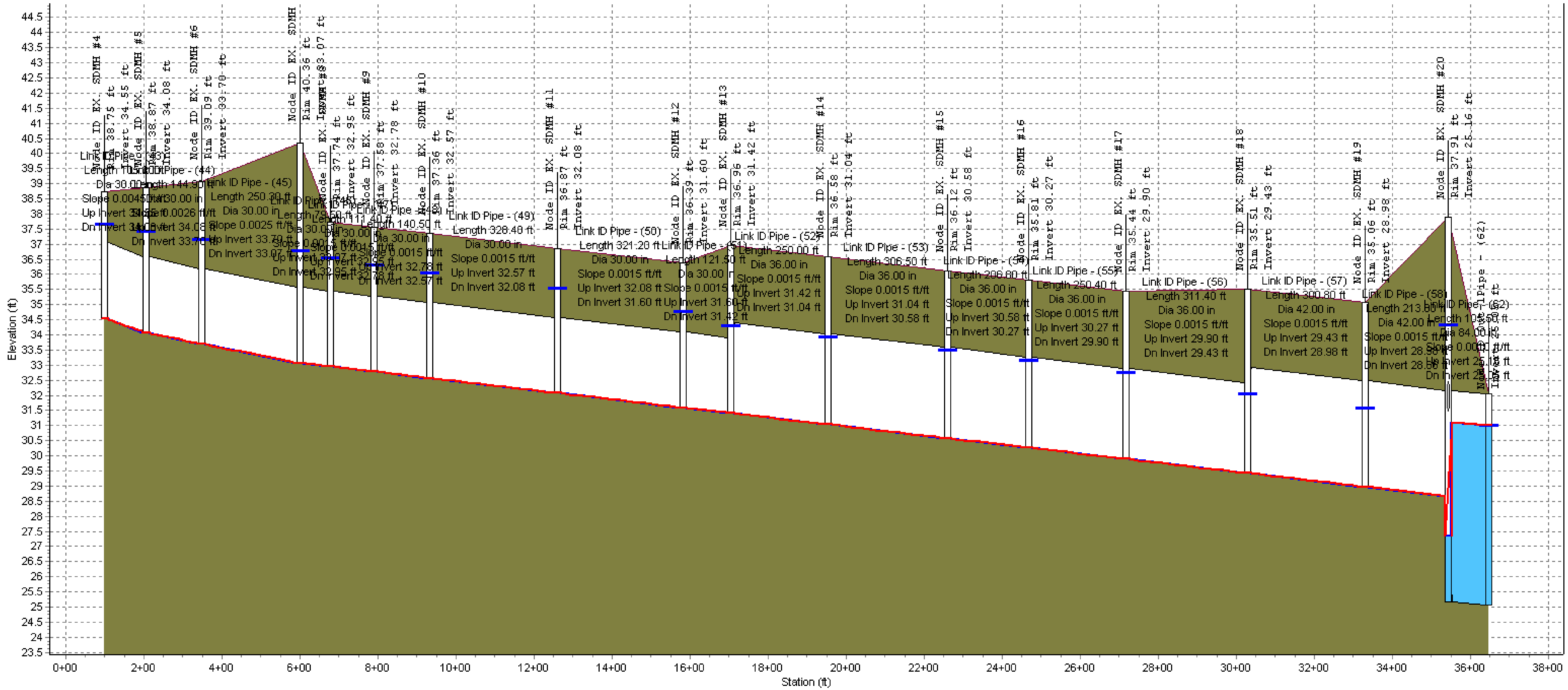
Link Pipe - (62) (3)
Link Pipe - (58) (2)
Link Pipe - (57) (2)
Link Pipe - (56) (2)

```
WARNING 005 : Minimum slope used for Conduit Pipe - (46).
WARNING 005 : Minimum slope used for Conduit Pipe - (47).
WARNING 005 : Minimum slope used for Conduit Pipe - (48).
WARNING 005 : Minimum slope used for Conduit Pipe - (49).
WARNING 005 : Minimum slope used for Conduit Pipe - (50).
WARNING 005 : Minimum slope used for Conduit Pipe - (51).
WARNING 005 : Minimum slope used for Conduit Pipe - (52).
WARNING 005 : Minimum slope used for Conduit Pipe - (53).
WARNING 005 : Minimum slope used for Conduit Pipe - (54).
WARNING 005 : Minimum slope used for Conduit Pipe - (55).
WARNING 005 : Minimum slope used for Conduit Pipe - (56).
WARNING 005 : Minimum slope used for Conduit Pipe - (57).
WARNING 005 : Minimum slope used for Conduit Pipe - (58).
WARNING 005 : Minimum slope used for Conduit Pipe - (62).

Analysis began on:  Mon Dec  9 12:37:26 2024
Analysis ended on:  Mon Dec  9 12:37:27 2024
Total elapsed time: 00:00:01
```

100-YEAR BACKWATER ANALYSIS

N LEVEE ROAD



Node ID:	EX. SDMH #4	EX. SDMH #5	EX. SDMH #6	EX. SDMH #7	EX. SDMH #8	EX. SDMH #9	EX. SDMH #10	EX. SDMH #11	EX. SDMH #12	EX. SDMH #13	EX. SDMH #14	EX. SDMH #15	EX. SDMH #16	EX. SDMH #17	EX. SDMH #18	EX. SDMH #19	EX. SDMH #20	Out Pipe - (62)
Rim (ft):	38.75	38.87	39.09	40.36	37.74	37.58	37.36	36.87	36.39	36.96	36.58	36.12	35.81	35.44	35.51	35.06	37.91	
Invert (ft):	34.55	34.08	33.70	33.07	32.95	32.78	32.57	32.08	31.60	31.42	31.04	30.58	30.27	29.90	29.43	28.98	25.16	25.05
Min Pipe Cover (ft):	1.70	2.29	2.89	4.79	2.29	2.29	2.29	2.29	2.29	2.54	2.54	2.54	2.54	2.54	2.58	2.58	5.45	
Max HGL (ft):	37.64	37.40	37.13	36.75	36.53	36.29	36.01	35.52	34.75	34.28	33.91	33.49	33.14	32.75	32.03	31.56	35.49	31.00

Link ID:	Pipe - (43)	Pipe - (44)	Pipe - (45)	Pipe - (46)	Pipe - (47)	Pipe - (48)	Pipe - (49)	Pipe - (50)	Pipe - (51)	Pipe - (52)	Pipe - (53)	Pipe - (54)	Pipe - (55)	Pipe - (56)	Pipe - (57)	Pipe - (58)	Pipe - (62)
Length (ft):	105.20	144.90	250.30	79.50	111.40	140.50	328.40	321.20	121.50	250.00	306.50	206.80	250.40	311.40	300.80	213.00	105.50
Dia (in):	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	36.00	36.00	36.00	36.00	36.00	42.00	42.00	84.00
Slope (ft/ft):	0.0045	0.0026	0.0025	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0010
Up Invert (ft):	34.55	34.08	33.70	33.07	32.95	32.78	32.57	32.08	31.60	31.42	31.04	30.58	30.27	29.90	29.43	28.98	25.16
Dn Invert (ft):	34.08	33.70	33.07	32.95	32.78	32.57	32.08	31.60	31.42	31.04	30.58	30.27	29.90	29.43	28.98	28.66	25.05
Max Q (cfs):	14.12	14.17	14.24	14.28	14.30	14.35	14.46	18.48	19.34	22.69	22.74	22.82	22.94	28.17	28.28	34.90	239.75
Max Vel (ft/s):	3.74	3.54	3.06	2.91	2.91	2.92	2.95	3.76	3.94	3.41	3.32	3.27	3.30	4.18	3.70	8.00	7.56
Max Depth (ft):	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.87	2.89	2.89	2.86	2.73	2.59	2.52	6.47

OFFSITE ANALYSIS PHOTO EXHIBIT

Photo Exhibit

Photo 1. Looking north from the SE property corner. Existing farmland is flat. There is no concentrated discharge point from this portion of the site.

Photo 2. Looking northwest toward the north, central portion of the site. Stormwater appears to drain in a general NW direction within this part of the site.

Photo 3. Looking north at the NW site corner during heavy rain event. Stormwater collects in this corner and passes under Freeman Rd within a 12-inch concrete culvert.

Photo 4. Looking north along roadside ditch on the west side of Freeman Rd opposite the north end of the site.

Photo 5. Looking west along ditch on the west side of Freeman Rd where the roadside ditch joins the larger agricultural ditch and then heads west.

Photo 6. Photo of the agricultural ditch during dry season.

Photo 7. Portion of oxbow wetland observed during peak rain event at the beginning of March 2022. No flooding of the wetland or related conveyance elements was observed during this period.

Photo 8. Located northwest of the intersection of Freeman Rd E and N Levee Rd, facing northwest. The vacant parcel is lower in elevation than the surrounding area and heavily vegetated.

Tab 5.0

5.0 PERMANENT STORMWATER CONTROL PLAN

5.0 PERMANENT STORMWATER CONTROL PLAN

Part A Existing Site Hydrology

Under existing conditions, the site is an assemblage of parcels which contain single family homes plus minimally developed pasture and farmland. The homes are mostly concentrated in the middle of the site and along the southwestern border. Per the geotechnical report prepared for the project, the soil on site is alluvial type loamy to sandy loam. The soil has minimal infiltration potential. The project site has a high-water table, approximately 2-9 feet below the existing grade, varying with the season and location. Site grades are minimal, however the overall trend is a gradual slope of less than 1% to the north. Vegetation is predominantly pasture in the north, prior crop use in the south, plus a few scattered trees and lawn adjacent the single-family homes. Runoff from the site appears to travel via sheet flow and shallow subsurface interflow toward the northwest corner. There are no existing manmade structures to collect and convey runoff onsite. Freeman Road is higher than the site and causes drainage to pond during heavy rain events and then runs north. There exists a shallow 12" concrete culvert in the northwest site corner where stormwater is conveyed offsite under Freeman Road to the west. See Section 4.0 for a more detailed analysis of the downstream system. The onsite area totals 24.05 acres, which is divided north and south by 22nd Ave NW. An additional 3.40 acres of existing plus proposed public ROW area along the project frontage on Freeman Road East and 22nd Ave NW will receive improvements. The north end of Freeman Road, north of 48th Street, is tributary to a roadside ditch. The onsite plus frontage areas total 27.45 acres.

A separate offsite area to the south of the parcels, at the Freeman and Levee Road intersection, is also part of the project. Road widening and ROW dedication is proposed at the northwest intersection corner to accommodate truck and trailer traffic to and from the development. The dedication area is contained on a single parcel which is undeveloped and forested. Part of the existing road shoulder to be widened is gravel covered. Road drainage is currently uncollected and is dispersed to the road shoulder. Stormwater is presumed to infiltrate (see Section 4). This offsite area is considered a separate basin. See part B for areas.

Converted surfaces for this project are considered forested in the pre-developed modeling condition for all basins.

Part B Developed Site Hydrology

The developed site will include two commercial warehouse buildings with dock high loading, associated parking and drive aisles, storm drainage facilities, utilities, landscaping and frontage improvements. The impervious coverage after development will be approximately 80%, including frontage improvements. Flow control and water quality facilities are proposed to mitigate stormwater runoff from the new plus replaced impervious surfaces and landscape.

The parcel area and adjacent frontage improvements of the site are contained within a single drainage basin. However, due to the configuration of the site plan, the public ROW of 22nd Ave NW divides the site into two halves, north and south. Stormwater mitigation is handled separately for private versus public runoff. Therefore, the private improvements include separate collection and detention facilities for the north and south buildings. An additional facility is designed to mitigate the public roadway stormwater. Mitigated stormwater is then collected to a central lift station and pumped offsite to the existing system along N Levee Road as described in part F of this section.

The frontage improvements along Freeman Road include significant road widening, curb, sidewalk, landscape, pavement replacement and storm drainage system. Stormwater runoff flows will increase due to the increased pavement surface area. The majority of runoff will be collected using curbing to direct flows to catch basins and underground storm pipes, then to a proposed detention vault. The collected surfaces along the frontage include 108,589 proposed new impervious area and 11,049 sf of landscape.

The offsite frontage improvements include a portion of Freeman Road between 19th Ave NW and N Levee Road, plus a small section of widening at the N. Levee Road intersection. Improvements include road widening to install turn pockets, curb, lighting, pavement replacement, pavement overlay and storm drainage system. Catch basin StormFilters are designed to treat the stormwater and then direct to an infiltration trench which is proposed under the pavement on the west side of Freeman Road. The total of new plus replaced impervious area is 28,277 sf.

A breakdown of developed site areas is provided in the below table:

DEVELOPED SITE AREAS		(sf)		(ac)
North Parcel				
Building (roof)	237,615		5.45	
Asphalt	135,854		3.12	
Sidewalk	26,299		0.60	
Landscape	70,130		1.61	
South Parcel				
Building (roof)	266,408		6.12	
Asphalt	126,514		2.90	
Sidewalk	43,669		1.00	
Landscape	79,032		1.81	
Frontage ROW				
Asphalt	94,940		2.18	
Sidewalk	13,649		0.31	
Landscape	11,049		0.25	
Offsite ROW				
Asphalt	28,277		0.65	
Total				
Building (roof)	504,023		11.57	
Asphalt	385,585		8.85	
Sidewalk	83,617		1.92	
Landscape	160,211		3.68	

Please refer to the later sections of this report for the sizing calculations for the flow control and water quality facilities.

Part C Performance Standards and Goals

This stormwater site plan is prepared in accordance with the 2019 Department of Ecology Stormwater Manual for Western Washington, as adopted by the City of Puyallup and City of Fife. The standard flow control criteria (50% of the 2-year, up to the full 50-yr duration matching) is applicable. Enhanced water quality treatment is required due to the intended commercial site use. A feasibility analysis is required for implementation of LID BMPs.

Low Impact Development Features

This development triggers all the minimum requirements, including Minimum Requirement #5 – On-site Stormwater Management. To meet this requirement, the LID performance standards will be implemented to the greatest extent feasible. See below for the feasibility analysis.

- Lawn and Landscaped Areas
  - Post-Construction Soil Quality and Depth (BMP T5.13)
    - This BMP is feasible and will be used onsite to the greatest extent possible.
- Roof Areas
  - Full dispersion
    - Full dispersion has been determined to be infeasible for this project due to the project site being within a mapped floodplain, per Pierce County GIS.
  - Downspout Full Infiltration
    - Downspout full infiltration has been determined to be infeasible for this project due to the lack of clearance from the seasonal high groundwater table. See the geotechnical report, included as a separate document in this submittal.
  - Bioretention
    - Bioretention has been determined to be infeasible for this project due to the project site being within a mapped floodplain, per Pierce County GIS. Furthermore, bioretention facilities would not be able to have sufficient clearance from the seasonal high groundwater table.
  - Downspout Dispersion
    - Downspout dispersion has been determined to be infeasible for this project due to the project site being within a mapped floodplain, per Pierce County GIS.
  - Perforated Stub-Out Connections
    - Perforated stub-out connections have been determined to be infeasible for this project due to the lack of clearance from the seasonal high groundwater table.
- Other hard surfaces
  - Full Dispersion
    - Full dispersion has been determined to be infeasible for this project due to the project site being within a mapped floodplain, per Pierce County GIS.
  - Permeable Pavement*
    - Permeable pavement has been determined to be infeasible due to the lack of sufficient strength to support the anticipated truck traffic.
  - Bioretention
    - Bioretention has been determined to be infeasible for this project due to the project site being within a mapped floodplain, per Pierce County GIS. Furthermore, bioretention facilities would not be able to have sufficient clearance from the seasonal high groundwater table to be useful year-round.
  - Sheet Flow/Concentrated Dispersion
    - Both sheet flow and concentrated dispersion have been determined to be infeasible for this project due to the project site being within a mapped floodplain, per Pierce County GIS.

*The offsite improvements south of 19th Ave NW are designed with infiltration in lieu of permeable pavement due to concerns with pavement longevity and limited space for dispersion devices. This facility also provides flow control for tributary stormwater.

Part D Flow Control System

WWHM was used to size four separate flow control facilities to serve the various target surface areas of the project. Two large underground detention vaults are designed for the main north and south building sites, serving the runoff from the private rooftop and parking areas. A third underground detention vault is designed within the ROW of 22nd Ave NW to provide flow control for the public Freeman Road and 22nd Ave frontage improvements, which are treated separately from onsite stormwater. Each vault is designed using a flow restrictor device to regulate the gravity release rate in accordance with the flow control standard. An infiltration facility is proposed to mitigate flows from the impervious area added by the project between 19th Ave NW and N. Levee Road. Catch basins and pipes collect and direct flows to each respective flow control facility. Proposed dimensions are provided in the table below.

Facility Name	Length (FT)	Width (FT)	Depth (FT)	Volume Provided (CF)	Volume Required per WWHM
Building A Vault	360	100	7.5	234,000	230,750
Building B Vault	350	120	7.5	273,000	261,300
22nd Ave Vault	308	20	11.5	64,680	61,530
Levee Road Infiltration Trench	650	9	4.0	9,360	9,000

The three vault facilities are located north of 19th Ave NW and are within the same basin. However, due to topography constraints, a gravity discharge to a downstream drainage course is not feasible. Mitigated flows from the three vaults are designed for conveyance to a central lift station facility where stormwater is pumped via force main to the downstream connection point offsite to the existing storm system along N Levee Road.

The lift station is designed with a wet well and 2-4 pumps with variable speed controls. The controls allow a wide range of flow adjustment to closely match the discharge rate of stormwater leaving the detention vaults. The preliminary control system includes multiple float switches, a variable frequency drive (VFD), and a pressure transducer to adjust the motor speed and/or turn on additional pumps to keep a consistent water level in the wet well. As a result, during the critical design storm range (50% of the 2-year peak up to the 100-year peak flow), the lift station will allow the control structure of each vault to operate normally via gravity such that the project impact at the point of compliance meets the flow control standard. See attached pump details in this section.

The Levee Road infiltration facility is within a separate basin. The proposed design includes a gravel filled trench and a perforated distribution pipe to spread flows evenly along the bottom area for infiltration into the native soils. The trench is designed with a 0.2 inch per hour infiltration rate which will handle all expected flows. An overflow pipe is provided near the center of the system that conveys excess water to a rock dispersion pad.

Part E Water Quality System

Water quality treatment is designed to mitigate stormwater from target pollution-generating impervious surfaces. Enhanced treatment is provided for the onsite and 22nd Ave improvements using underground proprietary vaults located downstream of each of the three detention vaults. Basic water quality treatment is designed for offsite improvements between 19th Ave NW and N. Levee Road using catch basin StormFilters (or approved equal). Since the Levee Road system includes infiltration, water quality treatment is designed upstream of the flow control facility to reduce the likelihood of native soil contamination. Each facility is designed using WWHM using the appropriate water quality design flow rate. Additional details will be provided during final engineering.

Part F Conveyance System Analysis and Design

The conveyance system will be sized for the 25-year storm event without flooding. The rational method will be used to size all conveyance pipes. This analysis will be completed for engineering permitting.

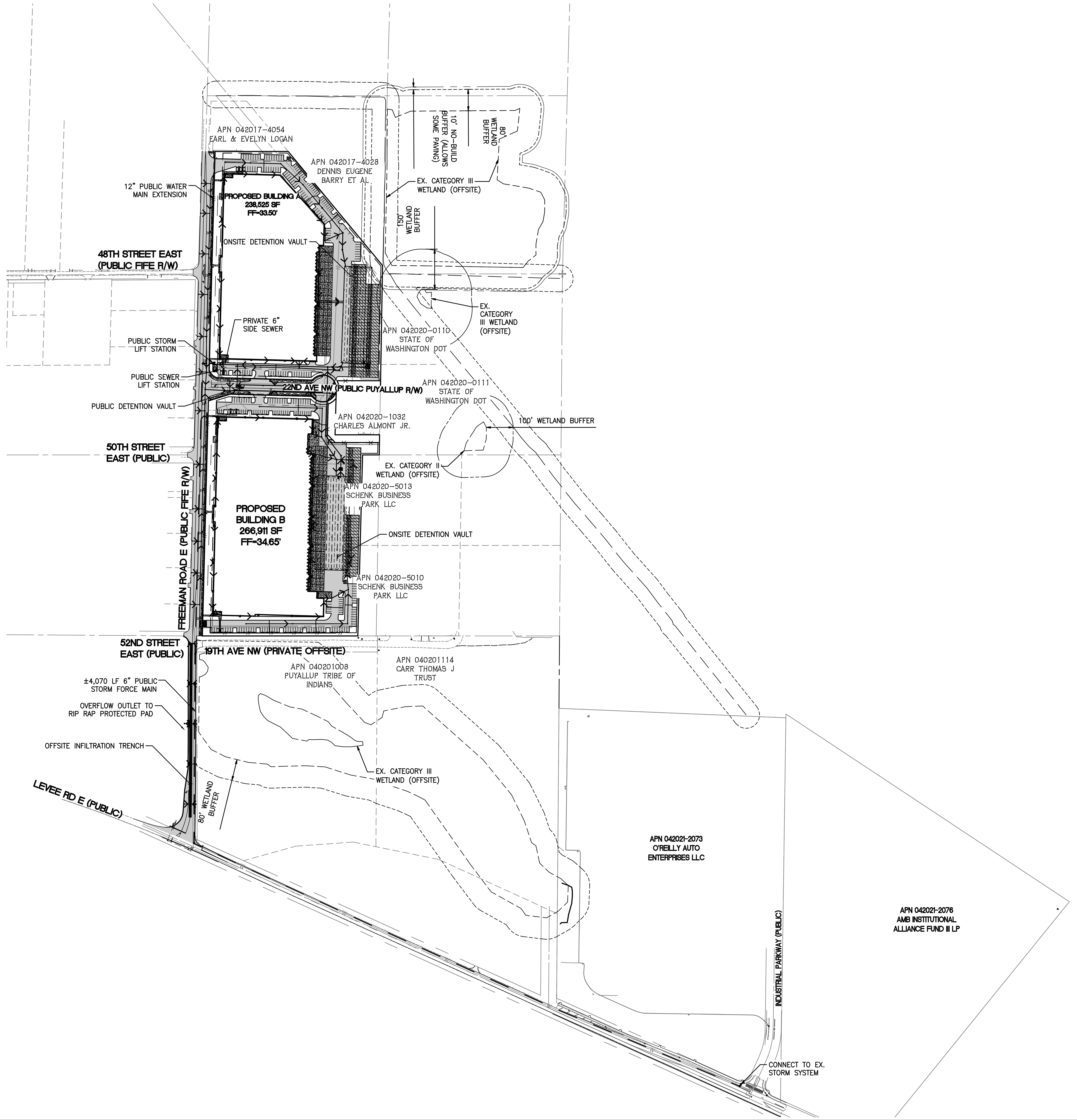
Refer to the attached pump calculations at the end of this section. Collected stormwater is routed through the proposed detention vaults and then through water quality facilities providing enhanced treatment. Following treatment, water is conveyed to a lift station, located near the southwest corner of building A. The lift station houses a duplex pump system that conveys water south along the eastern portion of Freeman Road until it turns easterly along N Levee Road. The pump discharge line continues east along N Levee Road until it turns north and ties into an existing manhole near the intersection of N Levee Road and Industrial Parkway. See the civil plans for more details. The lift station and force main are proposed as public facilities to be owned and maintained by the City of Puyallup.

GRADING AND STORM DRAINAGE PLAN

PRELIMINARY STORM DRAINAGE OVERALL PLAN
OF
FREEMAN LOGISTICS
PTNS. OF THE SE1/4, OF SEC. 17, TWP. 20 N., RGE 4 EAST, W. M.
AND PTNS. OF THE NE1/4, OF SEC. 20, TWP. 20 N., RGE 4 EAST, W. M.
PIERCE COUNTY, WASHINGTON

N

0 100' 200' 400'
SCALE: 1"=200'



APPROVED

BY ____________________
CITY OF PUYALLUP
DEVELOPMENT ENGINEERING

DATE ____________________

NOTE: THIS APPROVAL IS VOID AFTER 180 DAYS FROM APPROVAL DATE. THE CITY WILL NOT BE RESPONSIBLE FOR ERRORS AND/OR OMISSIONS ON THESE PLANS. FIELD CONDITIONS MAY DICTATE CHANGES TO THESE PLANS AS DETERMINED BY THE DEVELOPMENT ENGINEERING MANAGER.

No.	Date	By	Ckd.	Appr.	Revision
5	12/13/24	DTC	JSM	JSM	SEPA RESUBMITTAL

Title: **PRELIMINARY STORM DRAINAGE OVERALL PLAN** FOR FREEMAN LOGISTICS

For: VECTOR DEVELOPMENT COMPANY
11411 NE 124TH STREET
SUITE 190
KIRKLAND, WA 98034

JASON S. MCARDLE
STATE OF WASHINGTON
54927
REGISTERED PROFESSIONAL ENGINEER
12/20/24

Scale: Horizontal 1"=200'
Vertical N/A

Designed JSM
Drawn DTC
Checked JSM
Approved JSM
Date 12/20/24

Barghausen Consulting Engineers, LLC.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222
barghausen.com

Job Number 21585

Sheet C7 of 44

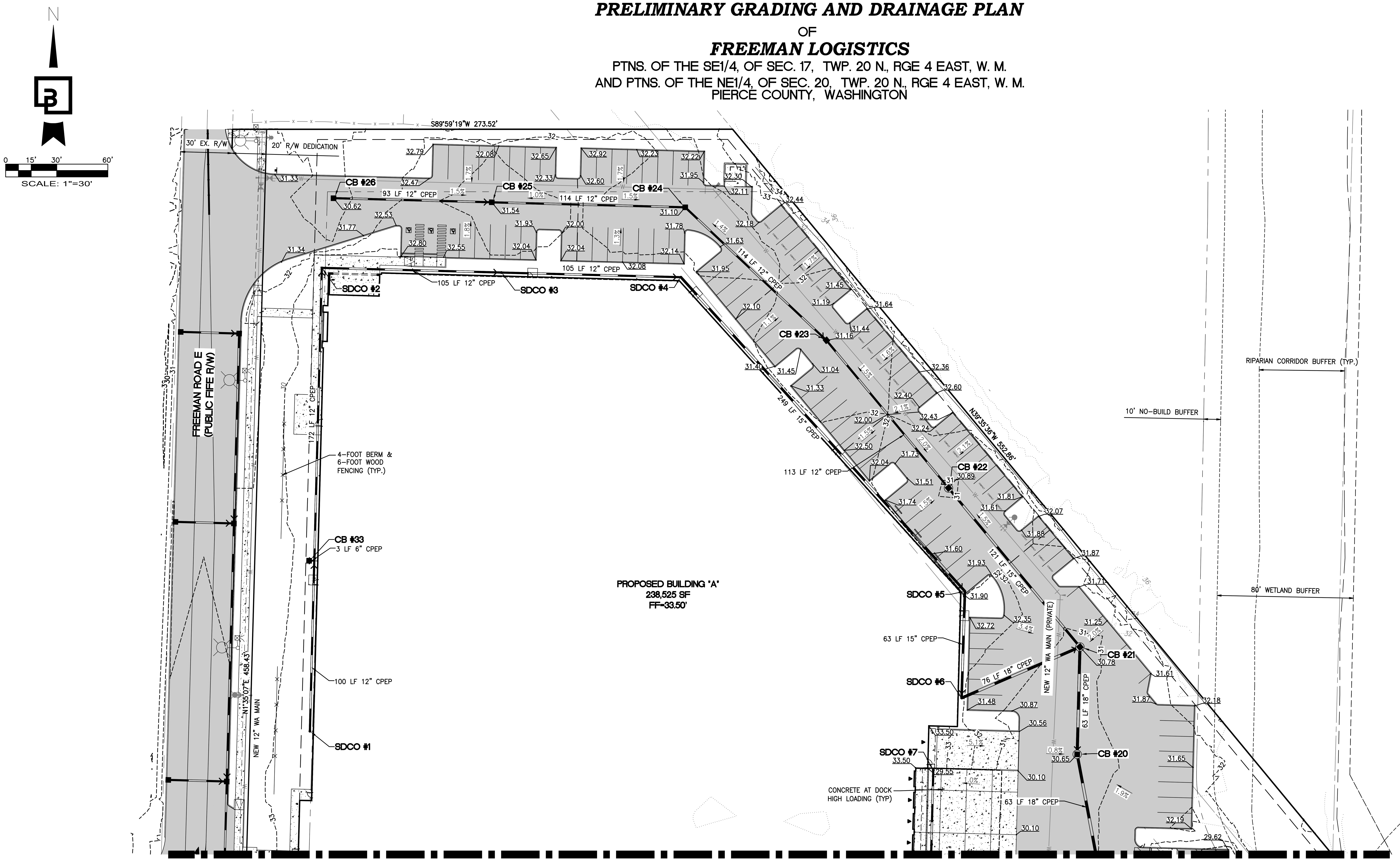
P:\21000s\21585\engineering\SEPA SET\21585-OM.dwg 12/20/2024 10:47 AM DCASEY

PRELIMINARY GRADING AND DRAINAGE PLAN

OF

FREEMAN LOGISTICS

PTNS. OF THE SE1/4, OF SEC. 17, TWP. 20 N., RGE 4 EAST, W. M.
AND PTNS. OF THE NE1/4, OF SEC. 20, TWP. 20 N., RGE 4 EAST, W. M.
PIERCE COUNTY, WASHINGTON



MATCHLINE- SEE SHEET C9 FOR CONTINUATION

CATCH BASINS
CB #20, TYPE 2–48" W/STANDARD GRATE RIM=30.65 IE=24.03 (18" N) IE=24.03 (18" S)
CB #21, TYPE 2–48" W/STANDARD GRATE RIM=30.78 IE=24.78 (15" NW) IE=24.53 (18" SW) IE=24.53 (18" S)
CB #22, TYPE 2–48" W/STANDARD GRATE RIM=30.89 IE=25.74 (12" NW) IE=25.49 (15" SE)
CB #23, TYPE 1, W/STANDARD GRATE RIM=31.16 IE=26.38 (12" NW) IE=26.38 (12" SE)
CB #24, TYPE 1, W/STANDARD GRATE RIM=31.10 IE=26.95 (12" W) IE=26.95 (12" SE)
CB #25, TYPE 1, W/STANDARD GRATE RIM=31.54 IE=27.52 (12" W) IE=27.52 (12" E)
CB #26, TYPE 1, W/STANDARD GRATE RIM=30.62 IE=27.98 (12" E)
CB #33, TYPE 1, W/STANDARD GRATE RIM=33.33 IE=30.90 (6" E)
SDCO #1, 8" SDCO RIM=33.46 IE=31.00 (12" N)
SDCO #2, 8" SDCO RIM=33.22 IE=28.98 (12" S) IE=28.98 (12" E)
SDCO #3, 8" SDCO RIM=32.21 IE=28.19 (12" W) IE=28.19 (12" E)
SDCO #4, 8" SDCO RIM=32.61 IE=27.41 (12" W) IE=27.16 (15" SE)
SDCO #5, 8" SDCO RIM=31.89 IE=25.56 (15" NW) IE=25.56 (15" S)
SDCO #6, 8" SDCO RIM=32.28 IE=25.09 (15" N) IE=24.84 (18" NE)
SDCO #7, 8" SDCO RIM=29.58 IE=27.20 (12" S)
SDCO #37, 8" SDCO RIM=33.43 IE=30.26 (12" S) IE=30.76 (6" W) IE=30.26 (12" N)

APPROVED

BY ____________________
CITY OF PUYALLUP
DEVELOPMENT ENGINEERING

DATE ____________________

NOTE: THIS APPROVAL IS VOID AFTER 180 DAYS FROM APPROVAL DATE. THE CITY WILL NOT BE RESPONSIBLE FOR ERRORS AND/OR OMISSIONS ON THESE PLANS. FIELD CONDITIONS MAY DICTATE CHANGES TO THESE PLANS AS DETERMINED BY THE DEVELOPMENT ENGINEERING MANAGER.

No.	Date	By	Ckd.	Appr.	Revision
5	12/13/24	DTC	JSM	JSM	SEPA RESUBMITTAL

Title: PRELIMINARY GRADING AND DRAINAGE PLAN FOR FREEMAN LOGISTICS

For: VECTOR DEVELOPMENT COMPANY
11411 NE 124TH STREET
SUITE 190
KIRKLAND, WA 98034

JASON S. MCARDLE
STATE OF WASHINGTON
54927
REGISTERED PROFESSIONAL ENGINEER
12/20/24

Scale: Horizontal 1"=30' Vertical N/A

Designed JSM Drawn DTC Checked JSM Approved JSM Date 12/20/24

Barghausen Consulting Engineers, LLC.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222
barghausen.com

Job Number 21585

Sheet C8 of 44

P:\21000s\21585\engineering\SEPA SET\21585-GM.dwg 12/20/2024 10:47 AM DCASEY

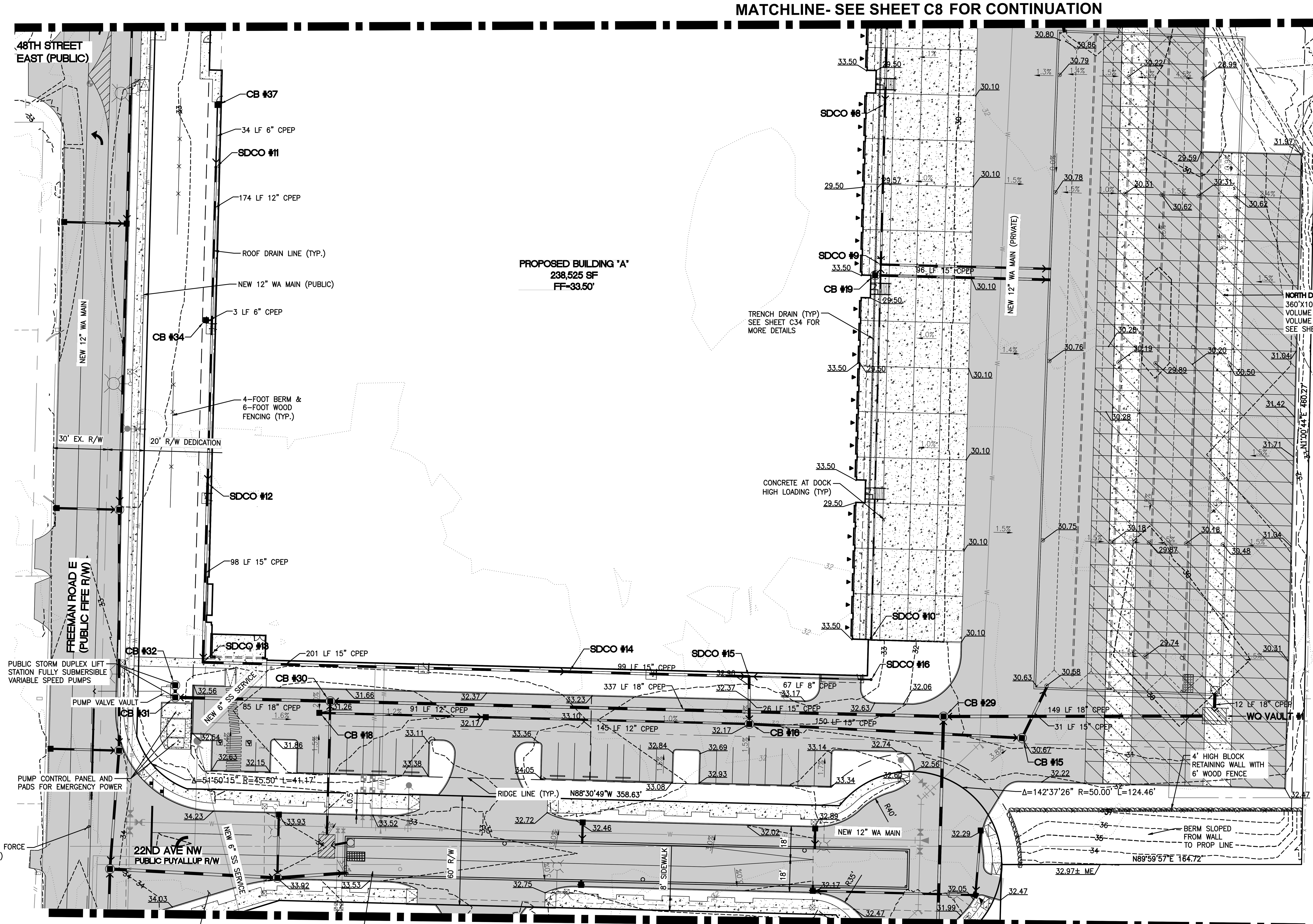
PRELIMINARY GRADING AND DRAINAGE PLAN
OF
FREEMAN LOGISTICS
PTNS. OF THE SE1/4, OF SEC. 17, TWP. 20 N., RGE 4 EAST, W. M.
AND PTNS. OF THE NE1/4, OF SEC. 20, TWP. 20 N., RGE 4 EAST, W. M.
PIERCE COUNTY, WASHINGTON

N

0 15' 30' 60'
SCALE: 1"=30'

CATCH BASINS
CB #15, TYPE 2–48", W/STANDARD GRATE RIM=30.67 IE=24.96 (15" W) IE=24.96 (15" NE)
CB #16, TYPE 2–48" W/STANDARD GRATE RIM=32.17 IE=27.22 (12" W) IE=26.97 (15" N) IE=26.97 (15" E)
CB #17, TYPE 1, W/STANDARD GRATE RIM=32.17 IE=27.94 (12" W) IE=27.94 (12" E)
CB #18, TYPE 1, W/STANDARD GRATE RIM=31.26 IE=28.40 (12" E)
CB #19, TYPE 2–48" W/STANDARD GRATE RIM=29.52 IE=24.00 (15" E)
CB #29, TYPE 2–48" W/SOLID LOCKING LID RIM=31.21 IE=17.18 (18" S) IE=17.18 (18" E) IE=17.18 (18" W)
CB #30, TYPE 2–48", W/STANDARD GRATE RIM=31.45 IE=14.88 (18" E) IE=15.38 (12" S) IE=14.88 (18" W)
CB #31, TYPE 2–54" W/SOLID LOCKING LID RIM=33.15 IE=14.30 (18" E) IE=14.30 (18" N)
CB #32, TYPE 2–54" W/SOLID LOCKING LID RIM=33.15 IE=14.30 (18" S)
CB #34, TYPE 1, W/STANDARD GRATE RIM=33.41 IE=31.33 (6" E)
CB #37, TYPE 1, W/STANDARD GRATE RIM=33.46 IE=31.75 (6" S)
SDCO #8, 8" SDCO RIM=29.57 IE=26.46 (12" N) IE=26.46 (12" S)
SDCO #9, 8" SDCO RIM=29.57 IE=26.08 (8" S) IE=25.75 (12" N) IE=25.75 (12" E)
SDCO #10, 8" SDCO RIM=29.59 IE=27.20 (8" N)
SDCO #11, 8" SDCO RIM=33.41 IE=31.50 (6" N) IE=31.00 (12" S)
SDCO #12, 8" SDCO RIM=33.48 IE=30.00 (12" N) IE=29.75 (15" S)
SDCO #13, 8" SDCO RIM=33.26 IE=29.17 (15" N) IE=29.17 (15" E)
SDCO #14, 8" SDCO RIM=33.36 IE=27.98 (15" W) IE=27.98 (15" E)
SDCO #15, 8" SDCO RIM=33.33 IE=27.39 (15" W) IE=27.97 (8" E) IE=27.39 (15" S)
SDCO #16, 8" SDCO RIM=33.33 IE=29.00 (8" W)
WQ VAULT #1, 6'X12' VAULT RIM=30.19 IE=20.29 (18" N) IE=18.12 (18" W)

MATCHLINE- SEE SHEET C8 FOR CONTINUATION



MATCHLINE- SEE SHEET C10 FOR CONTINUATION

PUBLIC ROADWAY COMMERCIAL COLLECTOR TO BE CONSTRUCTED PER CITY OF PUYALLUP STANDARD 01.01.04 SEE SHEET C27

OFFSITE DETENTION VAULT
308'X20'X11.5'
VOLUME REQUIRED=1.410 AC-FT
VOLUME PROVIDED=1.480 AC-FT
SEE SHEET C27 FOR MORE DETAILS

APPROVED

BY ______________
CITY OF PUYALLUP
DEVELOPMENT ENGINEERING

DATE ______________

NOTE: THIS APPROVAL IS VOID AFTER 180 DAYS FROM APPROVAL DATE. THE CITY WILL NOT BE RESPONSIBLE FOR ERRORS AND/OR OMISSIONS ON THESE PLANS. FIELD CONDITIONS MAY DICTATE CHANGES TO THESE PLANS AS DETERMINED BY THE DEVELOPMENT ENGINEERING MANAGER.

No.	Date	By	Ckd.	Appr.	Revision
5	12/13/24	DTC	JSM	JSM	SEPA RESUBMITTAL

Title: **PRELIMINARY GRADING AND DRAINAGE PLAN FOR FREEMAN LOGISTICS**

For: VECTOR DEVELOPMENT COMPANY
11411 NE 124TH STREET
SUITE 190
KIRKLAND, WA 98034

JASON S. MCARDLE, STATE OF WASHINGTON, 54927, REGISTERED PROFESSIONAL ENGINEER
12/20/24

Scale: Horizontal 1"=30'; Vertical N/A

Designed JSM; Drawn DTC; Checked JSM; Approved JSM; Date 12/20/24

Barghausen Consulting Engineers, LLC.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222
barghausen.com

Job Number 21585

Sheet C9 of 44

P:\21000s\21585\engineering\SEPA SET\21585-GM.dwg 12/20/2024 11:21 AM DCASEY

PRELIMINARY GRADING AND DRAINAGE PLAN
OF
FREEMAN LOGISTICS

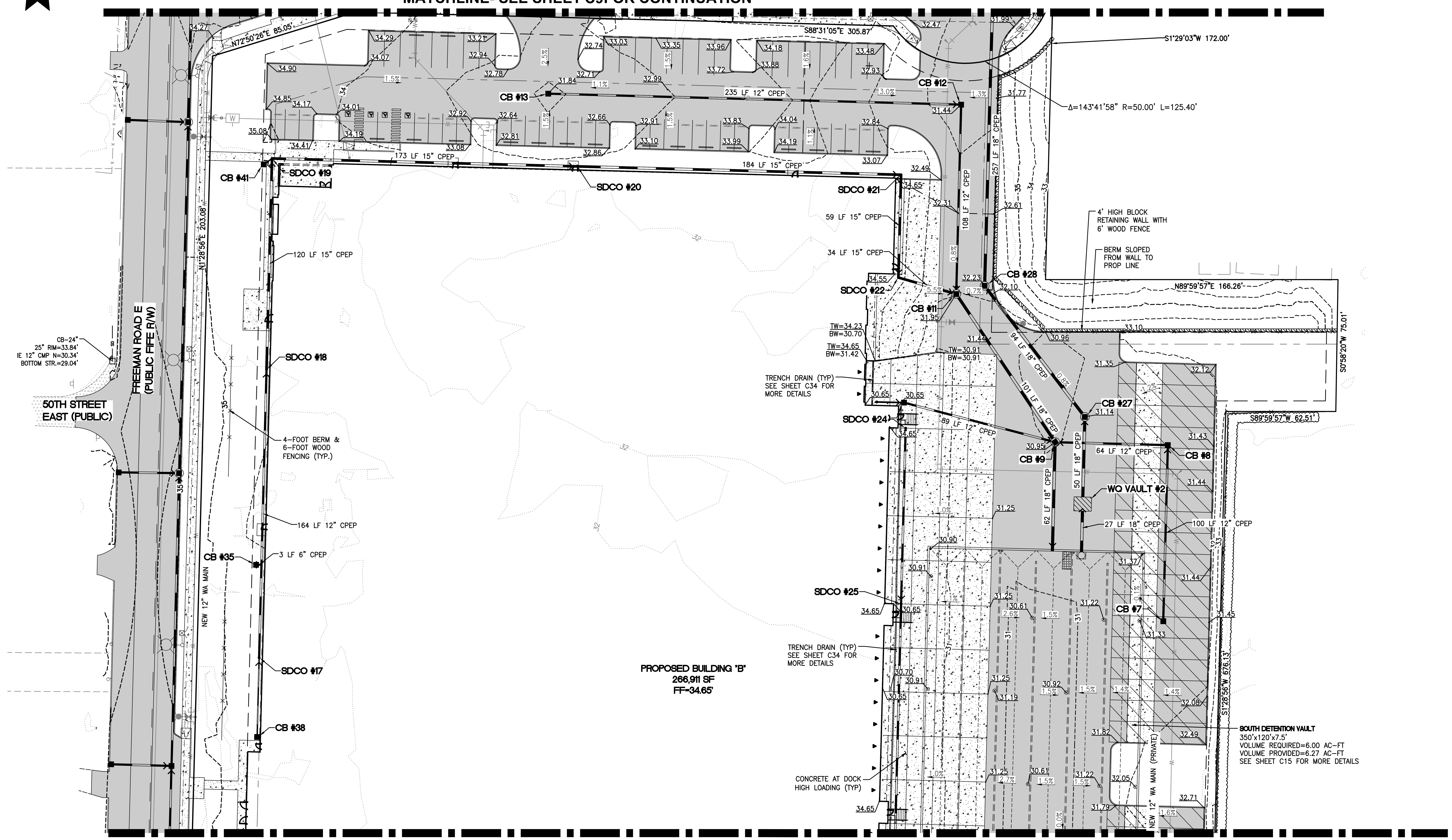
PTNS. OF THE SE1/4, OF SEC. 17, TWP. 20 N., RGE 4 EAST, W. M.
AND PTNS. OF THE NE1/4, OF SEC. 20, TWP. 20 N., RGE 4 EAST, W. M.
PIERCE COUNTY, WASHINGTON

N

0 15' 30' 60'
SCALE: 1"=30'

MATCHLINE- SEE SHEET C9FOR CONTINUATION

CATCH BASINS
CB #7, TYPE 1, W/STANDARD GRATE RIM=31.06 IE=27.60 (12" N)
CB #8, TYPE 1, W/STANDARD GRATE RIM=31.04 IE=26.85 (12" S) IE=26.85 (12" W)
CB #9, TYPE 2-54" W/STANDARD GRATE RIM=30.95 IE=25.37 (18" NW) IE=25.98 (12" W) IE=26.06 (12" E) IE=25.37 (18" S)
CB #10, TYPE 1, W/STANDARD GRATE RIM=30.69 IE=27.98 (8" W) IE=27.65 (12" E)
CB #11, TYPE 2-48" W/STANDARD GRATE RIM=31.95 IE=26.48 (12" N) IE=26.23 (15" W) IE=25.98 (18" SE)
CB #12, TYPE 1, W/STANDARD GRATE RIM=31.44 IE=27.04 (12" W) IE=27.04 (12" S)
CB #13, TYPE 1, W/STANDARD GRATE RIM=31.84 IE=28.26 (12" E)
CB #27, TYPE 2-48" W/SOLID LOCKING LID RIM=31.14 IE=18.65 (18" S) IE=18.65 (18" NW)
CB #28, TYPE 2-48" W/SOLID LOCKING LID RIM=32.23 IE=18.26 (18" SE) IE=18.26 (18" N)
CB #35, TYPE 1, W/STANDARD GRATE RIM=34.73 IE=31.33 (6" E)
CB #38, TYPE 1, W/STANDARD GRATE RIM=34.53 IE=32.33 (6" N)
CB #41, TYPE 1, W/STANDARD GRATE RIM=34.38 IE=31.00 (6" NE)
SDCO #17, 8" SDCO RIM=34.61 IE=32.05 (6" S) IE=31.55 (12" N)
SDCO #18, 8" SDCO RIM=34.47 IE=30.73 (12" S) IE=30.48 (15" N)
SDCO #19, 8" SDCO RIM=34.42 IE=29.87 (15" S) IE=30.62 (6" SW) IE=29.87 (15" E)
SDCO #20, 8" SDCO RIM=33.36 IE=28.56 (15" W) IE=28.56 (15" E)
SDCO #21, 8" SDCO RIM=33.62 IE=27.18 (15" W) IE=27.18 (15" S)
SDCO #22, 8" SDCO RIM=34.33 IE=26.74 (15" N) IE=26.74 (15" E)
SDCO #23, 8" SDCO RIM=30.65 IE=28.50 (8" E)
SDCO #24, 8" SDCO RIM=30.73 IE=28.30 (12" S)
SDCO #25, 8" SDCO RIM=30.70 IE=27.02 (12" N) IE=27.02 (12" S)
WQ VAULT #2, 6'X12' VAULT RIM=31.42 IE=21.07 (18" S) IE=18.90 (18" N)



MATCHLINE- SEE SHEET C11 FOR CONTINUATION

No.	Date	By	Ckd.	Appr.	Revision
5	12/13/24	DTC	JSM	JSM	SEPA RESUBMITTAL

Title: PRELIMINARY GRADING AND DRAINAGE PLAN FOR FREEMAN LOGISTICS

For: VECTOR DEVELOPMENT COMPANY
11411 NE 124TH STREET
SUITE 190
KIRKLAND, WA 98034

JASON S. MCARDLE
STATE OF WASHINGTON
54927
REGISTERED PROFESSIONAL ENGINEER
12/20/24

Scale: Horizontal 1"=30' Vertical N/A

Designed JSM
Drawn DTC
Checked JSM
Approved JSM
Date 12/20/24

Barghausen Consulting Engineers, LLC.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222
barghausen.com

Job Number 21585
Sheet C10 of 44

APPROVED

BY ____________
CITY OF PUYALLUP
DEVELOPMENT ENGINEERING

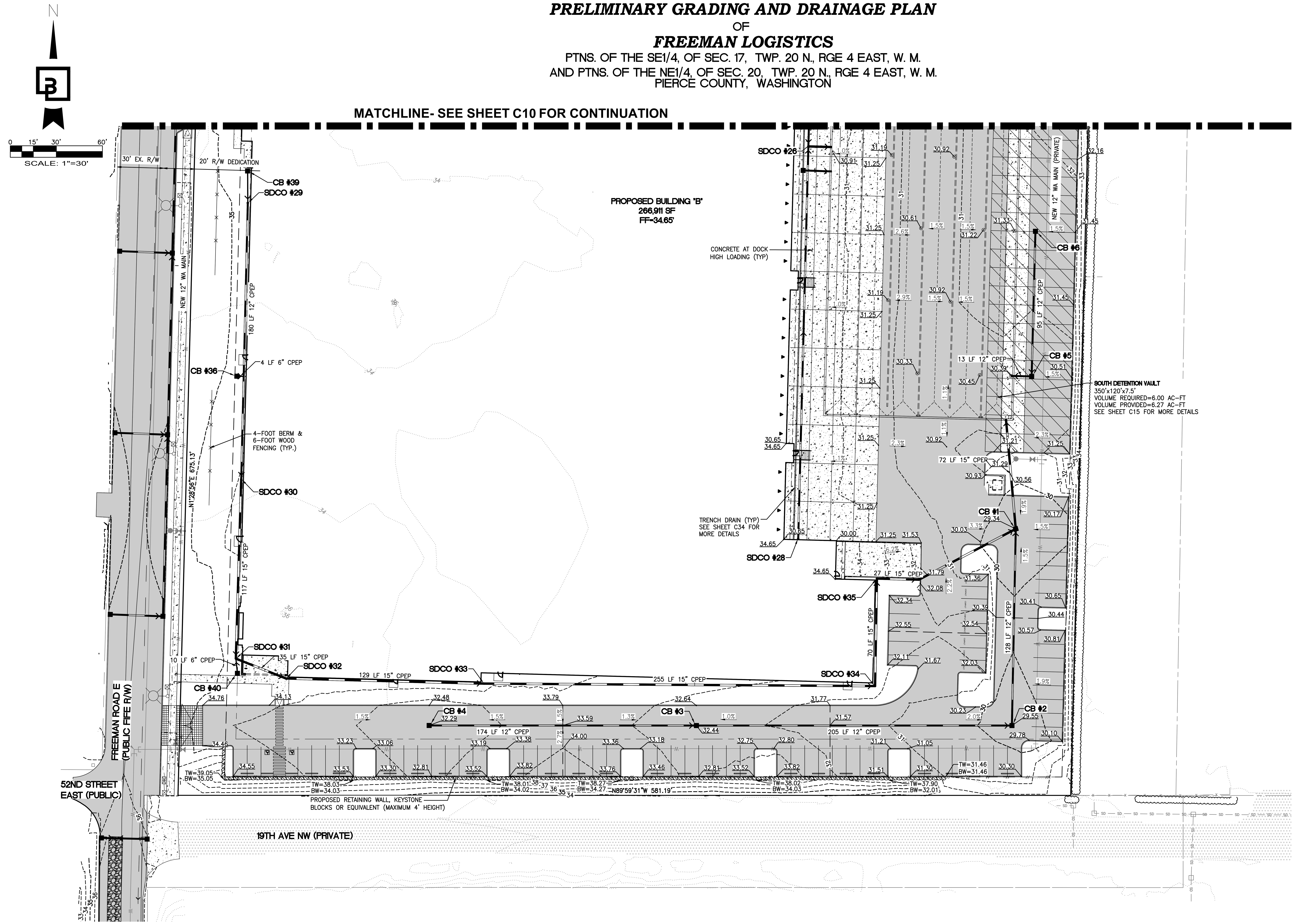
DATE ____________

NOTE: THIS APPROVAL IS VOID AFTER 180 DAYS FROM APPROVAL DATE. THE CITY WILL NOT BE RESPONSIBLE FOR ERRORS AND/OR OMISSIONS ON THESE PLANS. FIELD CONDITIONS MAY DICTATE CHANGES TO THESE PLANS AS DETERMINED BY THE DEVELOPMENT ENGINEERING MANAGER.

P:\21000s\21585\engineering\SEPA SET\21585-GM.dwg 12/20/2024 10:47 AM DCASEY

PRELIMINARY GRADING AND DRAINAGE PLAN
OF
FREEMAN LOGISTICS
PTNS. OF THE SE1/4, OF SEC. 17, TWP. 20 N., RGE 4 EAST, W. M.
AND PTNS. OF THE NE1/4, OF SEC. 20, TWP. 20 N., RGE 4 EAST, W. M.
PIERCE COUNTY, WASHINGTON

MATCHLINE- SEE SHEET C10 FOR CONTINUATION



CATCH BASINS
CB #1, TYPE 1L, W/STANDARD GRATE RIM=29.34 IE=26.13 (12" S) IE=25.88 (15" SW) IE=25.88 (15" N)
CB #2, TYPE 1, W/STANDARD GRATE RIM=29.55 IE=27.80 (12" W) IE=27.80 (12" N)
CB #3, TYPE 1, W/STANDARD GRATE RIM=32.44 IE=28.83 (12" W) IE=28.83 (12" E)
CB #4, TYPE 1, W/STANDARD GRATE RIM=32.29 IE=29.70 (12" E)
CB #5, TYPE 1, W/STANDARD GRATE RIM=30.12 IE=26.31 (12" N) IE=26.31 (12" W)
CB #6, TYPE 1, W/STANDARD GRATE RIM=31.06 IE=28.50 (12" S)
CB #14, TYPE 1, W/STANDARD GRATE RIM=30.71 IE=27.70 (12" E)
CB #36, TYPE 1, W/STANDARD GRATE RIM=34.74 IE=31.33 (6" E)
CB #39, TYPE 1, W/STANDARD GRATE RIM=34.53 IE=32.63 (6" S)
CB #40, TYPE 1, W/STANDARD GRATE RIM=34.54 IE=31.00 (6" N)
SDCO #26, 8" SDCO RIM=30.74 IE=25.19 (12" S) IE=25.19 (12" N) IE=24.94 (15" E)
SDCO #27, 8" SDCO RIM=30.74 IE=26.63 (12" S) IE=26.63 (12" N)
SDCO #28, 8" SDCO RIM=30.47 IE=28.30 (12" N)
SDCO #29, 8" SDCO RIM=34.60 IE=32.50 (6" N) IE=32.00 (12" S)
SDCO #31, 8" SDCO RIM=34.77 IE=29.73 (15" N) IE=30.48 (6" S) IE=29.73 (15" E)
SDCO #32, 8" SDCO RIM=34.51 IE=29.50 (15" W) IE=29.50 (15" E)
SDCO #33, 8" SDCO RIM=34.44 IE=28.65 (15" W) IE=28.65 (15" E)
SDCO #34, 8" SDCO RIM=32.34 IE=26.98 (15" W) IE=26.98 (15" N)
SDCO #35, 8" SDCO RIM=33.03 IE=26.52 (15" S) IE=26.52 (15" E)
SDCO #36, 8" SDCO RIM=32.33 IE=26.37 (15" W) IE=26.37 (15" NE)

APPROVED

BY ______________
CITY OF PUYALLUP
DEVELOPMENT ENGINEERING

DATE ______________

NOTE: THIS APPROVAL IS VOID AFTER 180 DAYS FROM APPROVAL DATE. THE CITY WILL NOT BE RESPONSIBLE FOR ERRORS AND/OR OMISSIONS ON THESE PLANS. FIELD CONDITIONS MAY DICTATE CHANGES TO THESE PLANS AS DETERMINED BY THE DEVELOPMENT ENGINEERING MANAGER.

No.	Date	By	Ckd.	Appr.	Revision
5	12/13/24	DTC	JSM	JSM	SEPA RESUBMITTAL

Title: PRELIMINARY GRADING AND DRAINAGE PLAN FOR FREEMAN LOGISTICS

For: VECTOR DEVELOPMENT COMPANY
11411 NE 124TH STREET
SUITE 190
KIRKLAND, WA 98034

JASON S. MCARDLE
STATE OF WASHINGTON
54927
REGISTERED PROFESSIONAL ENGINEER
12/20/24

Scale: Horizontal 1"=30' Vertical N/A

Designed JSM
Drawn DTC
Checked JSM
Approved JSM
Date 12/20/24

Barghausen Consulting Engineers, LLC.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222
barghausen.com

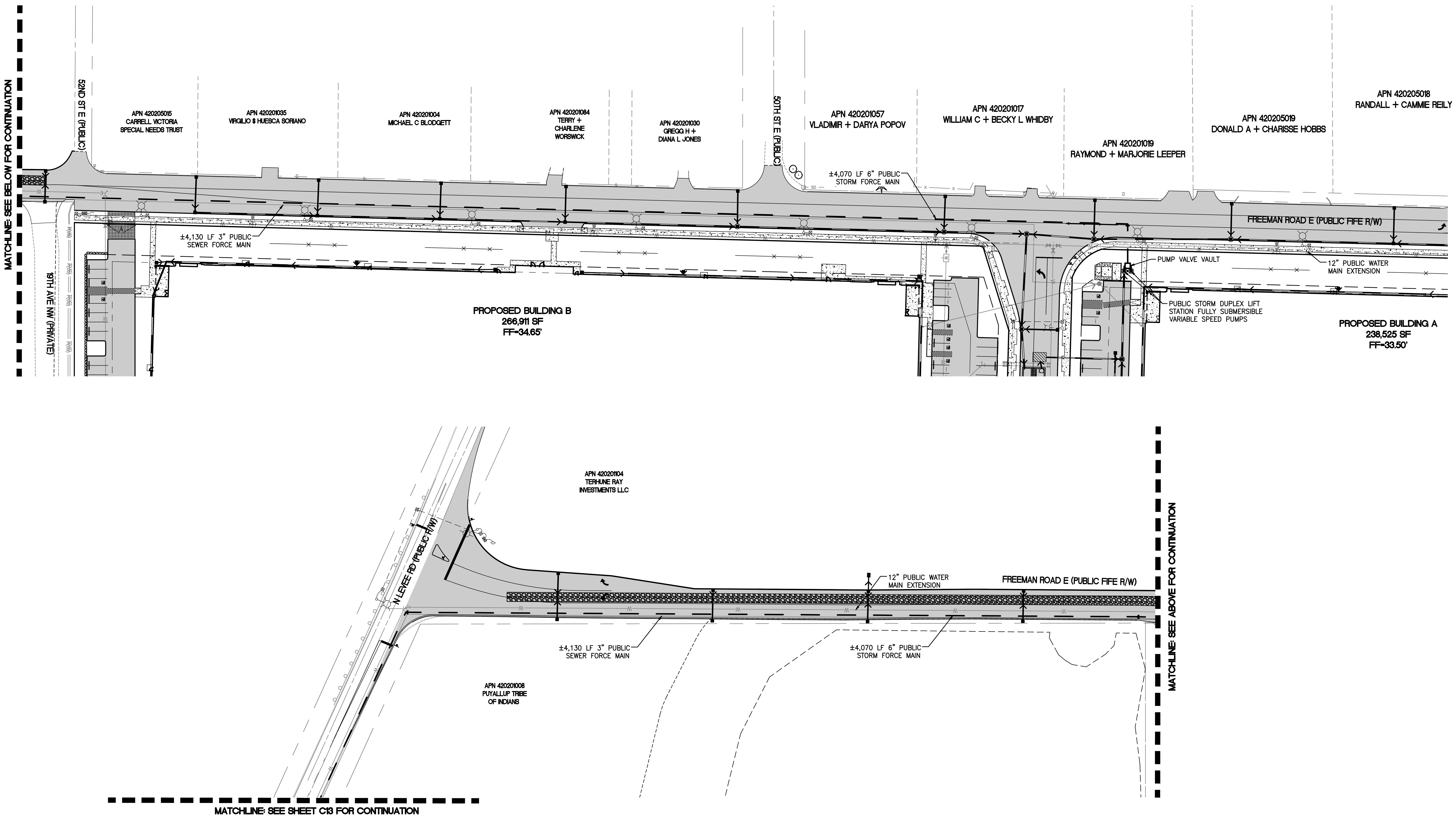
Job Number 21585

Sheet C11 of 44

P:\21000s\21585\engineering\SEPA SET\21585-GM.dwg 12/20/2024 10:47 AM DCASEY

PRELIMINARY DRAINAGE OUTLET PLAN
OF
FREEMAN LOGISTICS
PTNS. OF THE SE1/4, OF SEC. 17, TWP. 20 N., RGE 4 EAST, W. M.
AND PTNS. OF THE NE1/4, OF SEC. 20, TWP. 20 N., RGE 4 EAST, W. M.
PIERCE COUNTY, WASHINGTON

0 25' 50' 100'
SCALE: 1"=50'



No.	Date	By	Ckd.	Appr.	Revision
5	12/13/24	DTC	JSM	JSM	SEPA RESUBMITTAL

Title: **PRELIMINARY DRAINAGE OUTLET PLAN**
FOR
FREEMAN LOGISTICS

For: VECTOR DEVELOPMENT COMPANY
11411 NE 124TH STREET
SUITE 190
KIRKLAND, WA 98034

JASON S. MCARDLE
STATE OF WASHINGTON
54927
REGISTERED
PROFESSIONAL ENGINEER
12/20/24

Scale: Horizontal 1"=50'
Vertical N/A

Designed JSM
Drawn DTC
Checked JSM
Approved JSM
Date 12/20/24

Barghausen Consulting Engineers, LLC.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222
barghausen.com

P:\21000s\21585\engineering\SEPA SET\21585-GM.dwg 12/20/2024 10:47 AM DCASEY

Job Number 21585
Sheet C12 of 44

APPROVED

BY ____________
CITY OF PUYALLUP
DEVELOPMENT ENGINEERING

DATE ____________

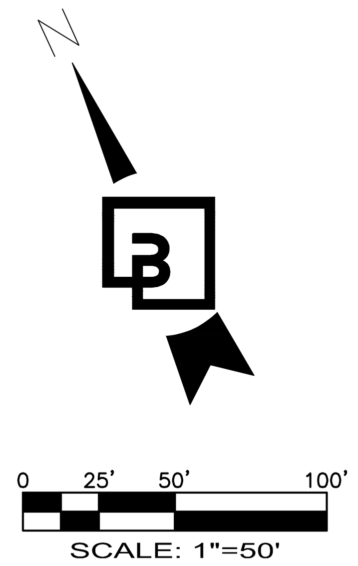
NOTE: THIS APPROVAL IS VOID AFTER 180 DAYS FROM APPROVAL DATE. THE CITY WILL NOT BE RESPONSIBLE FOR ERRORS AND/OR OMISSIONS ON THESE PLANS. FIELD CONDITIONS MAY DICTATE CHANGES TO THESE PLANS AS DETERMINED BY THE DEVELOPMENT ENGINEERING MANAGER.

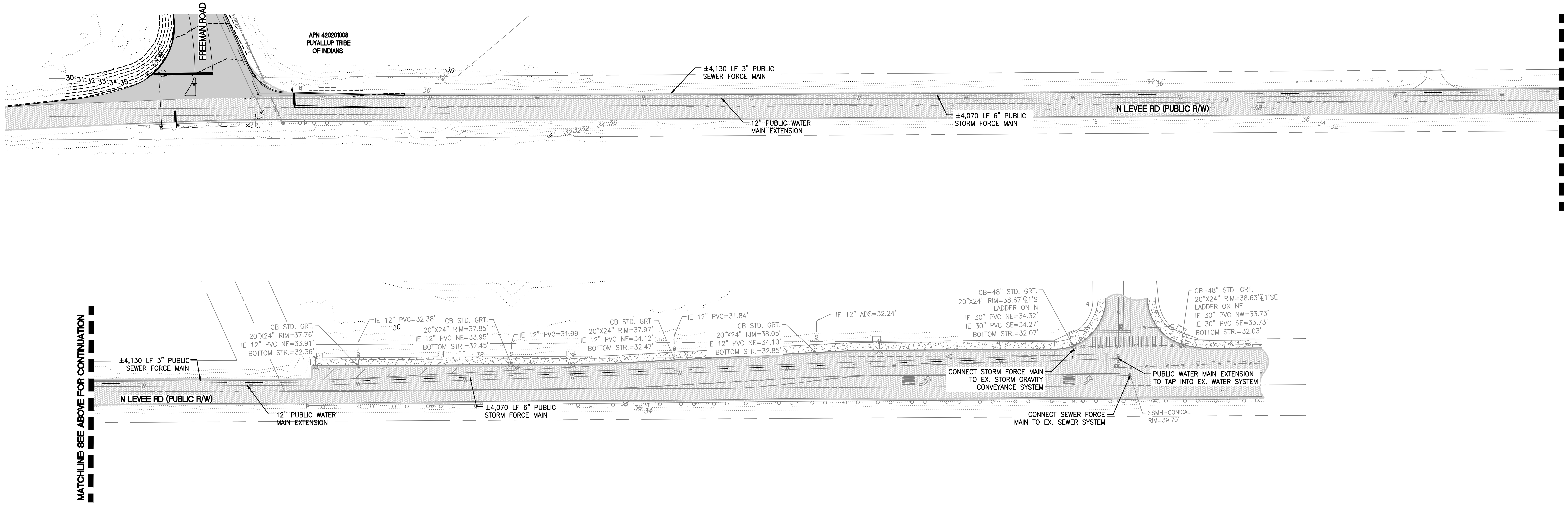
ENGINEER'S REVIEW FIFE
- ☐ APPROVED
- ☐ APPROVED AS CORRECTED
- ☐ REVISE AND RESUBMIT
- ☐ REJECTED
- ☐ FOR INFORMATION ONLY

THE CITY'S REVIEW IS NOT A CONFIRMATION OF ANY DIMENSION OR QUANTITIES SHOWN IN THE PLANS AND WILL NOT RELIEVE THE DEVELOPER OR ENGINEER FROM RESPONSIBILITY FOR PLANS ERRORS. NO CHANGES SHALL BE MADE TO THE PLANS EXCEPT WITH THE CONSENT OF THE CITY ENGINEER. IF CONSTRUCTION HAS NOT COMMENCED WITHIN A REASONABLE PERIOD OF THE APPROVAL DATE, PLANS WILL REQUIRE RE-APPROVAL BY THE CITY.

BY DATE

PRELIMINARY DRAINAGE OUTLET PLAN
OF
FREEMAN LOGISTICS
PTNS. OF THE SE1/4, OF SEC. 17, TWP. 20 N., RGE 4 EAST, W. M.
AND PTNS. OF THE NE1/4, OF SEC. 20, TWP. 20 N., RGE 4 EAST, W. M.
PIERCE COUNTY, WASHINGTON





No.	Date	By	Ckd.	Appr.	Revision
5	12/13/24	DTC	JSM	JSM	SEPA RESUBMITTAL

Title: **PRELIMINARY DRAINAGE OUTLET PLAN**
FOR
FREEMAN LOGISTICS

For: VECTOR DEVELOPMENT COMPANY
11411 NE 124TH STREET
SUITE 190
KIRKLAND, WA 98034

JASON S. MCARDLE
STATE OF WASHINGTON
54927
REGISTERED
PROFESSIONAL ENGINEER
12/20/24

Scale: Horizontal 1"=50'
Vertical N/A

Designed JSM
Drawn DTC
Checked JSM
Approved JSM
Date 12/20/24

Barghausen Consulting Engineers, LLC.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222
barghausen.com

APPROVED

BY ______________________
CITY OF PUYALLUP
DEVELOPMENT ENGINEERING

DATE ______________________

NOTE: THIS APPROVAL IS VOID AFTER 180 DAYS FROM APPROVAL DATE.
THE CITY WILL NOT BE RESPONSIBLE FOR ERRORS AND/OR OMISSIONS ON THESE PLANS.
FIELD CONDITIONS MAY DICTATE CHANGES TO THESE PLANS AS DETERMINED BY THE DEVELOPMENT ENGINEERING MANAGER.

Job Number 21585

Sheet C13 of 44

P:\21000s\21585\engineering\SEPA SET\21585-OM.dwg 12/20/2024 10:47 AM DCASEY

STORMWATER TRIBUTARY BASIN MAPS

PREDEVELOPED BASIN - FREEMAN ROAD
FOR
FREEMAN ROAD LOGISTICS

A PORTION OF THE SE¼ OF SEC. 17, TWP. 20 NORTH, RGE. 4 EAST AND
A PORTION OF THE NE¼ OF SEC. 20, TWP. 20 NORTH, RGE. 4 EAST, W.M.
CITY OF FIFE, PIERCE COUNTY, WASHINGTON

811
Know what's below.
Call before you dig.

N

0 50' 100' 200'
SCALE: 1"=100'

FREEMAN ROAD PREDEVELOPED BASIN

OFFSITE					
	EX. ASPHALT	88,338	SF	2.03	AC
	FOREST	1,074,470	SF	24.67	AC
TOTAL		1,162,808	SF	26.69	AC

No.	Date	By	Ckd.	Appr.	Revision

Title: **PREDEVELOPED BASIN**
FREEMAN ROAD LOGISTICS

For: VECTOR DEVELOPMENT COMPANY
11335 NE 122ND WAY, SUITE 105
KIRKLAND, WA 98034

Scale: Horizontal 1"=100' Vertical N/A

Designed JSM
Drawn DTC
Checked JSM
Approved JSM
Date 7/8/21

Barghausen Consulting Engineers, Inc.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222
barghausen.com

Job Number 21585
Sheet 1 of 5

P:\21000s\21585\exhibit\21585-basin sepa.dwg 12/2/2024 3:43 PM DCASEY

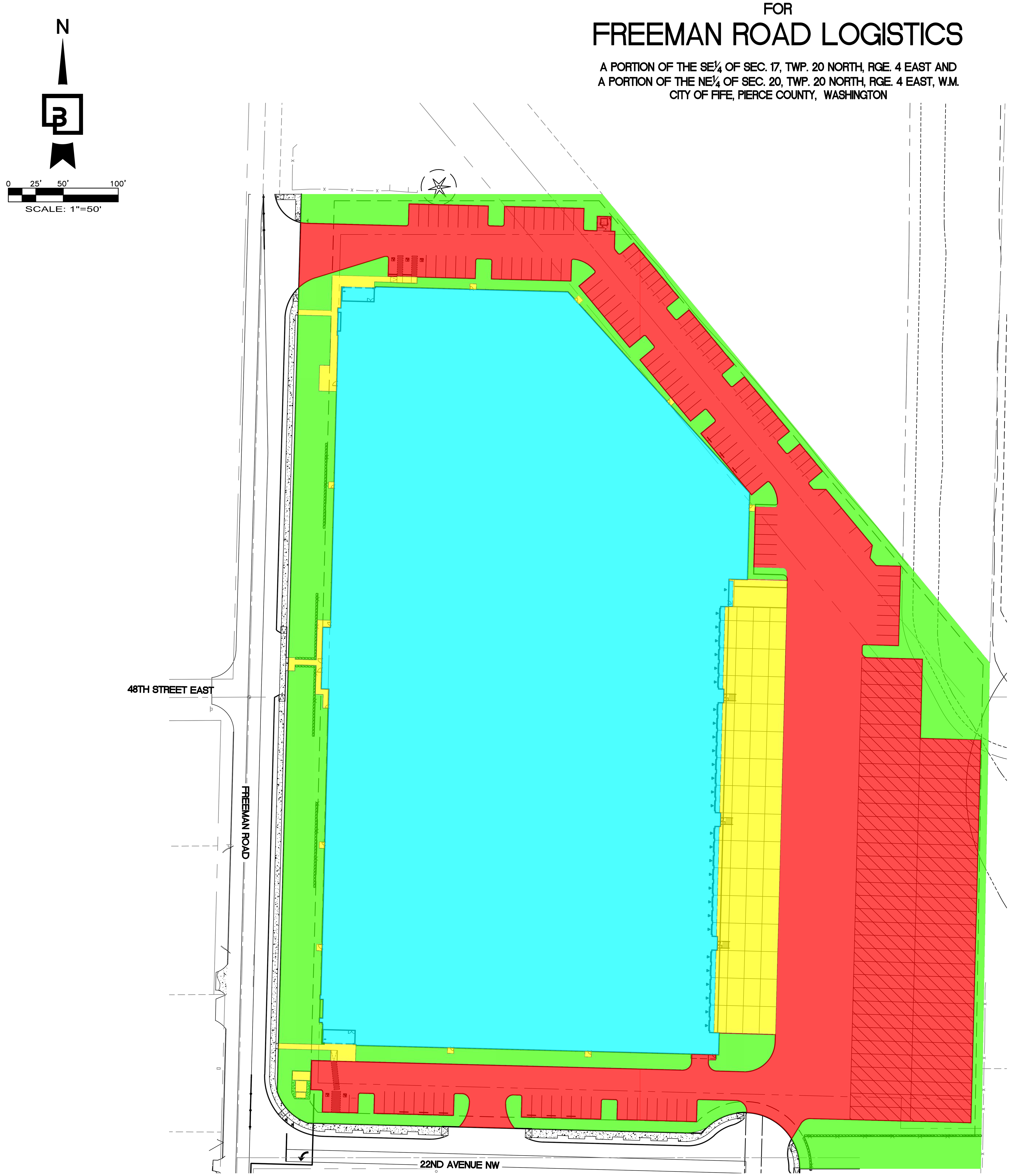
DEVELOPED BASIN - NORTH

FOR

FREEMAN ROAD LOGISTICS

A PORTION OF THE SE¼ OF SEC. 17, TWP. 20 NORTH, RGE. 4 EAST AND
A PORTION OF THE NE¼ OF SEC. 20, TWP. 20 NORTH, RGE. 4 EAST, W.M.
CITY OF FIFE, PIERCE COUNTY, WASHINGTON

811 Know what's below. Call before you dig.



FREEMAN ROAD DEVELOPED BASIN - NORTH

NORTH	TRIBUTARY				
	BUILDING	237,615	SF	5.45	AC
	ASPHALT	135,854	SF	3.12	AC
	SIDEWALK	26,299	SF	0.60	AC
	TOTAL PAVEMENT	162,153	SF	3.72	AC
	LANDSCAPE	70,130	SF	1.61	AC
TOTAL		469,898	SF	10.79	AC

No.	Date	By	Ckd.	Appr.	Revision

Title: DEVELOPED BASIN - NORTH
FREEMAN ROAD LOGISTICS

For: VECTOR DEVELOPMENT COMPANY
11335 NE 122ND WAY, SUITE 105
KIRKLAND, WA 98034

Scale: Horizontal 1"=50' Vertical N/A

Designed JSM
Drawn DTC
Checked JSM
Approved JSM
Date 7/8/21

Barghausen Consulting Engineers, Inc.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222
barghausen.com

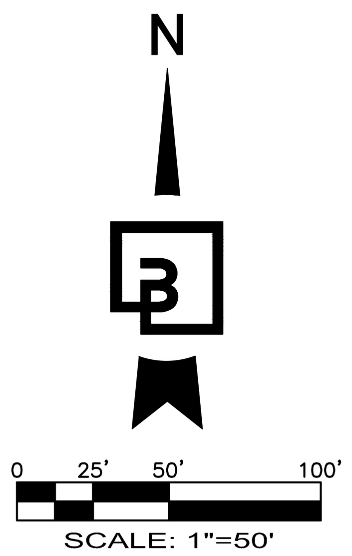
Job Number 21585

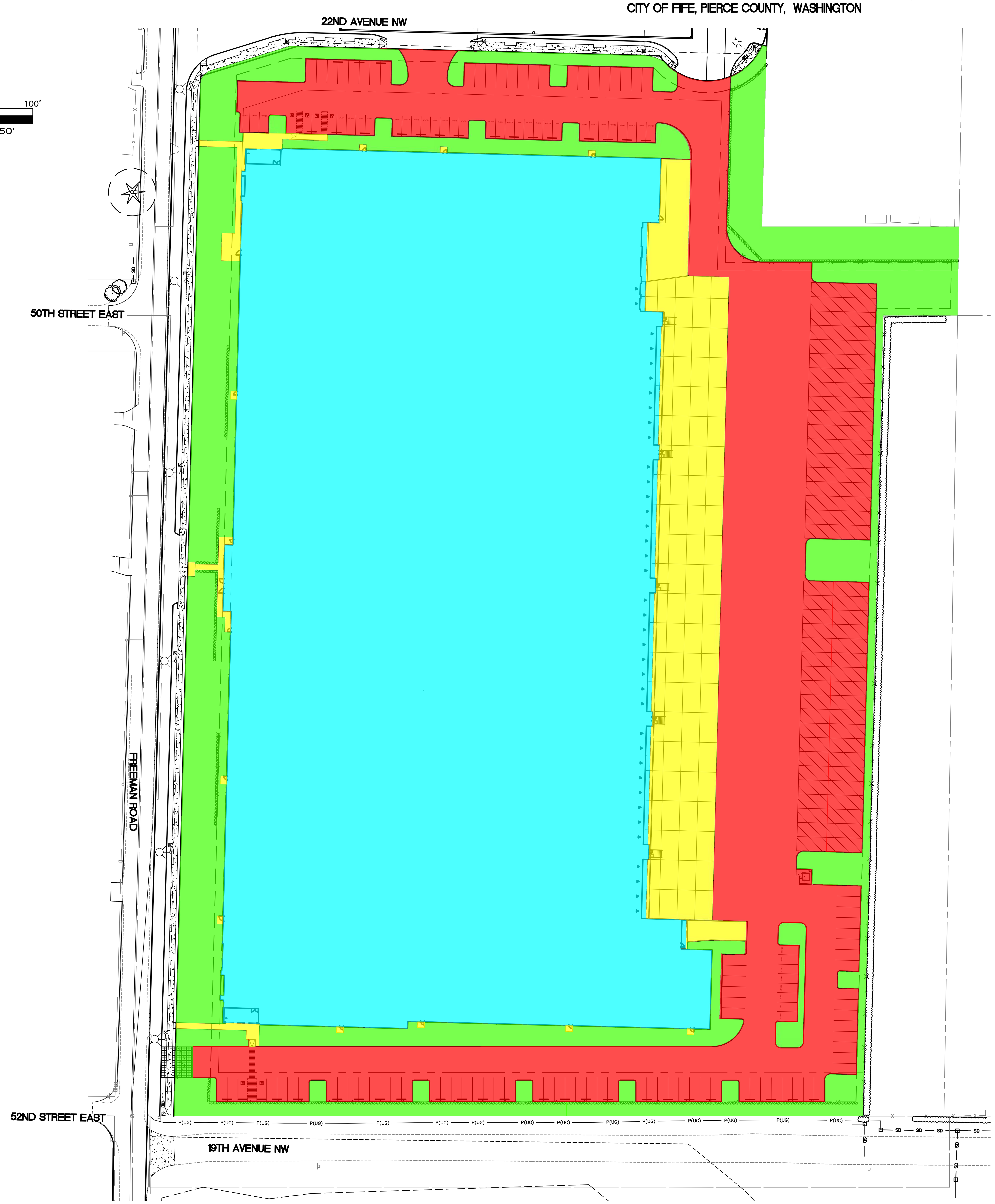
Sheet 2 of 5

P:\21000s\21585\exhibit\21585-basin sepo.dwg 12/2/2024 3:43 PM DCASEY

DEVELOPED BASIN - SOUTH
FOR
FREEMAN ROAD LOGISTICS

A PORTION OF THE SE¼ OF SEC. 17, TWP. 20 NORTH, RGE. 4 EAST AND
A PORTION OF THE NE¼ OF SEC. 20, TWP. 20 NORTH, RGE. 4 EAST, W.M.
CITY OF FIFE, PIERCE COUNTY, WASHINGTON





Know what's below. Call before you dig.

FREEMAN ROAD DEVELOPED BASIN - SOUTH

SOUTH	TRIBUTARY				
	BUILDING	266,408	SF	6.12	AC
	ASPHALT	126,514	SF	2.90	AC
	SIDEWALK	43,669	SF	1.00	AC
	TOTAL PAVEMENT	170,183	SF	3.91	AC
	LANDSCAPE	79,032	SF	1.81	AC
TOTAL		515,623	SF	11.84	AC

No. Date By Ckd. Appr. Revision

Title: DEVELOPED BASIN - SOUTH
FREEMAN ROAD LOGISTICS

For: VECTOR DEVELOPMENT COMPANY
11335 NE 122ND WAY, SUITE 105
KIRKLAND, WA 98034

Scale: Horizontal 1"=50' Vertical N/A

Designed JSM
Drawn DTC
Checked JSM
Approved JSM
Date 7/8/21

Barghausen Consulting Engineers, Inc.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222
barghausen.com

Job Number 21585

Sheet 3 of 5

P:\21000s\21585\exhibit\21585-basin sepa.dwg 12/2/2024 3:43 PM DCASEY

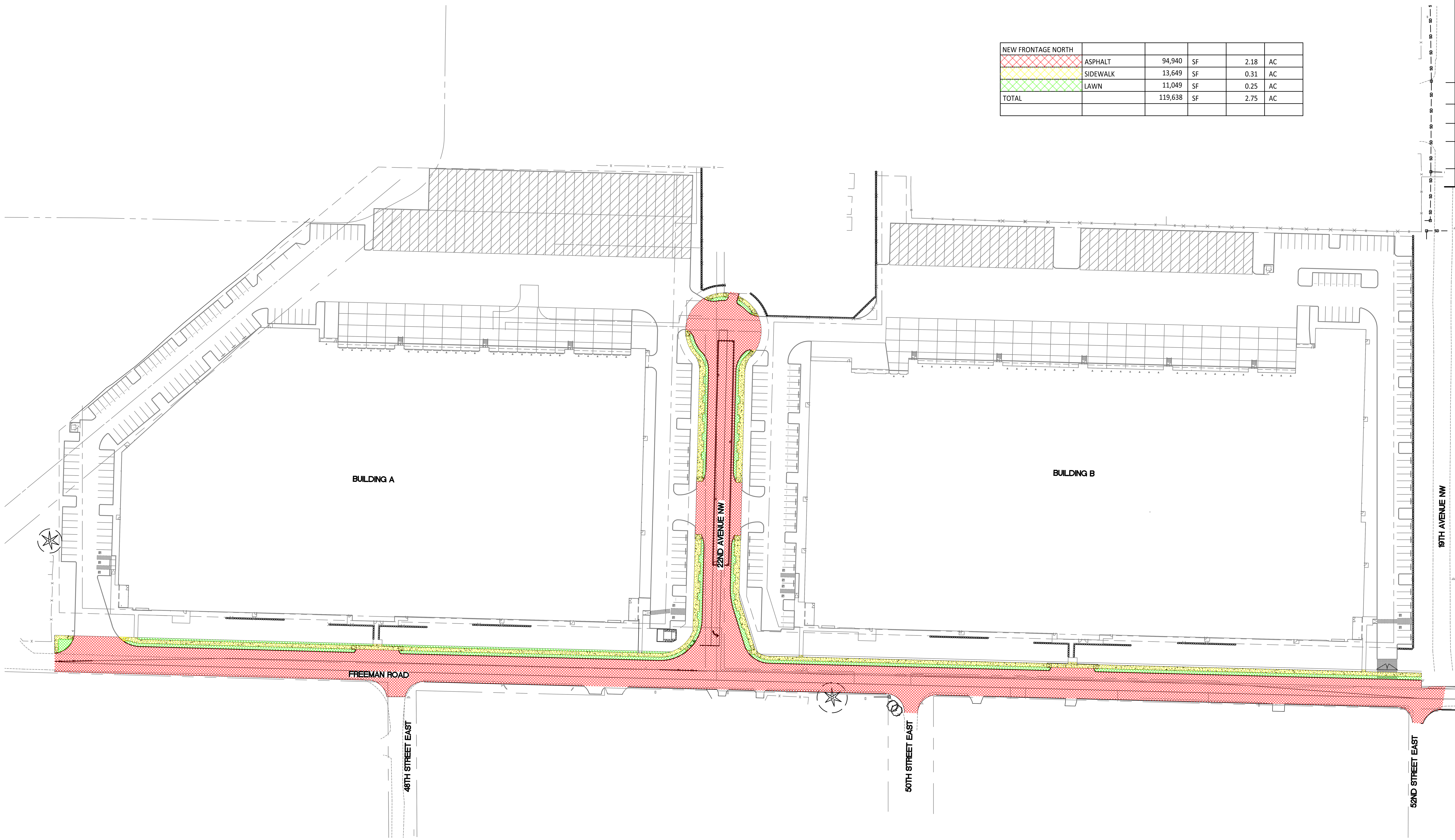
DEVELOPED BASIN - OFFSITE
FOR
FREEMAN ROAD LOGISTICS

A PORTION OF THE SE¼ OF SEC. 17, TWP. 20 NORTH, RGE. 4 EAST AND
A PORTION OF THE NE¼ OF SEC. 20, TWP. 20 NORTH, RGE. 4 EAST, W.M.
CITY OF FIFE, PIERCE COUNTY, WASHINGTON

SCALE: 1"=60'

Know what's below. Call before you dig.

NEW FRONTAGE NORTH					
	ASPHALT	94,940	SF	2.18	AC
	SIDEWALK	13,649	SF	0.31	AC
	LAWN	11,049	SF	0.25	AC
TOTAL		119,638	SF	2.75	AC



Title: DEVELOPED BASIN - OFFSITE
FREEMAN ROAD LOGISTICS

For: VECTOR DEVELOPMENT COMPANY
11335 NE 122ND WAY, SUITE 105
KIRKLAND, WA 98034

Scale: Horizontal 1"=60' Vertical N/A

Designed JSM
Drawn DTC
Checked JSM
Approved JSM
Date 7/8/21

Barghausen Consulting Engineers, Inc.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222
barghausen.com

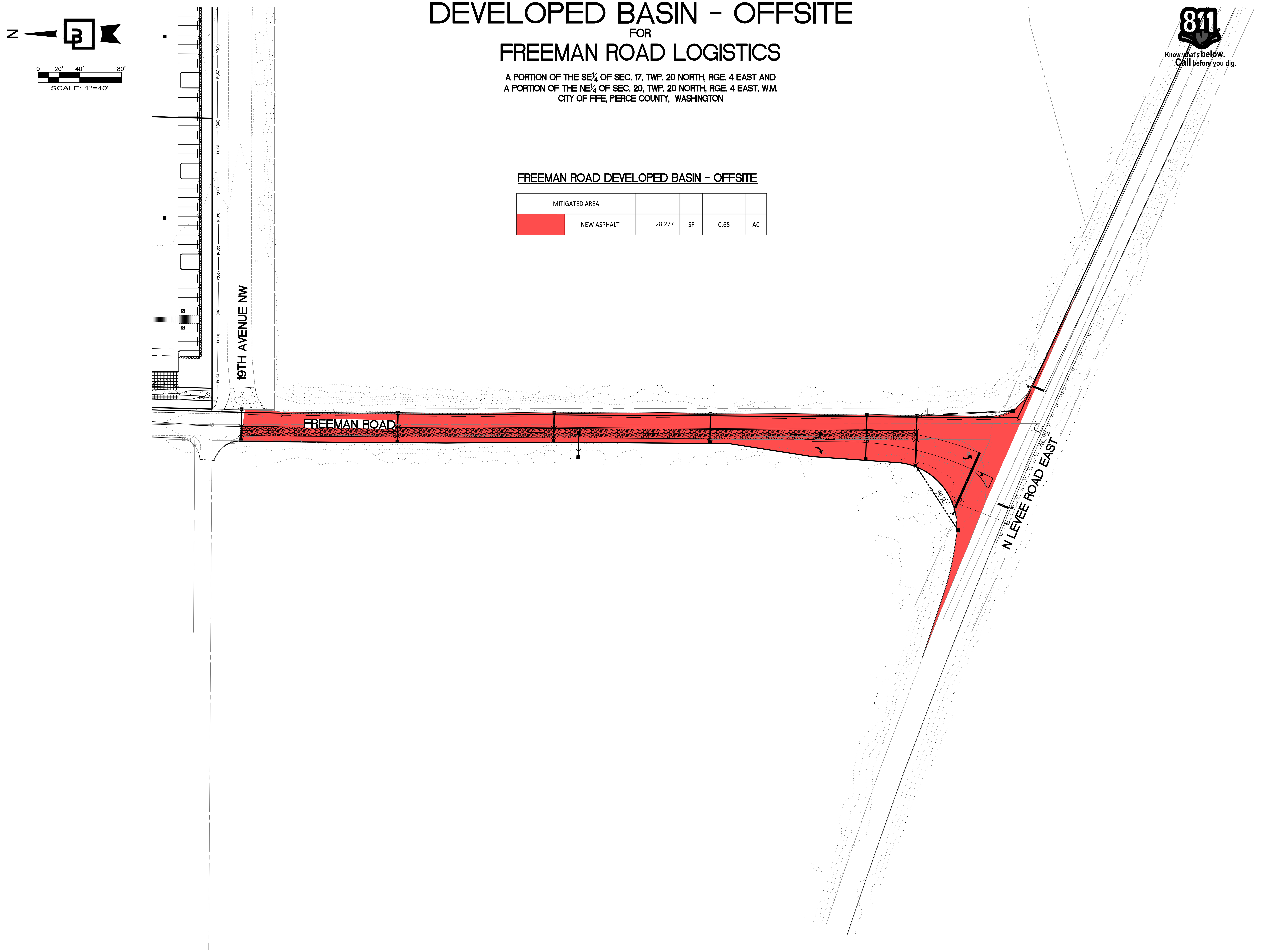
Job Number 21585

Sheet 4 of 5

P:\21000s\21585\exhibit\21585-basin sepo.dwg 12/2/2024 3:43 PM DCASEY

DEVELOPED BASIN - OFFSITE
FOR
FREEMAN ROAD LOGISTICS

A PORTION OF THE SE¼ OF SEC. 17, TWP. 20 NORTH, RGE. 4 EAST AND
A PORTION OF THE NE¼ OF SEC. 20, TWP. 20 NORTH, RGE. 4 EAST, W.M.
CITY OF FIFE, PIERCE COUNTY, WASHINGTON



FREEMAN ROAD DEVELOPED BASIN - OFFSITE

MITIGATED AREA					
	NEW ASPHALT	28,277	SF	0.65	AC

Title: DEVELOPED BASIN - OFFSITE
FREEMAN ROAD LOGISTICS

For: VECTOR DEVELOPMENT COMPANY
11335 NE 122ND WAY, SUITE 105
KIRKLAND, WA 98034

Barghausen Consulting Engineers, Inc.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222
barghausen.com

Designed JSM
Drawn DTC
Checked JSM
Approved JSM
Date 7/8/21

Scale: Horizontal 1"=40' Vertical N/A

Job Number 21585
Sheet 5 of 8

FLOW CONTROL AND WATER QUALITY CALCULATIONS

WWHM2012

PROJECT REPORT

FLOW CONTROL AND WATER
QUALITY CALCULATIONS
NORTHERN ONSITE BASIN
FREEMAN LOGISTICS
BCE JOB #21585

General Model Information

WWHM2012 Project Name: 21585-CALC-DRNG-NORTH-DETN-2024-08-13

Site Name:	FREEMAN ROAD LOGISTICS
Site Address:	
City:	PUYALLUP
Report Date:	9/24/2024
Gage:	42 IN EAST
Data Start:	10/01/1901
Data End:	09/30/2059
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2024/06/28
Version:	4.3.1

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data

Predeveloped Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Flat	10.78
Pervious Total	10.78
Impervious Land Use	acre
Impervious Total	0
Basin Total	10.78

Element Flow Componants:

Surface	Interflow	Groundwater
Componant Flows To:		
POC 1	POC 1	

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Lawn, Flat	1.61
Pervious Total	1.61
Impervious Land Use	acre
ROOF TOPS FLAT	5.45
SIDEWALKS FLAT	0.6
PARKING FLAT	3.12
Impervious Total	9.17
Basin Total	10.78

Element Flow Componants:

Surface	Interflow	Groundwater
Componant Flows To:		
Vault 1	Vault 1	

Mitigated Routing

Vault 1

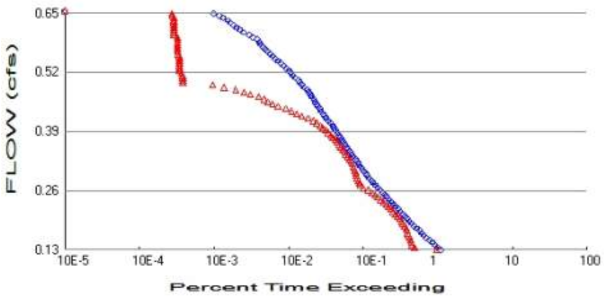
Width:	100 ft.
Length:	355 ft.
Depth:	7.5 ft.
Discharge Structure	
Riser Height:	6.5 ft.
Riser Diameter:	18 in.
Orifice 1 Diameter:	1.540 in. Elevation:0 ft.
Orifice 2 Diameter:	2.310 in. Elevation:4.43 ft.
Orifice 3 Diameter:	1.990 in. Elevation:5.17 ft.
Element Outlets:	
Outlet 1	Outlet 2
Outlet Flows To:	

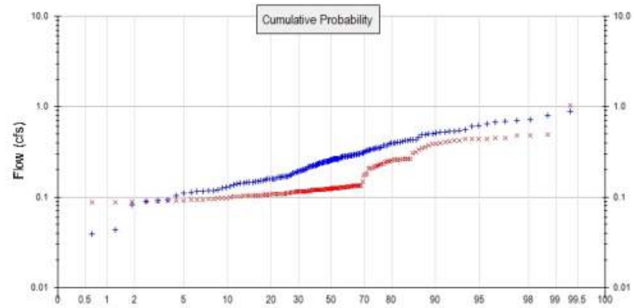
Vault Hydraulic Table

Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**Infilt(cfs)**
0.0000	0.815	0.000	0.000	0.000
0.0833	0.815	0.067	0.018	0.000
0.1667	0.815	0.135	0.026	0.000
0.2500	0.815	0.203	0.032	0.000
0.3333	0.815	0.271	0.037	0.000
0.4167	0.815	0.339	0.041	0.000
0.5000	0.815	0.407	0.045	0.000
0.5833	0.815	0.475	0.049	0.000
0.6667	0.815	0.543	0.052	0.000
0.7500	0.815	0.611	0.055	0.000
0.8333	0.815	0.679	0.058	0.000
0.9167	0.815	0.747	0.061	0.000
1.0000	0.815	0.815	0.064	0.000
1.0833	0.815	0.882	0.067	0.000
1.1667	0.815	0.950	0.069	0.000
1.2500	0.815	1.018	0.072	0.000
1.3333	0.815	1.086	0.074	0.000
1.4167	0.815	1.154	0.076	0.000
1.5000	0.815	1.222	0.078	0.000
1.5833	0.815	1.290	0.081	0.000
1.6667	0.815	1.358	0.083	0.000
1.7500	0.815	1.426	0.085	0.000
1.8333	0.815	1.494	0.087	0.000
1.9167	0.815	1.562	0.089	0.000
2.0000	0.815	1.629	0.091	0.000
2.0833	0.815	1.697	0.092	0.000
2.1667	0.815	1.765	0.094	0.000
2.2500	0.815	1.833	0.096	0.000
2.3333	0.815	1.901	0.098	0.000
2.4167	0.815	1.969	0.100	0.000
2.5000	0.815	2.037	0.101	0.000
2.5833	0.815	2.105	0.103	0.000
2.6667	0.815	2.173	0.105	0.000
2.7500	0.815	2.241	0.106	0.000
2.8333	0.815	2.309	0.108	0.000
2.9167	0.815	2.377	0.109	0.000
3.0000	0.815	2.444	0.111	0.000

3.0833	0.815	2.512	0.113	0.000
3.1667	0.815	2.580	0.114	0.000
3.2500	0.815	2.648	0.116	0.000
3.3333	0.815	2.716	0.117	0.000
3.4167	0.815	2.784	0.119	0.000
3.5000	0.815	2.852	0.120	0.000
3.5833	0.815	2.920	0.121	0.000
3.6667	0.815	2.988	0.123	0.000
3.7500	0.815	3.056	0.124	0.000
3.8333	0.815	3.124	0.126	0.000
3.9167	0.815	3.192	0.127	0.000
4.0000	0.815	3.259	0.128	0.000
4.0833	0.815	3.327	0.130	0.000
4.1667	0.815	3.395	0.131	0.000
4.2500	0.815	3.463	0.132	0.000
4.3333	0.815	3.531	0.134	0.000
4.4167	0.815	3.599	0.135	0.000
4.5000	0.815	3.667	0.174	0.000
4.5833	0.815	3.735	0.194	0.000
4.6667	0.815	3.803	0.209	0.000
4.7500	0.815	3.871	0.222	0.000
4.8333	0.815	3.939	0.233	0.000
4.9167	0.815	4.006	0.243	0.000
5.0000	0.815	4.074	0.253	0.000
5.0833	0.815	4.142	0.262	0.000
5.1667	0.815	4.210	0.270	0.000
5.2500	0.815	4.278	0.309	0.000
5.3333	0.815	4.346	0.329	0.000
5.4167	0.815	4.414	0.347	0.000
5.5000	0.815	4.482	0.362	0.000
5.5833	0.815	4.550	0.376	0.000
5.6667	0.815	4.618	0.390	0.000
5.7500	0.815	4.686	0.402	0.000
5.8333	0.815	4.754	0.414	0.000
5.9167	0.815	4.821	0.426	0.000
6.0000	0.815	4.889	0.437	0.000
6.0833	0.815	4.957	0.447	0.000
6.1667	0.815	5.025	0.457	0.000
6.2500	0.815	5.093	0.467	0.000
6.3333	0.815	5.161	0.477	0.000
6.4167	0.815	5.229	0.487	0.000
6.5000	0.815	5.297	0.496	0.000
6.5833	0.815	5.365	0.887	0.000
6.6667	0.815	5.433	1.588	0.000
6.7500	0.815	5.501	2.461	0.000
6.8333	0.815	5.568	3.413	0.000
6.9167	0.815	5.636	4.352	0.000
7.0000	0.815	5.704	5.186	0.000
7.0833	0.815	5.772	5.849	0.000
7.1667	0.815	5.840	6.318	0.000
7.2500	0.815	5.908	6.643	0.000
7.3333	0.815	5.976	7.048	0.000
7.4167	0.815	6.044	7.371	0.000
7.5000	0.815	6.112	7.680	0.000
7.5833	0.815	6.180	7.977	0.000
7.6667	0.000	0.000	8.263	0.000

Analysis Results
POC 1





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 10.78
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 1.61
Total Impervious Area: 9.17

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.259602
5 year	0.398289
10 year	0.48347
25 year	0.581891
50 year	0.648562
100 year	0.709894

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.142619
5 year	0.227599
10 year	0.304305
25 year	0.430264
50 year	0.549413
100 year	0.694305

WATER QUALITY DESIGN FLOW RATE
EQUAL TO 2 YEAR RELEASE RATE
DOWNSTREAM OF DETENTION

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1902	0.249	0.126
1903	0.159	0.098
1904	0.293	0.116
1905	0.139	0.179
1906	0.082	0.087
1907	0.405	0.122
1908	0.286	0.104
1909	0.278	0.124
1910	0.395	0.124
1911	0.257	0.119

1912	0.894	0.134
1913	0.400	0.261
1914	0.104	0.089
1915	0.178	0.222
1916	0.259	0.114
1917	0.091	0.108
1918	0.267	0.350
1919	0.225	0.116
1920	0.263	0.119
1921	0.288	0.172
1922	0.281	0.121
1923	0.230	0.217
1924	0.114	0.109
1925	0.151	0.106
1926	0.248	0.115
1927	0.205	0.120
1928	0.196	0.128
1929	0.392	0.211
1930	0.253	0.120
1931	0.247	0.125
1932	0.184	0.148
1933	0.217	0.126
1934	0.517	0.445
1935	0.243	0.309
1936	0.234	0.129
1937	0.351	0.116
1938	0.222	0.121
1939	0.024	0.089
1940	0.243	0.180
1941	0.158	0.092
1942	0.368	0.447
1943	0.174	0.125
1944	0.393	0.263
1945	0.293	0.123
1946	0.165	0.102
1947	0.131	0.109
1948	0.545	0.126
1949	0.485	0.315
1950	0.155	0.111
1951	0.199	0.108
1952	0.697	0.337
1953	0.645	0.441
1954	0.236	0.133
1955	0.206	0.100
1956	0.117	0.101
1957	0.342	0.230
1958	0.680	0.484
1959	0.423	0.454
1960	0.119	0.093
1961	0.430	0.440
1962	0.243	0.130
1963	0.114	0.090
1964	0.136	0.103
1965	0.486	0.402
1966	0.149	0.115
1967	0.218	0.103
1968	0.239	0.135
1969	0.221	0.122

1970	0.339	0.128
1971	0.507	0.388
1972	0.333	0.129
1973	0.435	0.258
1974	0.235	0.119
1975	0.528	0.478
1976	0.291	0.126
1977	0.146	0.089
1978	0.464	0.396
1979	0.143	0.111
1980	0.280	0.120
1981	0.267	0.130
1982	0.145	0.092
1983	0.428	0.218
1984	0.200	0.113
1985	0.320	0.116
1986	0.264	0.134
1987	0.496	0.370
1988	0.309	0.245
1989	0.284	0.114
1990	0.334	0.121
1991	0.264	0.128
1992	0.326	0.352
1993	0.346	0.120
1994	0.505	0.129
1995	0.124	0.118
1996	0.552	0.426
1997	0.248	0.105
1998	0.281	0.121
1999	0.039	0.104
2000	0.213	0.135
2001	0.111	0.087
2002	0.374	0.121
2003	0.325	0.129
2004	0.277	0.124
2005	0.535	0.131
2006	0.169	0.114
2007	0.186	0.123
2008	0.282	0.120
2009	0.192	0.115
2010	0.165	0.233
2011	0.151	0.109
2012	0.257	0.115
2013	0.165	0.092
2014	0.118	0.094
2015	0.228	0.109
2016	0.093	0.109
2017	0.373	0.265
2018	0.685	0.494
2019	0.723	0.436
2020	0.217	0.106
2021	0.354	0.266
2022	0.150	0.104
2023	0.298	0.131
2024	0.801	0.119
2025	0.265	0.126
2026	0.425	0.257
2027	0.168	0.110

2028	0.143	0.093
2029	0.283	0.251
2030	0.521	0.228
2031	0.168	0.098
2032	0.116	0.096
2033	0.158	0.100
2034	0.159	0.109
2035	0.609	1.026
2036	0.313	0.135
2037	0.090	0.103
2038	0.263	0.246
2039	0.043	0.082
2040	0.159	0.112
2041	0.188	0.104
2042	0.615	0.426
2043	0.297	0.261
2044	0.387	0.248
2045	0.256	0.210
2046	0.300	0.386
2047	0.224	0.135
2048	0.297	0.120
2049	0.267	0.124
2050	0.193	0.117
2051	0.308	0.126
2052	0.168	0.122
2053	0.287	0.410
2054	0.348	0.266
2055	0.144	0.097
2056	0.129	0.105
2057	0.198	0.129
2058	0.246	0.208
2059	0.411	0.203

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.8944	1.0261
2	0.8013	0.4944
3	0.7232	0.4843
4	0.6971	0.4783
5	0.6846	0.4539
6	0.6798	0.4475
7	0.6446	0.4447
8	0.6147	0.4413
9	0.6093	0.4400
10	0.5521	0.4362
11	0.5453	0.4256
12	0.5349	0.4255
13	0.5284	0.4095
14	0.5207	0.4021
15	0.5169	0.3957
16	0.5075	0.3878
17	0.5054	0.3860
18	0.4957	0.3702
19	0.4860	0.3523
20	0.4854	0.3502
21	0.4642	0.3368
22	0.4350	0.3153

23	0.4302	0.3093
24	0.4283	0.2662
25	0.4248	0.2660
26	0.4232	0.2648
27	0.4106	0.2632
28	0.4054	0.2611
29	0.4003	0.2608
30	0.3948	0.2581
31	0.3927	0.2569
32	0.3925	0.2512
33	0.3872	0.2479
34	0.3743	0.2458
35	0.3729	0.2450
36	0.3684	0.2332
37	0.3541	0.2304
38	0.3508	0.2280
39	0.3484	0.2220
40	0.3463	0.2178
41	0.3421	0.2170
42	0.3392	0.2108
43	0.3345	0.2104
44	0.3333	0.2079
45	0.3261	0.2028
46	0.3251	0.1797
47	0.3203	0.1786
48	0.3129	0.1722
49	0.3086	0.1481
50	0.3082	0.1348
51	0.3000	0.1348
52	0.2977	0.1347
53	0.2973	0.1345
54	0.2971	0.1342
55	0.2928	0.1336
56	0.2926	0.1334
57	0.2906	0.1312
58	0.2884	0.1311
59	0.2868	0.1303
60	0.2857	0.1301
61	0.2836	0.1295
62	0.2832	0.1293
63	0.2817	0.1291
64	0.2810	0.1290
65	0.2808	0.1285
66	0.2797	0.1284
67	0.2778	0.1281
68	0.2774	0.1279
69	0.2672	0.1262
70	0.2667	0.1262
71	0.2666	0.1260
72	0.2654	0.1259
73	0.2640	0.1257
74	0.2636	0.1256
75	0.2632	0.1253
76	0.2630	0.1248
77	0.2591	0.1245
78	0.2571	0.1241
79	0.2568	0.1239
80	0.2556	0.1236

81	0.2525	0.1232
82	0.2490	0.1229
83	0.2485	0.1219
84	0.2477	0.1218
85	0.2470	0.1215
86	0.2462	0.1215
87	0.2428	0.1214
88	0.2427	0.1210
89	0.2426	0.1209
90	0.2387	0.1206
91	0.2360	0.1205
92	0.2348	0.1203
93	0.2344	0.1203
94	0.2299	0.1202
95	0.2278	0.1199
96	0.2250	0.1196
97	0.2244	0.1193
98	0.2218	0.1190
99	0.2214	0.1190
100	0.2184	0.1187
101	0.2175	0.1177
102	0.2168	0.1175
103	0.2132	0.1161
104	0.2055	0.1158
105	0.2050	0.1157
106	0.2003	0.1155
107	0.1992	0.1150
108	0.1977	0.1150
109	0.1955	0.1147
110	0.1933	0.1146
111	0.1919	0.1145
112	0.1880	0.1145
113	0.1855	0.1138
114	0.1845	0.1133
115	0.1777	0.1125
116	0.1738	0.1112
117	0.1686	0.1109
118	0.1682	0.1098
119	0.1680	0.1090
120	0.1676	0.1090
121	0.1650	0.1089
122	0.1646	0.1088
123	0.1645	0.1086
124	0.1594	0.1086
125	0.1592	0.1083
126	0.1586	0.1077
127	0.1578	0.1063
128	0.1576	0.1057
129	0.1554	0.1054
130	0.1515	0.1053
131	0.1506	0.1044
132	0.1499	0.1044
133	0.1487	0.1038
134	0.1461	0.1036
135	0.1451	0.1032
136	0.1445	0.1031
137	0.1431	0.1030
138	0.1428	0.1023

139	0.1387	0.1014
140	0.1359	0.1005
141	0.1309	0.1002
142	0.1289	0.0978
143	0.1242	0.0975
144	0.1189	0.0973
145	0.1181	0.0956
146	0.1166	0.0944
147	0.1160	0.0934
148	0.1139	0.0925
149	0.1138	0.0922
150	0.1105	0.0919
151	0.1037	0.0915
152	0.0932	0.0903
153	0.0909	0.0894
154	0.0895	0.0889
155	0.0822	0.0889
156	0.0434	0.0875
157	0.0388	0.0871
158	0.0245	0.0823

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.1298	60941	52797	86	Pass
0.1350	55063	26686	48	Pass
0.1403	50592	25063	49	Pass
0.1455	46531	24421	52	Pass
0.1508	42841	23772	55	Pass
0.1560	38958	23085	59	Pass
0.1612	36121	22515	62	Pass
0.1665	33517	21922	65	Pass
0.1717	31019	21401	68	Pass
0.1770	28742	20775	72	Pass
0.1822	26398	19667	74	Pass
0.1874	24626	18842	76	Pass
0.1927	22980	18050	78	Pass
0.1979	21490	17052	79	Pass
0.2032	19867	15811	79	Pass
0.2084	18631	14919	80	Pass
0.2136	17374	13922	80	Pass
0.2189	16183	12986	80	Pass
0.2241	14936	11950	80	Pass
0.2294	13972	11119	79	Pass
0.2346	13080	10321	78	Pass
0.2398	12255	9540	77	Pass
0.2451	11324	8615	76	Pass
0.2503	10626	7911	74	Pass
0.2556	9933	7230	72	Pass
0.2608	9280	6482	69	Pass
0.2660	8537	5546	64	Pass
0.2713	7994	4996	62	Pass
0.2765	7468	4858	65	Pass
0.2818	7019	4748	67	Pass
0.2870	6554	4607	70	Pass
0.2922	6221	4476	71	Pass
0.2975	5917	4376	73	Pass
0.3027	5623	4292	76	Pass
0.3080	5319	4206	79	Pass
0.3132	5022	4049	80	Pass
0.3184	4782	3918	81	Pass
0.3237	4553	3778	82	Pass
0.3289	4327	3631	83	Pass
0.3342	4078	3408	83	Pass
0.3394	3874	3230	83	Pass
0.3446	3678	3075	83	Pass
0.3499	3469	2935	84	Pass
0.3551	3286	2758	83	Pass
0.3604	3137	2618	83	Pass
0.3656	2992	2478	82	Pass
0.3708	2845	2328	81	Pass
0.3761	2684	2153	80	Pass
0.3813	2581	2024	78	Pass
0.3866	2461	1872	76	Pass
0.3918	2371	1726	72	Pass
0.3970	2239	1582	70	Pass
0.4023	2143	1473	68	Pass

0.4075	2004	1315	65	Pass
0.4128	1886	1180	62	Pass
0.4180	1757	1005	57	Pass
0.4232	1674	832	49	Pass
0.4285	1590	707	44	Pass
0.4337	1514	606	40	Pass
0.4390	1440	503	34	Pass
0.4442	1356	396	29	Pass
0.4494	1301	336	25	Pass
0.4547	1240	292	23	Pass
0.4599	1194	260	21	Pass
0.4652	1120	218	19	Pass
0.4704	1077	170	15	Pass
0.4756	1029	139	13	Pass
0.4809	980	108	11	Pass
0.4861	896	76	8	Pass
0.4914	839	53	6	Pass
0.4966	786	21	2	Pass
0.5018	744	21	2	Pass
0.5071	678	21	3	Pass
0.5123	632	21	3	Pass
0.5176	590	20	3	Pass
0.5228	559	19	3	Pass
0.5280	510	19	3	Pass
0.5333	475	19	4	Pass
0.5385	436	19	4	Pass
0.5438	396	19	4	Pass
0.5490	367	19	5	Pass
0.5542	341	19	5	Pass
0.5595	310	18	5	Pass
0.5647	286	18	6	Pass
0.5700	267	18	6	Pass
0.5752	247	18	7	Pass
0.5804	234	18	7	Pass
0.5857	222	18	8	Pass
0.5909	208	18	8	Pass
0.5962	183	18	9	Pass
0.6014	163	16	9	Pass
0.6066	139	16	11	Pass
0.6119	122	16	13	Pass
0.6171	110	16	14	Pass
0.6224	102	16	15	Pass
0.6276	92	16	17	Pass
0.6328	85	16	18	Pass
0.6381	73	16	21	Pass
0.6433	64	15	23	Pass
0.6486	55	15	27	Pass

Appendix
Predeveloped Schematic

Mitigated Schematic

Disclaimer

Legal Notice

This program and accompanying documentation are provided 'as-is' without warranty of any kind. The entire risk regarding the performance and results of this program is assumed by End User. Clear Creek Solutions Inc. and the governmental licensee or sublicensees disclaim all warranties, either expressed or implied, including but not limited to implied warranties of program and accompanying documentation. In no event shall Clear Creek Solutions Inc. be liable for any damages whatsoever (including without limitation to damages for loss of business profits, loss of business information, business interruption, and the like) arising out of the use of, or inability to use this program even if Clear Creek Solutions Inc. or their authorized representatives have been advised of the possibility of such damages.

Clear Creek Solutions, Inc.
6200 Capitol Blvd. Ste F
Olympia, WA. 98501
Toll Free 1(866)943-0304
Local (360)943-0304

www.clearcreeksolutions.com

WWHM2012

PROJECT REPORT

FLOW CONTROL AND WATER
QUALITY CALCULATIONS
SOUTHERN ONSITE BASIN
FREEMAN LOGISTICS
BCE JOB #21585

General Model Information

WWHM2012 Project Name: 21585-CALC-DRNG-SOUTH-DETN-2024-08-13

Site Name:	FREEMAN ROAD LOGISTICS
Site Address:	
City:	PUYALLUP
Report Date:	8/13/2024
Gage:	42 IN EAST
Data Start:	1901/10/01 00:00
Data End:	2059/09/30 00:00
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2023/01/27
Version:	4.2.19

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data

Predeveloped Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Flat	11.84
Pervious Total	11.84
Impervious Land Use	acre
Impervious Total	0
Basin Total	11.84

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Lawn, Flat	1.82
Pervious Total	1.82
Impervious Land Use	acre
ROOF TOPS FLAT	6.12
SIDEWALKS FLAT	1
PARKING FLAT	2.9
Impervious Total	10.02
Basin Total	11.84

Mitigated Routing

Vault 1

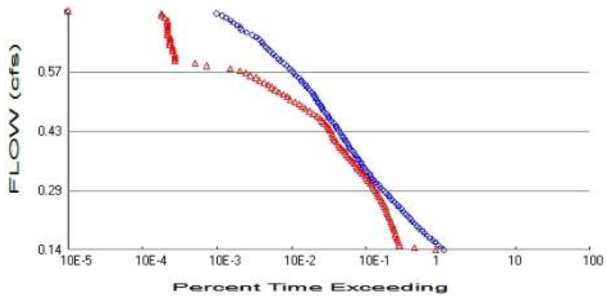
Width:	120 ft.
Length:	335 ft.
Depth:	7.5 ft.
Discharge Structure	
Riser Height:	6.5 ft.
Riser Diameter:	18 in.
Orifice 1 Diameter:	1.590 in. Elevation:0 ft.
Orifice 2 Diameter:	3.110 in. Elevation:4.87 ft.
Orifice 3 Diameter:	1.860 in. Elevation:5.66 ft.
Element Flows To:	
Outlet 1	Outlet 2

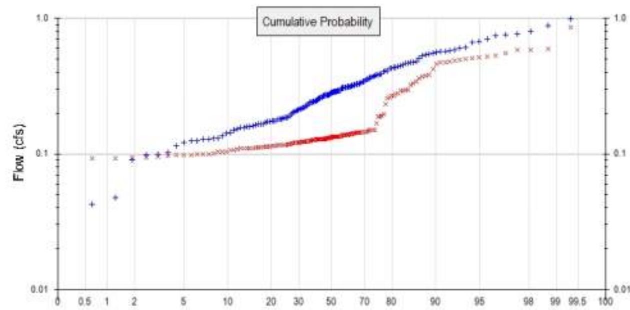
Vault Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.922	0.000	0.000	0.000
0.0833	0.922	0.076	0.019	0.000
0.1667	0.922	0.153	0.028	0.000
0.2500	0.922	0.230	0.034	0.000
0.3333	0.922	0.307	0.039	0.000
0.4167	0.922	0.384	0.044	0.000
0.5000	0.922	0.461	0.048	0.000
0.5833	0.922	0.538	0.052	0.000
0.6667	0.922	0.615	0.056	0.000
0.7500	0.922	0.692	0.059	0.000
0.8333	0.922	0.769	0.062	0.000
0.9167	0.922	0.846	0.065	0.000
1.0000	0.922	0.922	0.068	0.000
1.0833	0.922	0.999	0.071	0.000
1.1667	0.922	1.076	0.074	0.000
1.2500	0.922	1.153	0.076	0.000
1.3333	0.922	1.230	0.079	0.000
1.4167	0.922	1.307	0.081	0.000
1.5000	0.922	1.384	0.084	0.000
1.5833	0.922	1.461	0.086	0.000
1.6667	0.922	1.538	0.088	0.000
1.7500	0.922	1.615	0.090	0.000
1.8333	0.922	1.691	0.092	0.000
1.9167	0.922	1.768	0.095	0.000
2.0000	0.922	1.845	0.097	0.000
2.0833	0.922	1.922	0.099	0.000
2.1667	0.922	1.999	0.101	0.000
2.2500	0.922	2.076	0.102	0.000
2.3333	0.922	2.153	0.104	0.000
2.4167	0.922	2.230	0.106	0.000
2.5000	0.922	2.307	0.108	0.000
2.5833	0.922	2.384	0.110	0.000
2.6667	0.922	2.461	0.112	0.000
2.7500	0.922	2.537	0.113	0.000
2.8333	0.922	2.614	0.115	0.000
2.9167	0.922	2.691	0.117	0.000
3.0000	0.922	2.768	0.118	0.000
3.0833	0.922	2.845	0.120	0.000

3.1667	0.922	2.922	0.122	0.000
3.2500	0.922	2.999	0.123	0.000
3.3333	0.922	3.076	0.125	0.000
3.4167	0.922	3.153	0.126	0.000
3.5000	0.922	3.230	0.128	0.000
3.5833	0.922	3.306	0.129	0.000
3.6667	0.922	3.383	0.131	0.000
3.7500	0.922	3.460	0.132	0.000
3.8333	0.922	3.537	0.134	0.000
3.9167	0.922	3.614	0.135	0.000
4.0000	0.922	3.691	0.137	0.000
4.0833	0.922	3.768	0.138	0.000
4.1667	0.922	3.845	0.140	0.000
4.2500	0.922	3.922	0.141	0.000
4.3333	0.922	3.999	0.142	0.000
4.4167	0.922	4.076	0.144	0.000
4.5000	0.922	4.152	0.145	0.000
4.5833	0.922	4.229	0.146	0.000
4.6667	0.922	4.306	0.148	0.000
4.7500	0.922	4.383	0.149	0.000
4.8333	0.922	4.460	0.150	0.000
4.9167	0.922	4.537	0.208	0.000
5.0000	0.922	4.614	0.248	0.000
5.0833	0.922	4.691	0.275	0.000
5.1667	0.922	4.768	0.298	0.000
5.2500	0.922	4.845	0.319	0.000
5.3333	0.922	4.921	0.337	0.000
5.4167	0.922	4.998	0.353	0.000
5.5000	0.922	5.075	0.369	0.000
5.5833	0.922	5.152	0.383	0.000
5.6667	0.922	5.229	0.405	0.000
5.7500	0.922	5.306	0.438	0.000
5.8333	0.922	5.383	0.462	0.000
5.9167	0.922	5.460	0.483	0.000
6.0000	0.922	5.537	0.501	0.000
6.0833	0.922	5.614	0.519	0.000
6.1667	0.922	5.691	0.536	0.000
6.2500	0.922	5.767	0.552	0.000
6.3333	0.922	5.844	0.567	0.000
6.4167	0.922	5.921	0.581	0.000
6.5000	0.922	5.998	0.596	0.000
6.5833	0.922	6.075	0.992	0.000
6.6667	0.922	6.152	1.697	0.000
6.7500	0.922	6.229	2.574	0.000
6.8333	0.922	6.306	3.531	0.000
6.9167	0.922	6.383	4.473	0.000
7.0000	0.922	6.460	5.312	0.000
7.0833	0.922	6.537	5.979	0.000
7.1667	0.922	6.613	6.451	0.000
7.2500	0.922	6.690	6.779	0.000
7.3333	0.922	6.767	7.188	0.000
7.4167	0.922	6.844	7.515	0.000
7.5000	0.922	6.921	7.827	0.000
7.5833	0.922	6.998	8.127	0.000
7.6667	0.000	0.000	8.416	0.000

Analysis Results
POC 1





+ Predeveloped   x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 11.84
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 1.82
Total Impervious Area: 10.02

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.285129
5 year	0.437453
10 year	0.53101
25 year	0.639108
50 year	0.712335
100 year	0.779698

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.14914
5 year	0.240266
10 year	0.323133
25 year	0.460094
50 year	0.590415
100 year	0.749658

WATER QUALITY DESIGN FLOW RATE
EQUAL TO 2 YEAR RELEASE RATE
DOWNSTREAM OF DETENTION

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1902	0.274	0.133
1903	0.174	0.104
1904	0.322	0.124
1905	0.152	0.146
1906	0.090	0.093
1907	0.445	0.128
1908	0.314	0.112
1909	0.305	0.133
1910	0.434	0.130
1911	0.282	0.127

1912	0.982	0.143
1913	0.440	0.291
1914	0.114	0.095
1915	0.195	0.187
1916	0.285	0.123
1917	0.100	0.115
1918	0.293	0.379
1919	0.247	0.122
1920	0.289	0.126
1921	0.317	0.146
1922	0.308	0.130
1923	0.253	0.150
1924	0.125	0.116
1925	0.165	0.113
1926	0.272	0.123
1927	0.225	0.127
1928	0.215	0.138
1929	0.431	0.196
1930	0.277	0.128
1931	0.271	0.134
1932	0.203	0.145
1933	0.238	0.134
1934	0.568	0.551
1935	0.266	0.361
1936	0.257	0.140
1937	0.385	0.125
1938	0.244	0.129
1939	0.027	0.094
1940	0.267	0.146
1941	0.173	0.099
1942	0.405	0.525
1943	0.191	0.133
1944	0.431	0.255
1945	0.321	0.132
1946	0.181	0.110
1947	0.144	0.116
1948	0.599	0.133
1949	0.533	0.321
1950	0.171	0.118
1951	0.219	0.115
1952	0.766	0.331
1953	0.708	0.507
1954	0.259	0.141
1955	0.226	0.107
1956	0.128	0.108
1957	0.376	0.187
1958	0.747	0.583
1959	0.465	0.532
1960	0.131	0.100
1961	0.472	0.501
1962	0.267	0.140
1963	0.125	0.096
1964	0.149	0.110
1965	0.534	0.485
1966	0.163	0.121
1967	0.240	0.110
1968	0.262	0.144
1969	0.243	0.130

1970	0.372	0.135
1971	0.557	0.420
1972	0.366	0.137
1973	0.478	0.280
1974	0.258	0.127
1975	0.580	0.594
1976	0.319	0.135
1977	0.160	0.094
1978	0.510	0.471
1979	0.157	0.118
1980	0.307	0.128
1981	0.294	0.138
1982	0.159	0.098
1983	0.470	0.149
1984	0.220	0.120
1985	0.352	0.122
1986	0.289	0.142
1987	0.544	0.384
1988	0.339	0.297
1989	0.311	0.122
1990	0.367	0.129
1991	0.290	0.139
1992	0.358	0.372
1993	0.380	0.129
1994	0.555	0.137
1995	0.136	0.125
1996	0.606	0.491
1997	0.273	0.113
1998	0.309	0.128
1999	0.043	0.110
2000	0.234	0.144
2001	0.121	0.093
2002	0.411	0.129
2003	0.357	0.137
2004	0.305	0.133
2005	0.588	0.140
2006	0.185	0.123
2007	0.204	0.132
2008	0.309	0.128
2009	0.211	0.122
2010	0.181	0.168
2011	0.166	0.116
2012	0.282	0.123
2013	0.181	0.098
2014	0.130	0.100
2015	0.250	0.116
2016	0.102	0.115
2017	0.410	0.267
2018	0.752	0.584
2019	0.794	0.518
2020	0.239	0.113
2021	0.389	0.342
2022	0.165	0.111
2023	0.327	0.141
2024	0.880	0.127
2025	0.291	0.134
2026	0.467	0.262
2027	0.184	0.116

2028	0.157	0.098
2029	0.311	0.295
2030	0.572	0.151
2031	0.184	0.104
2032	0.127	0.101
2033	0.173	0.107
2034	0.175	0.115
2035	0.669	0.858
2036	0.344	0.143
2037	0.098	0.110
2038	0.289	0.231
2039	0.048	0.087
2040	0.175	0.120
2041	0.206	0.112
2042	0.675	0.475
2043	0.326	0.270
2044	0.425	0.277
2045	0.281	0.149
2046	0.330	0.457
2047	0.247	0.144
2048	0.326	0.128
2049	0.293	0.134
2050	0.212	0.125
2051	0.339	0.133
2052	0.185	0.131
2053	0.315	0.483
2054	0.383	0.290
2055	0.159	0.104
2056	0.142	0.112
2057	0.217	0.138
2058	0.270	0.150
2059	0.451	0.191

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	**Predeveloped**	**Mitigated**
1	0.9823	0.8584
2	0.8801	0.5943
3	0.7943	0.5842
4	0.7657	0.5827
5	0.7519	0.5511
6	0.7467	0.5323
7	0.7080	0.5249
8	0.6751	0.5182
9	0.6693	0.5072
10	0.6064	0.5006
11	0.5989	0.4905
12	0.5875	0.4845
13	0.5804	0.4827
14	0.5719	0.4754
15	0.5677	0.4708
16	0.5574	0.4568
17	0.5551	0.4196
18	0.5444	0.3840
19	0.5338	0.3791
20	0.5332	0.3715
21	0.5098	0.3606
22	0.4778	0.3417

23	0.4725	0.3312
24	0.4705	0.3212
25	0.4666	0.2968
26	0.4648	0.2947
27	0.4510	0.2914
28	0.4453	0.2901
29	0.4397	0.2802
30	0.4336	0.2770
31	0.4313	0.2699
32	0.4310	0.2674
33	0.4253	0.2616
34	0.4111	0.2554
35	0.4095	0.2312
36	0.4046	0.1958
37	0.3890	0.1907
38	0.3853	0.1873
39	0.3826	0.1872
40	0.3803	0.1680
41	0.3758	0.1507
42	0.3725	0.1503
43	0.3674	0.1498
44	0.3661	0.1490
45	0.3582	0.1489
46	0.3570	0.1459
47	0.3518	0.1459
48	0.3436	0.1457
49	0.3390	0.1447
50	0.3385	0.1444
51	0.3295	0.1436
52	0.3270	0.1436
53	0.3265	0.1435
54	0.3263	0.1433
55	0.3216	0.1422
56	0.3214	0.1414
57	0.3192	0.1409
58	0.3167	0.1404
59	0.3149	0.1398
60	0.3137	0.1396
61	0.3114	0.1386
62	0.3111	0.1383
63	0.3094	0.1382
64	0.3086	0.1375
65	0.3084	0.1373
66	0.3072	0.1373
67	0.3052	0.1369
68	0.3046	0.1354
69	0.2935	0.1348
70	0.2929	0.1343
71	0.2928	0.1342
72	0.2914	0.1341
73	0.2899	0.1336
74	0.2895	0.1335
75	0.2891	0.1332
76	0.2889	0.1330
77	0.2846	0.1330
78	0.2824	0.1329
79	0.2821	0.1328
80	0.2807	0.1323

81	0.2773	0.1316
82	0.2735	0.1306
83	0.2729	0.1301
84	0.2721	0.1297
85	0.2712	0.1295
86	0.2704	0.1294
87	0.2667	0.1289
88	0.2666	0.1288
89	0.2665	0.1287
90	0.2622	0.1284
91	0.2592	0.1283
92	0.2579	0.1283
93	0.2575	0.1282
94	0.2525	0.1277
95	0.2502	0.1276
96	0.2471	0.1275
97	0.2465	0.1272
98	0.2436	0.1269
99	0.2431	0.1266
100	0.2399	0.1262
101	0.2389	0.1254
102	0.2381	0.1247
103	0.2342	0.1245
104	0.2257	0.1238
105	0.2252	0.1234
106	0.2200	0.1228
107	0.2188	0.1226
108	0.2172	0.1225
109	0.2147	0.1220
110	0.2123	0.1220
111	0.2108	0.1218
112	0.2065	0.1217
113	0.2038	0.1214
114	0.2026	0.1199
115	0.1952	0.1195
116	0.1909	0.1182
117	0.1851	0.1182
118	0.1847	0.1163
119	0.1845	0.1162
120	0.1840	0.1161
121	0.1812	0.1158
122	0.1808	0.1156
123	0.1807	0.1154
124	0.1751	0.1153
125	0.1749	0.1152
126	0.1742	0.1149
127	0.1734	0.1133
128	0.1731	0.1127
129	0.1707	0.1126
130	0.1664	0.1123
131	0.1654	0.1119
132	0.1646	0.1118
133	0.1633	0.1108
134	0.1604	0.1104
135	0.1594	0.1103
136	0.1587	0.1098
137	0.1571	0.1096
138	0.1568	0.1095

139	0.1523	0.1082
140	0.1493	0.1074
141	0.1438	0.1068
142	0.1416	0.1041
143	0.1364	0.1039
144	0.1306	0.1037
145	0.1297	0.1012
146	0.1280	0.0998
147	0.1274	0.0996
148	0.1251	0.0990
149	0.1250	0.0978
150	0.1214	0.0976
151	0.1139	0.0975
152	0.1024	0.0961
153	0.0998	0.0952
154	0.0983	0.0943
155	0.0903	0.0941
156	0.0477	0.0927
157	0.0426	0.0925
158	0.0269	0.0866

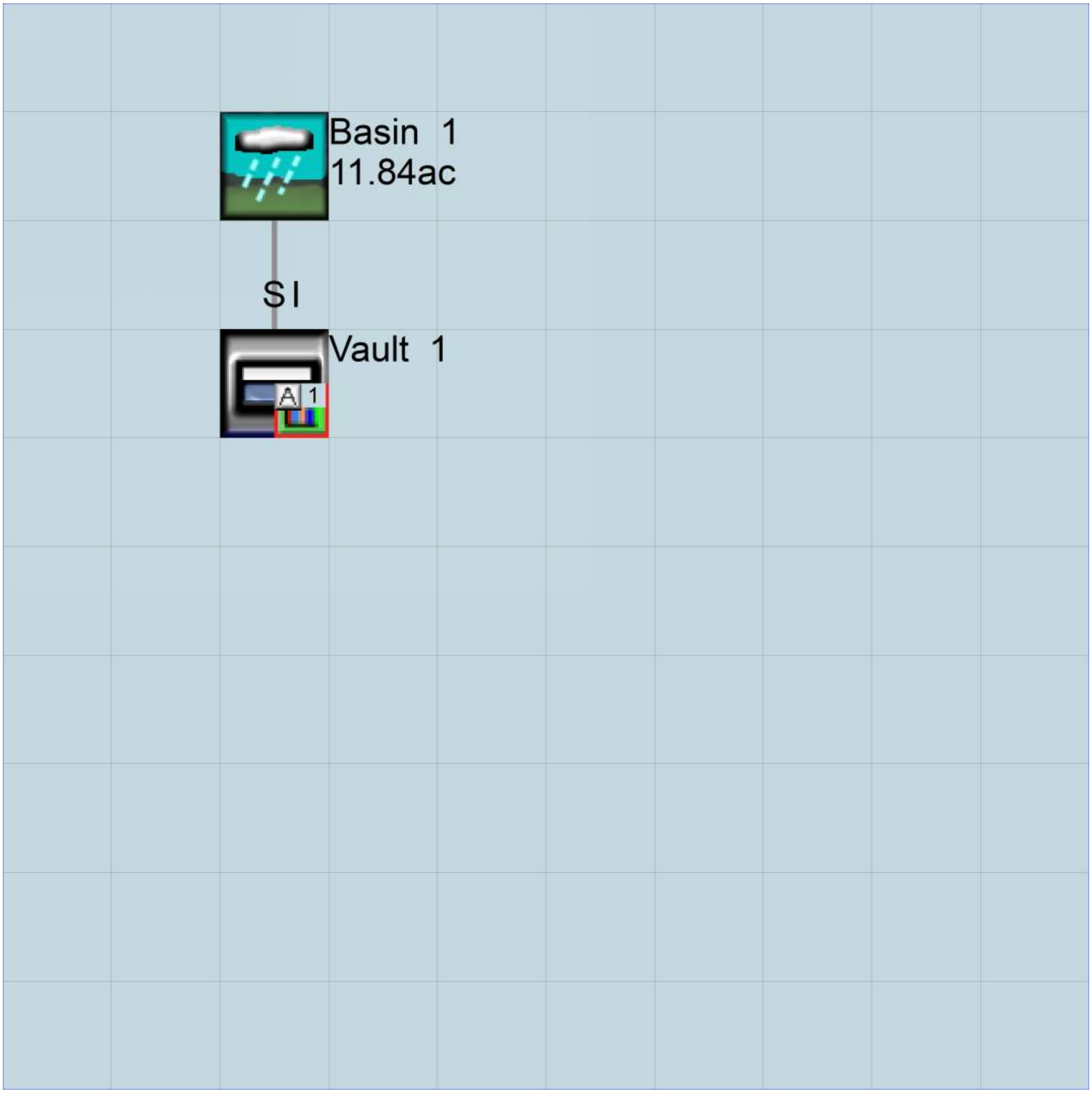
Duration Flows
The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.1426	60664	47013	77	Pass
0.1483	55279	24581	44	Pass
0.1541	50415	15440	30	Pass
0.1598	46708	15047	32	Pass
0.1656	42686	14604	34	Pass
0.1713	39152	14194	36	Pass
0.1771	36033	13834	38	Pass
0.1829	33673	13523	40	Pass
0.1886	30941	13141	42	Pass
0.1944	28465	12775	44	Pass
0.2001	26360	12437	47	Pass
0.2059	24747	12194	49	Pass
0.2116	22947	11834	51	Pass
0.2174	21335	11401	53	Pass
0.2231	19856	11008	55	Pass
0.2289	18731	10731	57	Pass
0.2346	17363	10382	59	Pass
0.2404	16083	10100	62	Pass
0.2462	14936	9800	65	Pass
0.2519	14050	9496	67	Pass
0.2577	13086	9058	69	Pass
0.2634	12183	8648	70	Pass
0.2692	11329	8305	73	Pass
0.2749	10703	8011	74	Pass
0.2807	9939	7618	76	Pass
0.2864	9224	7274	78	Pass
0.2922	8554	6897	80	Pass
0.2980	8055	6604	81	Pass
0.3037	7479	6221	83	Pass
0.3095	6992	5867	83	Pass
0.3152	6565	5533	84	Pass
0.3210	6260	5253	83	Pass
0.3267	5928	4909	82	Pass
0.3325	5607	4582	81	Pass
0.3382	5284	4309	81	Pass
0.3440	5055	4080	80	Pass
0.3498	4790	3851	80	Pass
0.3555	4544	3628	79	Pass
0.3613	4300	3399	79	Pass
0.3670	4068	3193	78	Pass
0.3728	3886	3013	77	Pass
0.3785	3669	2845	77	Pass
0.3843	3450	2641	76	Pass
0.3900	3281	2488	75	Pass
0.3958	3148	2347	74	Pass
0.4016	2990	2206	73	Pass
0.4073	2833	2091	73	Pass
0.4131	2683	2012	74	Pass
0.4188	2592	1957	75	Pass
0.4246	2461	1890	76	Pass
0.4303	2361	1819	77	Pass
0.4361	2239	1743	77	Pass
0.4418	2148	1654	77	Pass

0.4476	2005	1531	76	Pass
0.4533	1878	1417	75	Pass
0.4591	1759	1312	74	Pass
0.4649	1684	1216	72	Pass
0.4706	1590	1083	68	Pass
0.4764	1509	967	64	Pass
0.4821	1430	842	58	Pass
0.4879	1373	764	55	Pass
0.4936	1302	698	53	Pass
0.4994	1237	615	49	Pass
0.5051	1185	532	44	Pass
0.5109	1125	483	42	Pass
0.5167	1081	428	39	Pass
0.5224	1027	374	36	Pass
0.5282	968	332	34	Pass
0.5339	903	299	33	Pass
0.5397	844	269	31	Pass
0.5454	785	235	29	Pass
0.5512	737	203	27	Pass
0.5569	687	183	26	Pass
0.5627	635	156	24	Pass
0.5685	589	135	22	Pass
0.5742	556	112	20	Pass
0.5800	520	83	15	Pass
0.5857	478	40	8	Pass
0.5915	435	28	6	Pass
0.5972	391	15	3	Pass
0.6030	370	15	4	Pass
0.6087	342	15	4	Pass
0.6145	310	15	4	Pass
0.6203	283	14	4	Pass
0.6260	265	14	5	Pass
0.6318	250	14	5	Pass
0.6375	234	13	5	Pass
0.6433	220	13	5	Pass
0.6490	204	13	6	Pass
0.6548	186	13	6	Pass
0.6605	163	12	7	Pass
0.6663	139	12	8	Pass
0.6720	117	12	10	Pass
0.6778	112	12	10	Pass
0.6836	103	12	11	Pass
0.6893	92	12	13	Pass
0.6951	85	12	14	Pass
0.7008	73	11	15	Pass
0.7066	65	10	15	Pass
0.7123	54	10	18	Pass

Appendix
Predeveloped Schematic

Mitigated Schematic



Disclaimer

Legal Notice

Clear Creek Solutions, Inc.
6200 Capitol Blvd. Ste F
Olympia, WA. 98501
Toll Free 1(866)943-0304
Local (360)943-0304

www.clearcreeksolutions.com

WWHM2012

PROJECT REPORT

FLOW CONTROL AND WQ CALCULATIONS
PUBLIC DETENTION 22ND AVE VAULT
FREEMAN LOGISTICS
BCE #21585

General Model Information

WWHM2012 Project Name: 21585-F-CALC-DRNG-22ND-DETN VLT-2024-11-25

Site Name:	FREEMAN ROAD LOGISTICS
Site Address:	
City:	PUYALLUP
Report Date:	11/26/2024
Gage:	42 IN EAST
Data Start:	10/01/1901
Data End:	09/30/2059
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2024/06/28
Version:	4.3.1

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data

Predeveloped Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Flat	2.75
Pervious Total	2.75
Impervious Land Use	acre
Impervious Total	0
Basin Total	2.75

Element Flow Componants:		
Surface	Interflow	Groundwater
Componant Flows To:		
POC 1	POC 1	

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Lawn, Flat	0.26
Pervious Total	0.26
Impervious Land Use	acre
ROADS FLAT	2.18
SIDEWALKS FLAT	0.31
Impervious Total	2.49
Basin Total	2.75

Element Flow Componants:

Surface	Interflow	Groundwater
Componant Flows To:		
Vault 1	Vault 1	

Mitigated Routing

Vault 1

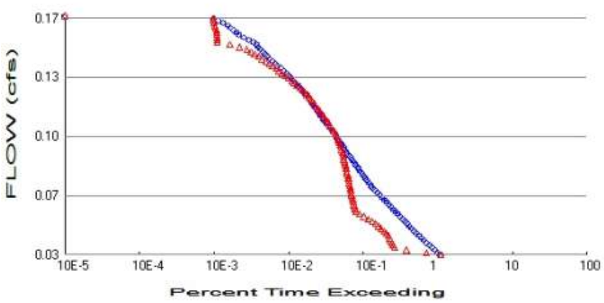
Width:	20 ft.	
Length:	293 ft.	
Depth:	11.5 ft.	
Discharge Structure		
Riser Height:	10.5 ft.	
Riser Diameter:	18 in.	
Orifice 1 Diameter:	0.682 in.	Elevation:0 ft.
Orifice 2 Diameter:	0.890 in.	Elevation:8.33 ft.
Orifice 3 Diameter:	1.590 in.	Elevation:9.13 ft.
Element Outlets:		
Outlet 1	Outlet 2	
Outlet Flows To:		

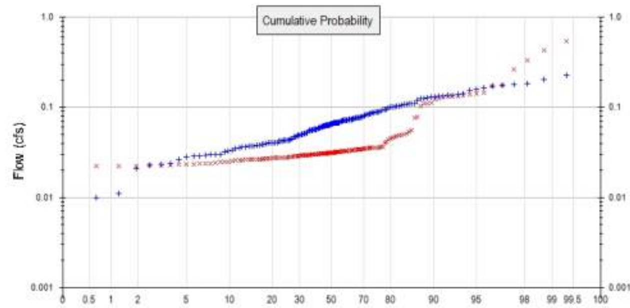
Vault Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.134	0.000	0.000	0.000
0.1278	0.134	0.017	0.004	0.000
0.2556	0.134	0.034	0.006	0.000
0.3833	0.134	0.051	0.007	0.000
0.5111	0.134	0.068	0.009	0.000
0.6389	0.134	0.085	0.010	0.000
0.7667	0.134	0.103	0.011	0.000
0.8944	0.134	0.120	0.011	0.000
1.0222	0.134	0.137	0.012	0.000
1.1500	0.134	0.154	0.013	0.000
1.2778	0.134	0.171	0.014	0.000
1.4056	0.134	0.189	0.015	0.000
1.5333	0.134	0.206	0.015	0.000
1.6611	0.134	0.223	0.016	0.000
1.7889	0.134	0.240	0.016	0.000
1.9167	0.134	0.257	0.017	0.000
2.0444	0.134	0.275	0.018	0.000
2.1722	0.134	0.292	0.018	0.000
2.3000	0.134	0.309	0.019	0.000
2.4278	0.134	0.326	0.019	0.000
2.5556	0.134	0.343	0.020	0.000
2.6833	0.134	0.361	0.020	0.000
2.8111	0.134	0.378	0.021	0.000
2.9389	0.134	0.395	0.021	0.000
3.0667	0.134	0.412	0.022	0.000
3.1944	0.134	0.429	0.022	0.000
3.3222	0.134	0.446	0.023	0.000
3.4500	0.134	0.464	0.023	0.000
3.5778	0.134	0.481	0.023	0.000
3.7056	0.134	0.498	0.024	0.000
3.8333	0.134	0.515	0.024	0.000
3.9611	0.134	0.532	0.025	0.000
4.0889	0.134	0.550	0.025	0.000
4.2167	0.134	0.567	0.025	0.000
4.3444	0.134	0.584	0.026	0.000
4.4722	0.134	0.601	0.026	0.000
4.6000	0.134	0.618	0.027	0.000

4.7278	0.134	0.636	0.027	0.000
4.8556	0.134	0.653	0.027	0.000
4.9833	0.134	0.670	0.028	0.000
5.1111	0.134	0.687	0.028	0.000
5.2389	0.134	0.704	0.028	0.000
5.3667	0.134	0.722	0.029	0.000
5.4944	0.134	0.739	0.029	0.000
5.6222	0.134	0.756	0.029	0.000
5.7500	0.134	0.773	0.030	0.000
5.8778	0.134	0.790	0.030	0.000
6.0056	0.134	0.807	0.030	0.000
6.1333	0.134	0.825	0.031	0.000
6.2611	0.134	0.842	0.031	0.000
6.3889	0.134	0.859	0.031	0.000
6.5167	0.134	0.876	0.032	0.000
6.6444	0.134	0.893	0.032	0.000
6.7722	0.134	0.911	0.032	0.000
6.9000	0.134	0.928	0.033	0.000
7.0278	0.134	0.945	0.033	0.000
7.1556	0.134	0.962	0.033	0.000
7.2833	0.134	0.979	0.034	0.000
7.4111	0.134	0.997	0.034	0.000
7.5389	0.134	1.014	0.034	0.000
7.6667	0.134	1.031	0.034	0.000
7.7944	0.134	1.048	0.035	0.000
7.9222	0.134	1.065	0.035	0.000
8.0500	0.134	1.082	0.035	0.000
8.1778	0.134	1.100	0.036	0.000
8.3056	0.134	1.117	0.036	0.000
8.4333	0.134	1.134	0.043	0.000
8.5611	0.134	1.151	0.047	0.000
8.6889	0.134	1.168	0.050	0.000
8.8167	0.134	1.186	0.052	0.000
8.9444	0.134	1.203	0.054	0.000
9.0722	0.134	1.220	0.056	0.000
9.2000	0.134	1.237	0.076	0.000
9.3278	0.134	1.254	0.090	0.000
9.4556	0.134	1.272	0.100	0.000
9.5833	0.134	1.289	0.109	0.000
9.7111	0.134	1.306	0.116	0.000
9.8389	0.134	1.323	0.123	0.000
9.9667	0.134	1.340	0.130	0.000
10.094	0.134	1.358	0.136	0.000
10.222	0.134	1.375	0.141	0.000
10.350	0.134	1.392	0.146	0.000
10.478	0.134	1.409	0.152	0.000
10.606	0.134	1.426	0.701	0.000
10.733	0.134	1.443	1.917	0.000
10.861	0.134	1.461	3.364	0.000
10.989	0.134	1.478	4.708	0.000
11.117	0.134	1.495	5.675	0.000
11.244	0.134	1.512	6.231	0.000
11.372	0.134	1.529	6.801	0.000
11.500	0.134	1.547	7.273	0.000
11.628	0.126	1.404	7.716	0.000

Analysis Results
POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 2.75
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.26
Total Impervious Area: 2.49

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.066225
5 year	0.101604
10 year	0.123334
25 year	0.148441
50 year	0.165449
100 year	0.181095

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.034473
5 year	0.060531
10 year	0.086973
25 year	0.135193
50 year	0.185416
100 year	0.251637

WATER QUALITY DESIGN FLOW RATE
EQUAL TO THE 2 YEAR RELEASE
RATE DOWNSTREAM OF DETENTION

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1902	0.064	0.032
1903	0.040	0.025
1904	0.075	0.029
1905	0.035	0.035
1906	0.021	0.022
1907	0.103	0.030
1908	0.073	0.027
1909	0.071	0.032
1910	0.101	0.031
1911	0.066	0.030

1912	0.228	0.034
1913	0.102	0.048
1914	0.026	0.023
1915	0.045	0.036
1916	0.066	0.029
1917	0.023	0.027
1918	0.068	0.104
1919	0.057	0.029
1920	0.067	0.030
1921	0.074	0.035
1922	0.072	0.031
1923	0.059	0.035
1924	0.029	0.028
1925	0.038	0.027
1926	0.063	0.029
1927	0.052	0.030
1928	0.050	0.033
1929	0.100	0.036
1930	0.064	0.030
1931	0.063	0.032
1932	0.047	0.034
1933	0.055	0.032
1934	0.132	0.262
1935	0.062	0.077
1936	0.060	0.033
1937	0.089	0.030
1938	0.057	0.031
1939	0.006	0.023
1940	0.062	0.035
1941	0.040	0.024
1942	0.094	0.139
1943	0.044	0.032
1944	0.100	0.046
1945	0.075	0.031
1946	0.042	0.026
1947	0.033	0.028
1948	0.139	0.032
1949	0.124	0.056
1950	0.040	0.028
1951	0.051	0.027
1952	0.178	0.054
1953	0.164	0.135
1954	0.060	0.033
1955	0.052	0.026
1956	0.030	0.026
1957	0.087	0.036
1958	0.173	0.335
1959	0.108	0.171
1960	0.030	0.024
1961	0.110	0.132
1962	0.062	0.033
1963	0.029	0.023
1964	0.035	0.026
1965	0.124	0.141
1966	0.038	0.029
1967	0.056	0.026
1968	0.061	0.034
1969	0.056	0.031

1970	0.087	0.032
1971	0.129	0.110
1972	0.085	0.033
1973	0.111	0.049
1974	0.060	0.030
1975	0.135	0.546
1976	0.074	0.032
1977	0.037	0.022
1978	0.118	0.130
1979	0.036	0.028
1980	0.071	0.030
1981	0.068	0.033
1982	0.037	0.023
1983	0.109	0.035
1984	0.051	0.029
1985	0.082	0.029
1986	0.067	0.034
1987	0.126	0.112
1988	0.079	0.050
1989	0.072	0.029
1990	0.085	0.030
1991	0.067	0.033
1992	0.083	0.110
1993	0.088	0.031
1994	0.129	0.033
1995	0.032	0.030
1996	0.141	0.133
1997	0.063	0.027
1998	0.072	0.030
1999	0.010	0.026
2000	0.054	0.034
2001	0.028	0.022
2002	0.095	0.031
2003	0.083	0.032
2004	0.071	0.032
2005	0.136	0.033
2006	0.043	0.029
2007	0.047	0.031
2008	0.072	0.030
2009	0.049	0.029
2010	0.042	0.036
2011	0.039	0.028
2012	0.066	0.029
2013	0.042	0.023
2014	0.030	0.024
2015	0.058	0.028
2016	0.024	0.028
2017	0.095	0.049
2018	0.175	0.176
2019	0.184	0.145
2020	0.055	0.027
2021	0.090	0.079
2022	0.038	0.026
2023	0.076	0.033
2024	0.204	0.030
2025	0.068	0.032
2026	0.108	0.044
2027	0.043	0.028

2028	0.036	0.023
2029	0.072	0.051
2030	0.133	0.036
2031	0.043	0.025
2032	0.030	0.024
2033	0.040	0.025
2034	0.041	0.028
2035	0.155	0.429
2036	0.080	0.034
2037	0.023	0.026
2038	0.067	0.040
2039	0.011	0.021
2040	0.041	0.028
2041	0.048	0.027
2042	0.157	0.122
2043	0.076	0.045
2044	0.099	0.041
2045	0.065	0.035
2046	0.077	0.134
2047	0.057	0.034
2048	0.076	0.031
2049	0.068	0.032
2050	0.049	0.030
2051	0.079	0.032
2052	0.043	0.031
2053	0.073	0.125
2054	0.089	0.047
2055	0.037	0.025
2056	0.033	0.027
2057	0.050	0.033
2058	0.063	0.036
2059	0.105	0.036

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.2282	0.5457
2	0.2044	0.4286
3	0.1845	0.3349
4	0.1778	0.2624
5	0.1746	0.1758
6	0.1734	0.1706
7	0.1644	0.1449
8	0.1568	0.1415
9	0.1554	0.1390
10	0.1408	0.1345
11	0.1391	0.1340
12	0.1365	0.1327
13	0.1348	0.1319
14	0.1328	0.1297
15	0.1319	0.1254
16	0.1295	0.1224
17	0.1289	0.1115
18	0.1264	0.1100
19	0.1240	0.1098
20	0.1238	0.1040
21	0.1184	0.0789
22	0.1110	0.0770

23	0.1097	0.0556
24	0.1093	0.0536
25	0.1084	0.0515
26	0.1080	0.0504
27	0.1048	0.0494
28	0.1034	0.0486
29	0.1021	0.0476
30	0.1007	0.0469
31	0.1002	0.0457
32	0.1001	0.0455
33	0.0988	0.0439
34	0.0955	0.0414
35	0.0951	0.0403
36	0.0940	0.0360
37	0.0903	0.0360
38	0.0895	0.0360
39	0.0889	0.0360
40	0.0883	0.0359
41	0.0873	0.0357
42	0.0865	0.0355
43	0.0853	0.0355
44	0.0850	0.0355
45	0.0832	0.0351
46	0.0829	0.0348
47	0.0817	0.0346
48	0.0798	0.0346
49	0.0787	0.0343
50	0.0786	0.0342
51	0.0765	0.0342
52	0.0760	0.0341
53	0.0758	0.0340
54	0.0758	0.0339
55	0.0747	0.0337
56	0.0746	0.0334
57	0.0741	0.0333
58	0.0736	0.0332
59	0.0732	0.0331
60	0.0729	0.0330
61	0.0723	0.0328
62	0.0722	0.0328
63	0.0719	0.0327
64	0.0717	0.0327
65	0.0716	0.0326
66	0.0714	0.0325
67	0.0709	0.0324
68	0.0708	0.0320
69	0.0682	0.0320
70	0.0680	0.0318
71	0.0680	0.0318
72	0.0677	0.0317
73	0.0673	0.0317
74	0.0672	0.0317
75	0.0672	0.0316
76	0.0671	0.0316
77	0.0661	0.0316
78	0.0656	0.0316
79	0.0655	0.0315
80	0.0652	0.0315

81	0.0644	0.0312
82	0.0635	0.0312
83	0.0634	0.0311
84	0.0632	0.0308
85	0.0630	0.0308
86	0.0628	0.0307
87	0.0619	0.0307
88	0.0619	0.0307
89	0.0619	0.0306
90	0.0609	0.0305
91	0.0602	0.0305
92	0.0599	0.0304
93	0.0598	0.0304
94	0.0587	0.0303
95	0.0581	0.0303
96	0.0574	0.0303
97	0.0573	0.0302
98	0.0566	0.0301
99	0.0565	0.0300
100	0.0557	0.0299
101	0.0555	0.0299
102	0.0553	0.0296
103	0.0544	0.0296
104	0.0524	0.0295
105	0.0523	0.0294
106	0.0511	0.0293
107	0.0508	0.0292
108	0.0504	0.0292
109	0.0499	0.0291
110	0.0493	0.0290
111	0.0490	0.0289
112	0.0480	0.0289
113	0.0473	0.0288
114	0.0471	0.0286
115	0.0453	0.0283
116	0.0443	0.0283
117	0.0430	0.0280
118	0.0429	0.0278
119	0.0428	0.0278
120	0.0427	0.0276
121	0.0421	0.0276
122	0.0420	0.0276
123	0.0420	0.0276
124	0.0407	0.0275
125	0.0406	0.0275
126	0.0405	0.0274
127	0.0403	0.0269
128	0.0402	0.0269
129	0.0397	0.0268
130	0.0386	0.0268
131	0.0384	0.0266
132	0.0382	0.0266
133	0.0379	0.0264
134	0.0373	0.0263
135	0.0370	0.0263
136	0.0369	0.0262
137	0.0365	0.0262
138	0.0364	0.0261

139	0.0354	0.0258
140	0.0347	0.0257
141	0.0334	0.0254
142	0.0329	0.0249
143	0.0317	0.0248
144	0.0303	0.0247
145	0.0301	0.0240
146	0.0297	0.0239
147	0.0296	0.0237
148	0.0291	0.0236
149	0.0290	0.0233
150	0.0282	0.0233
151	0.0265	0.0232
152	0.0238	0.0229
153	0.0232	0.0229
154	0.0228	0.0226
155	0.0210	0.0225
156	0.0111	0.0223
157	0.0099	0.0222
158	0.0062	0.0208

Duration Flows
The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0331	60110	60387	100	Pass
0.0344	55057	38797	70	Pass
0.0358	50370	21019	41	Pass
0.0371	46171	14498	31	Pass
0.0385	42359	13978	32	Pass
0.0398	38974	13507	34	Pass
0.0411	35994	13041	36	Pass
0.0425	33274	12554	37	Pass
0.0438	30697	12044	39	Pass
0.0451	28315	11202	39	Pass
0.0465	26332	10421	39	Pass
0.0478	24493	9656	39	Pass
0.0492	22781	8897	39	Pass
0.0505	21235	8122	38	Pass
0.0518	19833	7280	36	Pass
0.0532	18526	6454	34	Pass
0.0545	17202	5673	32	Pass
0.0558	16005	4889	30	Pass
0.0572	14914	4404	29	Pass
0.0585	13894	4325	31	Pass
0.0598	12980	4246	32	Pass
0.0612	12133	4164	34	Pass
0.0625	11318	4079	36	Pass
0.0639	10593	3999	37	Pass
0.0652	9850	3921	39	Pass
0.0665	9174	3856	42	Pass
0.0679	8537	3804	44	Pass
0.0692	7961	3758	47	Pass
0.0705	7429	3705	49	Pass
0.0719	6947	3646	52	Pass
0.0732	6554	3597	54	Pass
0.0746	6199	3550	57	Pass
0.0759	5895	3496	59	Pass
0.0772	5573	3436	61	Pass
0.0786	5274	3373	63	Pass
0.0799	5010	3318	66	Pass
0.0812	4759	3261	68	Pass
0.0826	4527	3211	70	Pass
0.0839	4290	3155	73	Pass
0.0852	4068	3110	76	Pass
0.0866	3861	3058	79	Pass
0.0879	3653	3010	82	Pass
0.0893	3442	2965	86	Pass
0.0906	3281	2910	88	Pass
0.0919	3124	2854	91	Pass
0.0933	2975	2779	93	Pass
0.0946	2829	2703	95	Pass
0.0959	2682	2640	98	Pass
0.0973	2575	2570	99	Pass
0.0986	2451	2501	102	Pass
0.0999	2357	2416	102	Pass
0.1013	2245	2325	103	Pass
0.1026	2140	2226	104	Pass

0.1040	2000	2114	105	Pass
0.1053	1878	2008	106	Pass
0.1066	1759	1911	108	Pass
0.1080	1674	1814	108	Pass
0.1093	1583	1715	108	Pass
0.1106	1507	1621	107	Pass
0.1120	1431	1541	107	Pass
0.1133	1354	1460	107	Pass
0.1147	1297	1385	106	Pass
0.1160	1237	1295	104	Pass
0.1173	1182	1222	103	Pass
0.1187	1120	1164	103	Pass
0.1200	1072	1105	103	Pass
0.1213	1026	1044	101	Pass
0.1227	970	974	100	Pass
0.1240	895	918	102	Pass
0.1253	838	852	101	Pass
0.1267	784	781	99	Pass
0.1280	735	711	96	Pass
0.1294	679	661	97	Pass
0.1307	633	609	96	Pass
0.1320	589	550	93	Pass
0.1334	556	492	88	Pass
0.1347	510	447	87	Pass
0.1360	475	412	86	Pass
0.1374	433	382	88	Pass
0.1387	389	332	85	Pass
0.1401	368	305	82	Pass
0.1414	341	275	80	Pass
0.1427	305	242	79	Pass
0.1441	283	217	76	Pass
0.1454	266	192	72	Pass
0.1467	247	174	70	Pass
0.1481	234	152	64	Pass
0.1494	218	121	55	Pass
0.1507	205	90	43	Pass
0.1521	185	61	32	Pass
0.1534	161	61	37	Pass
0.1548	139	61	43	Pass
0.1561	119	60	50	Pass
0.1574	110	60	54	Pass
0.1588	102	60	58	Pass
0.1601	92	58	63	Pass
0.1614	85	57	67	Pass
0.1628	73	55	75	Pass
0.1641	62	54	87	Pass
0.1654	54	54	100	Pass

Appendix
Predeveloped Schematic

Mitigated Schematic

Disclaimer

Legal Notice

Clear Creek Solutions, Inc.
6200 Capitol Blvd. Ste F
Olympia, WA. 98501
Toll Free 1(866)943-0304
Local (360)943-0304

www.clearcreeksolutions.com

WWHM2012

PROJECT REPORT

FLOW CONTROL CALCULATIONS
OFFSITE BASIN
FREEMAN LOGISTICS
BCE #21585

General Model Information

WWHM2012 Project Name: 21585-levee infiltration trench 42 EAST

Site Name:	FREEMAN LOGISTICS
Site Address:	
City:	PUYALLUP
Report Date:	12/4/2024
Gage:	42 IN EAST
Data Start:	10/01/1901
Data End:	09/30/2059
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2024/06/28
Version:	4.3.1

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data

Predeveloped Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Flat	0.65
Pervious Total	0.65
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.65

Element Flow Componants:

Surface	Interflow	Groundwater

Componant Flows To:

POC 1	POC 1

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
Pervious Total	0
Impervious Land Use	acre
ROADS FLAT	0.65
Impervious Total	0.65
Basin Total	0.65

Element Flow Componants:

Surface	Interflow	Groundwater
Componant Flows To:		
Gravel Trench Bed 1	Gravel Trench Bed 1	

Mitigated Routing

Gravel Trench Bed 1

Bottom Length:	625.00 ft.
Bottom Width:	9.00 ft.
Trench bottom slope 1:	0 To 1
Trench Left side slope 0:	0 To 1
Trench right side slope 2:	0 To 1
Material thickness of first layer:	4
Pour Space of material for first layer:	0.4
Material thickness of second layer:	0
Pour Space of material for second layer:	0
Material thickness of third layer:	0
Pour Space of material for third layer:	0
Infiltration On	
Infiltration rate:	0.2
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft.):	294.374
Total Volume Through Riser (ac-ft.):	0.004
Total Volume Through Facility (ac-ft.):	294.378
Percent Infiltrated:	100
Total Precip Applied to Facility:	0
Total Evap From Facility:	0

Discharge Structure

Riser Height: 4 ft.

Riser Diameter: 8 in.

Element Outlets:

Outlet 1 Outlet 2

Outlet Flows To:

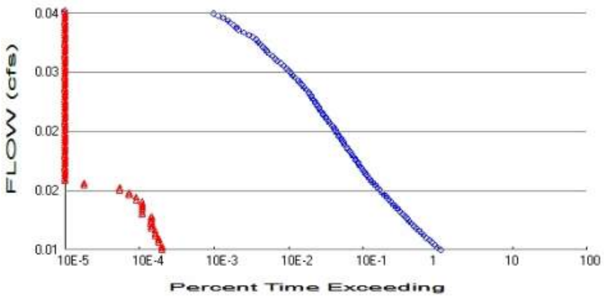
Gravel Trench Bed Hydraulic Table

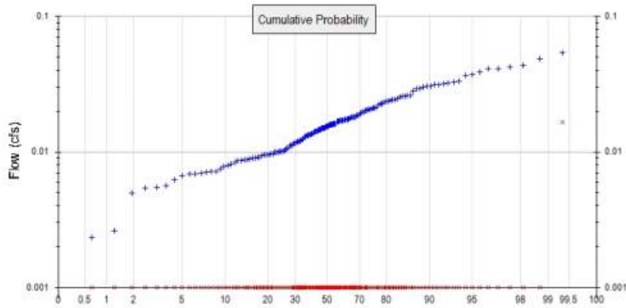
Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**Infilt(cfs)**
0.0000	0.129	0.000	0.000	0.000
0.0500	0.129	0.002	0.000	0.026
0.1000	0.129	0.005	0.000	0.026
0.1500	0.129	0.007	0.000	0.026
0.2000	0.129	0.010	0.000	0.026
0.2500	0.129	0.012	0.000	0.026
0.3000	0.129	0.015	0.000	0.026
0.3500	0.129	0.018	0.000	0.026
0.4000	0.129	0.020	0.000	0.026
0.4500	0.129	0.023	0.000	0.026
0.5000	0.129	0.025	0.000	0.026
0.5500	0.129	0.028	0.000	0.026
0.6000	0.129	0.031	0.000	0.026
0.6500	0.129	0.033	0.000	0.026
0.7000	0.129	0.036	0.000	0.026
0.7500	0.129	0.038	0.000	0.026
0.8000	0.129	0.041	0.000	0.026
0.8500	0.129	0.043	0.000	0.026
0.9000	0.129	0.046	0.000	0.026
0.9500	0.129	0.049	0.000	0.026
1.0000	0.129	0.051	0.000	0.026
1.0500	0.129	0.054	0.000	0.026
1.1000	0.129	0.056	0.000	0.026

1.1500	0.129	0.059	0.000	0.026
1.2000	0.129	0.062	0.000	0.026
1.2500	0.129	0.064	0.000	0.026
1.3000	0.129	0.067	0.000	0.026
1.3500	0.129	0.069	0.000	0.026
1.4000	0.129	0.072	0.000	0.026
1.4500	0.129	0.074	0.000	0.026
1.5000	0.129	0.077	0.000	0.026
1.5500	0.129	0.080	0.000	0.026
1.6000	0.129	0.082	0.000	0.026
1.6500	0.129	0.085	0.000	0.026
1.7000	0.129	0.087	0.000	0.026
1.7500	0.129	0.090	0.000	0.026
1.8000	0.129	0.093	0.000	0.026
1.8500	0.129	0.095	0.000	0.026
1.9000	0.129	0.098	0.000	0.026
1.9500	0.129	0.100	0.000	0.026
2.0000	0.129	0.103	0.000	0.026
2.0500	0.129	0.105	0.000	0.026
2.1000	0.129	0.108	0.000	0.026
2.1500	0.129	0.111	0.000	0.026
2.2000	0.129	0.113	0.000	0.026
2.2500	0.129	0.116	0.000	0.026
2.3000	0.129	0.118	0.000	0.026
2.3500	0.129	0.121	0.000	0.026
2.4000	0.129	0.124	0.000	0.026
2.4500	0.129	0.126	0.000	0.026
2.5000	0.129	0.129	0.000	0.026
2.5500	0.129	0.131	0.000	0.026
2.6000	0.129	0.134	0.000	0.026
2.6500	0.129	0.136	0.000	0.026
2.7000	0.129	0.139	0.000	0.026
2.7500	0.129	0.142	0.000	0.026
2.8000	0.129	0.144	0.000	0.026
2.8500	0.129	0.147	0.000	0.026
2.9000	0.129	0.149	0.000	0.026
2.9500	0.129	0.152	0.000	0.026
3.0000	0.129	0.155	0.000	0.026
3.0500	0.129	0.157	0.000	0.026
3.1000	0.129	0.160	0.000	0.026
3.1500	0.129	0.162	0.000	0.026
3.2000	0.129	0.165	0.000	0.026
3.2500	0.129	0.167	0.000	0.026
3.3000	0.129	0.170	0.000	0.026
3.3500	0.129	0.173	0.000	0.026
3.4000	0.129	0.175	0.000	0.026
3.4500	0.129	0.178	0.000	0.026
3.5000	0.129	0.180	0.000	0.026
3.5500	0.129	0.183	0.000	0.026
3.6000	0.129	0.186	0.000	0.026
3.6500	0.129	0.188	0.000	0.026
3.7000	0.129	0.191	0.000	0.026
3.7500	0.129	0.193	0.000	0.026
3.8000	0.129	0.196	0.000	0.026
3.8500	0.129	0.198	0.000	0.026
3.9000	0.129	0.201	0.000	0.026
3.9500	0.129	0.204	0.000	0.026
4.0000	0.129	0.206	0.000	0.026

4.0500	0.129	0.213	0.078	0.026
4.1000	0.129	0.219	0.219	0.026
4.1500	0.129	0.226	0.385	0.026
4.2000	0.129	0.232	0.547	0.026
4.2500	0.129	0.238	0.678	0.026
4.3000	0.129	0.245	0.762	0.026
4.3500	0.129	0.251	0.828	0.026
4.4000	0.129	0.258	0.885	0.026
4.4500	0.129	0.264	0.939	0.026
4.5000	0.129	0.271	0.989	0.026

Analysis Results
POC 1





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.65
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0
Total Impervious Area: 0.65

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.015653
5 year	0.024016
10 year	0.029152
25 year	0.035086
50 year	0.039106
100 year	0.042804

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0
5 year	0
10 year	0
25 year	0
50 year	0
100 year	0

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1902	0.015	0.000
1903	0.010	0.000
1904	0.018	0.000
1905	0.008	0.000
1906	0.005	0.000
1907	0.024	0.000
1908	0.017	0.000
1909	0.017	0.000
1910	0.024	0.000
1911	0.015	0.000

1912	0.054	0.000
1913	0.024	0.000
1914	0.006	0.000
1915	0.011	0.000
1916	0.016	0.000
1917	0.005	0.000
1918	0.016	0.000
1919	0.014	0.000
1920	0.016	0.000
1921	0.017	0.000
1922	0.017	0.000
1923	0.014	0.000
1924	0.007	0.000
1925	0.009	0.000
1926	0.015	0.000
1927	0.012	0.000
1928	0.012	0.000
1929	0.024	0.000
1930	0.015	0.000
1931	0.015	0.000
1932	0.011	0.000
1933	0.013	0.000
1934	0.031	0.000
1935	0.015	0.000
1936	0.014	0.000
1937	0.021	0.000
1938	0.013	0.000
1939	0.001	0.000
1940	0.015	0.000
1941	0.010	0.000
1942	0.022	0.000
1943	0.010	0.000
1944	0.024	0.000
1945	0.018	0.000
1946	0.010	0.000
1947	0.008	0.000
1948	0.033	0.000
1949	0.029	0.000
1950	0.009	0.000
1951	0.012	0.000
1952	0.042	0.000
1953	0.039	0.000
1954	0.014	0.000
1955	0.012	0.000
1956	0.007	0.000
1957	0.021	0.000
1958	0.041	0.000
1959	0.026	0.000
1960	0.007	0.000
1961	0.026	0.000
1962	0.015	0.000
1963	0.007	0.000
1964	0.008	0.000
1965	0.029	0.000
1966	0.009	0.000
1967	0.013	0.000
1968	0.014	0.000
1969	0.013	0.000

1970	0.020	0.000
1971	0.031	0.000
1972	0.020	0.000
1973	0.026	0.000
1974	0.014	0.000
1975	0.032	0.000
1976	0.018	0.000
1977	0.009	0.000
1978	0.028	0.000
1979	0.009	0.000
1980	0.017	0.000
1981	0.016	0.000
1982	0.009	0.000
1983	0.026	0.000
1984	0.012	0.000
1985	0.019	0.000
1986	0.016	0.000
1987	0.030	0.000
1988	0.019	0.000
1989	0.017	0.000
1990	0.020	0.000
1991	0.016	0.000
1992	0.020	0.000
1993	0.021	0.000
1994	0.030	0.000
1995	0.007	0.000
1996	0.033	0.000
1997	0.015	0.000
1998	0.017	0.000
1999	0.002	0.000
2000	0.013	0.000
2001	0.007	0.000
2002	0.023	0.000
2003	0.020	0.000
2004	0.017	0.000
2005	0.032	0.000
2006	0.010	0.000
2007	0.011	0.000
2008	0.017	0.000
2009	0.012	0.000
2010	0.010	0.000
2011	0.009	0.000
2012	0.016	0.000
2013	0.010	0.000
2014	0.007	0.000
2015	0.014	0.000
2016	0.006	0.000
2017	0.022	0.000
2018	0.041	0.017
2019	0.044	0.000
2020	0.013	0.000
2021	0.021	0.000
2022	0.009	0.000
2023	0.018	0.000
2024	0.048	0.000
2025	0.016	0.000
2026	0.026	0.000
2027	0.010	0.000

2028	0.009	0.000
2029	0.017	0.000
2030	0.031	0.000
2031	0.010	0.000
2032	0.007	0.000
2033	0.010	0.000
2034	0.010	0.000
2035	0.037	0.000
2036	0.019	0.000
2037	0.005	0.000
2038	0.016	0.000
2039	0.003	0.000
2040	0.010	0.000
2041	0.011	0.000
2042	0.037	0.000
2043	0.018	0.000
2044	0.023	0.000
2045	0.015	0.000
2046	0.018	0.000
2047	0.014	0.000
2048	0.018	0.000
2049	0.016	0.000
2050	0.012	0.000
2051	0.019	0.000
2052	0.010	0.000
2053	0.017	0.000
2054	0.021	0.000
2055	0.009	0.000
2056	0.008	0.000
2057	0.012	0.000
2058	0.015	0.000
2059	0.025	0.000

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.0539	0.0167
2	0.0483	0.0000
3	0.0436	0.0000
4	0.0420	0.0000
5	0.0413	0.0000
6	0.0410	0.0000
7	0.0389	0.0000
8	0.0371	0.0000
9	0.0367	0.0000
10	0.0333	0.0000
11	0.0329	0.0000
12	0.0323	0.0000
13	0.0319	0.0000
14	0.0314	0.0000
15	0.0312	0.0000
16	0.0306	0.0000
17	0.0305	0.0000
18	0.0299	0.0000
19	0.0293	0.0000
20	0.0293	0.0000
21	0.0280	0.0000
22	0.0262	0.0000

23	0.0259	0.0000
24	0.0258	0.0000
25	0.0256	0.0000
26	0.0255	0.0000
27	0.0248	0.0000
28	0.0244	0.0000
29	0.0241	0.0000
30	0.0238	0.0000
31	0.0237	0.0000
32	0.0237	0.0000
33	0.0233	0.0000
34	0.0226	0.0000
35	0.0225	0.0000
36	0.0222	0.0000
37	0.0214	0.0000
38	0.0212	0.0000
39	0.0210	0.0000
40	0.0209	0.0000
41	0.0206	0.0000
42	0.0204	0.0000
43	0.0202	0.0000
44	0.0201	0.0000
45	0.0197	0.0000
46	0.0196	0.0000
47	0.0193	0.0000
48	0.0189	0.0000
49	0.0186	0.0000
50	0.0186	0.0000
51	0.0181	0.0000
52	0.0180	0.0000
53	0.0179	0.0000
54	0.0179	0.0000
55	0.0177	0.0000
56	0.0176	0.0000
57	0.0175	0.0000
58	0.0174	0.0000
59	0.0173	0.0000
60	0.0172	0.0000
61	0.0171	0.0000
62	0.0171	0.0000
63	0.0170	0.0000
64	0.0169	0.0000
65	0.0169	0.0000
66	0.0169	0.0000
67	0.0168	0.0000
68	0.0167	0.0000
69	0.0161	0.0000
70	0.0161	0.0000
71	0.0161	0.0000
72	0.0160	0.0000
73	0.0159	0.0000
74	0.0159	0.0000
75	0.0159	0.0000
76	0.0159	0.0000
77	0.0156	0.0000
78	0.0155	0.0000
79	0.0155	0.0000
80	0.0154	0.0000

81	0.0152	0.0000
82	0.0150	0.0000
83	0.0150	0.0000
84	0.0149	0.0000
85	0.0149	0.0000
86	0.0148	0.0000
87	0.0146	0.0000
88	0.0146	0.0000
89	0.0146	0.0000
90	0.0144	0.0000
91	0.0142	0.0000
92	0.0142	0.0000
93	0.0141	0.0000
94	0.0139	0.0000
95	0.0137	0.0000
96	0.0136	0.0000
97	0.0135	0.0000
98	0.0134	0.0000
99	0.0133	0.0000
100	0.0132	0.0000
101	0.0131	0.0000
102	0.0131	0.0000
103	0.0129	0.0000
104	0.0124	0.0000
105	0.0124	0.0000
106	0.0121	0.0000
107	0.0120	0.0000
108	0.0119	0.0000
109	0.0118	0.0000
110	0.0117	0.0000
111	0.0116	0.0000
112	0.0113	0.0000
113	0.0112	0.0000
114	0.0111	0.0000
115	0.0107	0.0000
116	0.0105	0.0000
117	0.0102	0.0000
118	0.0101	0.0000
119	0.0101	0.0000
120	0.0101	0.0000
121	0.0099	0.0000
122	0.0099	0.0000
123	0.0099	0.0000
124	0.0096	0.0000
125	0.0096	0.0000
126	0.0096	0.0000
127	0.0095	0.0000
128	0.0095	0.0000
129	0.0094	0.0000
130	0.0091	0.0000
131	0.0091	0.0000
132	0.0090	0.0000
133	0.0090	0.0000
134	0.0088	0.0000
135	0.0088	0.0000
136	0.0087	0.0000
137	0.0086	0.0000
138	0.0086	0.0000

139	0.0084	0.0000
140	0.0082	0.0000
141	0.0079	0.0000
142	0.0078	0.0000
143	0.0075	0.0000
144	0.0072	0.0000
145	0.0071	0.0000
146	0.0070	0.0000
147	0.0070	0.0000
148	0.0069	0.0000
149	0.0069	0.0000
150	0.0067	0.0000
151	0.0063	0.0000
152	0.0056	0.0000
153	0.0055	0.0000
154	0.0054	0.0000
155	0.0050	0.0000
156	0.0026	0.0000
157	0.0023	0.0000
158	0.0015	0.0000

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0078	60110	11	0	Pass
0.0081	55029	11	0	Pass
0.0085	50359	11	0	Pass
0.0088	46171	10	0	Pass
0.0091	42343	10	0	Pass
0.0094	38963	10	0	Pass
0.0097	35988	9	0	Pass
0.0100	33323	9	0	Pass
0.0104	30720	9	0	Pass
0.0107	28315	8	0	Pass
0.0110	26360	8	0	Pass
0.0113	24493	8	0	Pass
0.0116	22814	8	0	Pass
0.0119	21246	8	0	Pass
0.0122	19867	8	0	Pass
0.0126	18554	6	0	Pass
0.0129	17213	6	0	Pass
0.0132	16033	6	0	Pass
0.0135	14925	6	0	Pass
0.0138	13928	6	0	Pass
0.0141	12991	6	0	Pass
0.0145	12133	5	0	Pass
0.0148	11329	5	0	Pass
0.0151	10593	4	0	Pass
0.0154	9872	4	0	Pass
0.0157	9180	3	0	Pass
0.0160	8537	3	0	Pass
0.0164	7978	1	0	Pass
0.0167	7435	1	0	Pass
0.0170	6964	0	0	Pass
0.0173	6559	0	0	Pass
0.0176	6199	0	0	Pass
0.0179	5900	0	0	Pass
0.0183	5579	0	0	Pass
0.0186	5278	0	0	Pass
0.0189	5012	0	0	Pass
0.0192	4759	0	0	Pass
0.0195	4530	0	0	Pass
0.0198	4292	0	0	Pass
0.0201	4078	0	0	Pass
0.0205	3861	0	0	Pass
0.0208	3652	0	0	Pass
0.0211	3444	0	0	Pass
0.0214	3282	0	0	Pass
0.0217	3128	0	0	Pass
0.0220	2978	0	0	Pass
0.0224	2829	0	0	Pass
0.0227	2684	0	0	Pass
0.0230	2575	0	0	Pass
0.0233	2452	0	0	Pass
0.0236	2359	0	0	Pass
0.0239	2238	0	0	Pass
0.0243	2140	0	0	Pass

0.0246	1991	0	0	Pass
0.0249	1869	0	0	Pass
0.0252	1757	0	0	Pass
0.0255	1674	0	0	Pass
0.0258	1583	0	0	Pass
0.0262	1506	0	0	Pass
0.0265	1430	0	0	Pass
0.0268	1354	0	0	Pass
0.0271	1297	0	0	Pass
0.0274	1234	0	0	Pass
0.0277	1181	0	0	Pass
0.0280	1120	0	0	Pass
0.0284	1073	0	0	Pass
0.0287	1026	0	0	Pass
0.0290	967	0	0	Pass
0.0293	895	0	0	Pass
0.0296	835	0	0	Pass
0.0299	781	0	0	Pass
0.0303	737	0	0	Pass
0.0306	678	0	0	Pass
0.0309	630	0	0	Pass
0.0312	589	0	0	Pass
0.0315	555	0	0	Pass
0.0318	511	0	0	Pass
0.0322	475	0	0	Pass
0.0325	431	0	0	Pass
0.0328	390	0	0	Pass
0.0331	367	0	0	Pass
0.0334	341	0	0	Pass
0.0337	304	0	0	Pass
0.0341	280	0	0	Pass
0.0344	265	0	0	Pass
0.0347	247	0	0	Pass
0.0350	233	0	0	Pass
0.0353	218	0	0	Pass
0.0356	204	0	0	Pass
0.0359	183	0	0	Pass
0.0363	161	0	0	Pass
0.0366	139	0	0	Pass
0.0369	117	0	0	Pass
0.0372	110	0	0	Pass
0.0375	101	0	0	Pass
0.0378	92	0	0	Pass
0.0382	85	0	0	Pass
0.0385	73	0	0	Pass
0.0388	62	0	0	Pass
0.0391	54	0	0	Pass

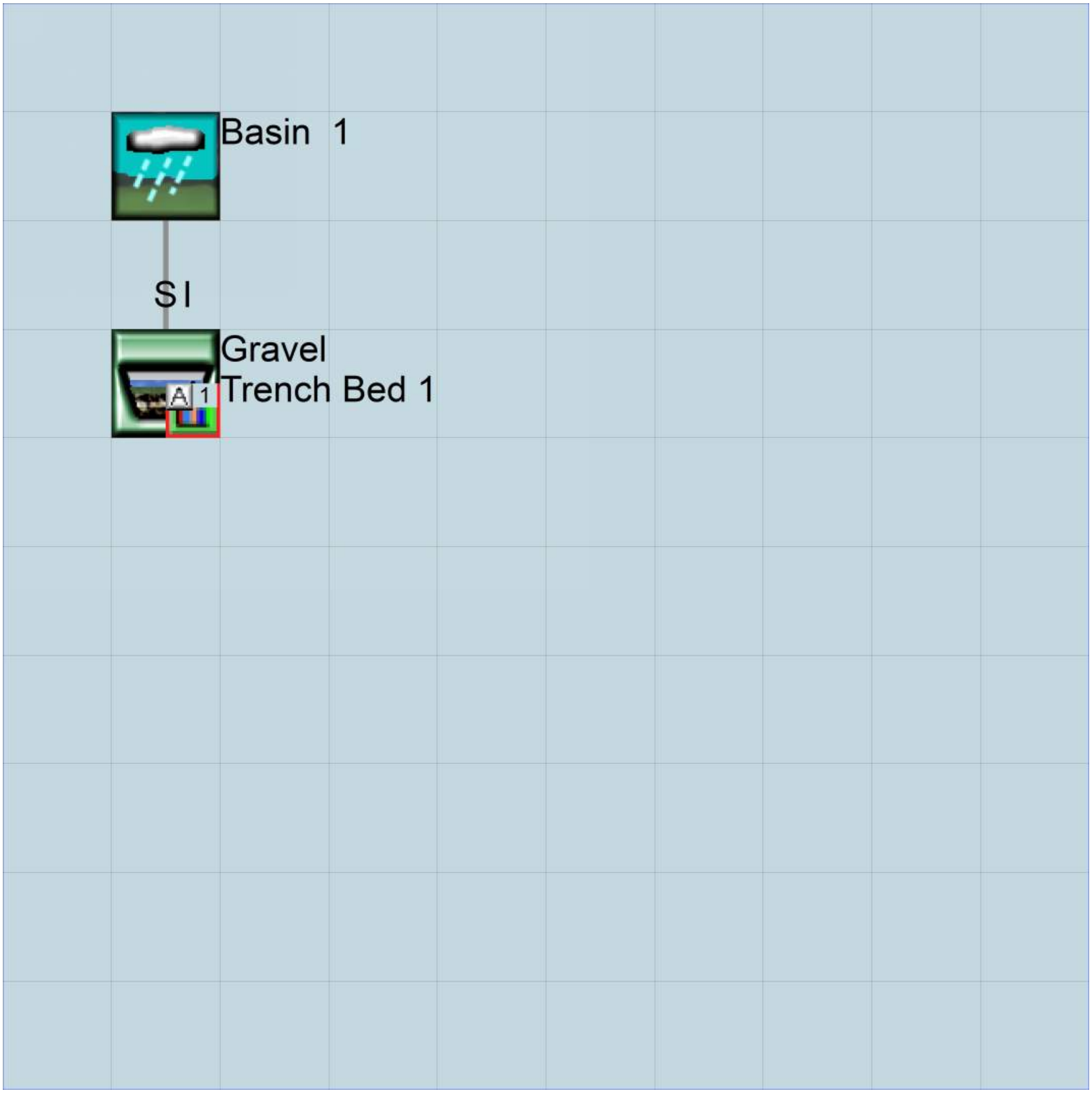
Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0.0328 acre-feet
On-line facility target flow:	0.0455 cfs.
Adjusted for 15 min:	0.0455 cfs.
Off-line facility target flow:	0.0264 cfs.
Adjusted for 15 min:	0.0264 cfs.

Appendix
Predeveloped Schematic

Mitigated Schematic



Disclaimer

Legal Notice

Clear Creek Solutions, Inc.
6200 Capitol Blvd. Ste F
Olympia, WA. 98501
Toll Free 1(866)943-0304
Local (360)943-0304

www.clearcreeksolutions.com

PRELIMINARY PUMP AND FORCE MAIN CALCULATIONS

PREPARED BY
JASON MCARDEL

FREEMAN LOGISTICS

PREPARED FOR	CLIENT ADDRESS
VECTOR DEVELOPMENT COMPANY	11411 NE 124TH ST, SUITE 190 KIRKLAND, WA 98034

SITE ADDRESS	PROJECT NO.	DATE	JURISDICTION
22ND AVE NW AND 82ND AVE E, PUYALLUP, WA	21585	12/06/2024	CITY OF PUYALLUP CITY OF FIFE

TABLE OF CONTENTS

APPENDICES

1.0 INTRODUCTION/GENERAL INFORMATION

The following pages of this report delineate the criteria followed and the methodology used for sizing the storm pump and force main servicing the Freeman Logistics project.

The project includes 2 warehouse buildings with associated parking and frontage improvements totaling 25.50 acres of total disturbed area. Onsite, two separate detention vaults are proposed. The frontage improvement will be collected and detained separately with a separate detention vault. These detention facilities will detain and release stormwater in accordance with the Flow Control Standard per the Department of Ecology drainage manual (2019 Department of Ecology manual). The 100-year peak storm release rate of the vaults is 1.7234 ft^3/sec. Released stormwater will then be treated for water quality using a DOE-approved proprietary structure. Following treatment, all flows, both onsite and offsite, will be conveyed to a manhole pump station. The pump station will convey flows northwest via a new 6-inch force main and then release further downstream, within an existing structure within the public road N. Levee Road E. The new force main will be approximately 4,070 feet in length.

Emergency standby power is proposed using a generator (natural gas or approved alternative). Additional storage volume is not required downstream of the detention vault.

This report also includes buoyancy calculations for the pump manhole due to the shallow seasonal high groundwater elevation on the site.

Figure 1
Vicinity Map

REFERENCE: MapQuest (2022)

Scale: *Horizontal:* ***N.T.S.*** *Vertical:* ***N/A***	*For:* Freeman Road Logistics Fife, Washington	Job Number 21585
Barghausen Consulting Engineers, Inc. 18215 72nd Avenue South Kent, WA 98032 425.251.6222 **barghausen.com**	*Title:* VICINITY MAP	DATE: 09/01/22

P:\21000s\21585\exhibit\graphics\21585 vmap.cdr

Appendix A
Pump Design

STORM PUMP DESIGN

Pump Criteria:

- Design a submersible duplex pump with variable speed which can meet or exceed the 100-year peak release rate of the detention system.

  100-year peak release rate of combined facilities = 1.72 cfs = 773 gpm

- **Suggested pump size = dual 450 gpm at ±120-feet TDH**

Pump Cycles

- To meet the desired discharge characteristics for matching the flow control standard, the pump controls include a VFD (Variable Frequency Drive) and level sensor which allow a wide range of pump speed to match the outflow rate from the control structure on the vault. The pumps can be controlled down to a flow rate of approximately 90 gpm. Assuming the pump starts at the lowest speed, the cycle time would be:

  Wet well storage = Pump On - Pump Off x 118.96 gallons per linear feet of MH = 13.94 – 11.44 x 118.96 = 446 gallons

  Cycle time = 446 gal / 45 gpm = 9.91 minutes

  Cycles per hour = 6.05

Appendix B
Force Main Sizing

STORM FORCE MAIN DESIGN

<u>Pump System</u>

Force main design for proposed force main:

- Design flow in the force main = 450 gpm = 1.00 cfs

- Use 6-inch force main
    - Velocity = 1.0 cfs/0.196 sf = 5.12 fps
    - 5.12 fps < 8 fps OK

Static Head = Invert at downstream end of force main - Pump Off Elevation

Invert elevation at tie-in structure = 34.27

Pump off elevation = 10.50

Static Head = 34.27 – 10.50 = ±23.8 feet

Total Dynamic Head = based on pump configuration and force main (to be verified by pump manufacturer)

Force Main is HDPE (Sch. 40 Pipe)

New 6" Force Main Pipe Length = 4,070 feet

Friction loss in 6-inch main = 4,070/100 x 2.19 = 89.1 feet

Fitting losses in equivalent length of 6" straight pipe (From Friction Loss chart)

Elbows and valves: 90 deg = 15.2
45 deg = 8.1
Ball & check valve = 4

Head loss = (15.2+(2)(8.1)+4)/100 x 1 = 0.35 feet

Total Head = Static Head + Friction Loss = 23.8 + 89.1 feet + 0.35 feet = 113.25 feet

Pump System

Pump Station Control Panel Specification

Primary power shall be from the proposed recreational building. Contractor is to verify available power source and sizing prior to ordering the pump station. Each pump system shall have its own control panel.

The control panel for each sanitary pump station shall include:

- Control for a duplex pump system (controls to be hard wired)
- VFD control for each pump
- Enclosure for installation outside (installation to be near the pump station)
- Visual alarm – flashing light
- Display at control panel to monitor station performance
- 12-hour battery backup for control panel
- Manual and remote reset for alarms
- Alarms for:
    - Pump failure
    - Seal failure
    - High temperature
    - Low water
    - High water
    - Low battery
    - Power failure
- Duplex cycle counter
- Duplex elapsed run time meter
- Surge protection
- Dial up to 8 phone numbers during an alarm condition
- Minimum 1 year warranty

Table A.2 Friction Loss Data for PVC Pipe. Data courtesy IPEX Inc.

GPM	cu ft / sec	Velocity (ft/s)	Friction Head Loss (ft water / 100 ft)	Friction Pressure (psi / 100 ft)	Velocity (ft/s)	Friction Head Loss (ft water / 100 ft)	Friction Pressure (psi / 100 ft)	Velocity (ft/s)	Friction Head Loss (ft water / 100 ft)	Friction Pressure (psi / 100 ft)	Velocity (ft/s)	Friction Head Loss (ft water / 100 ft)	Friction Pressure (psi / 100 ft)
			1/2"										
1	0.002	1.13	1.16	0.50		3/4"							
2	0.004	2.26	4.19	1.81	1.26	1.03	0.44		1"			1 1/4"	
5	0.011	5.64	22.88	9.90	3.16	5.60	2.42	1.93	1.69	0.73	1.10	0.43	0.19
7	0.016	7.89	42.66	18.47	4.43	10.44	4.52	2.70	3.14	1.36	1.55	0.81	0.35
10	0.022				6.32	20.21	8.75	3.86	6.08	2.63	2.21	1.57	0.68
12	0.027				7.59	28.33	12.26	4.63	8.53	3.69	2.65	2.20	0.95
15	0.033				9.48	42.82	18.54	5.79	12.89	5.58	3.31	3.32	1.44
20	0.045							7.72	21.96	9.51	4.42	5.65	2.45
25	0.056							9.65	33.20	14.37	5.52	8.55	3.70
30	0.067							11.58	46.54	20.15	6.63	11.98	5.19
35	0.078										7.73	15.94	6.90
40	0.089		4"								8.84	20.41	8.84
45	0.100	1.15	0.13	0.06							9.94	25.39	10.99
50	0.111	1.28	0.16	0.07							11.05	30.86	13.36
55	0.123	1.41	0.19	0.08									
60	0.134	1.53	0.23	0.10									
65	0.145	1.66	0.26	0.11		5"							
70	0.156	1.79	0.30	0.13	1.14	0.10	0.04						
75	0.167	1.92	0.34	0.15	1.22	0.11	0.05						
80	0.178	2.05	0.39	0.17	1.30	0.13	0.06						
90	0.201	2.30	0.48	0.21	1.46	0.16	0.07		6"				
100	0.223	2.56	0.59	0.25	1.62	0.19	0.08	1.12	0.08	0.03			
125	0.279	3.20	0.89	0.38	2.03	0.29	0.13	1.40	0.12	0.05			
150	0.334	3.84	1.24	0.54	2.44	0.41	0.18	1.69	0.17	0.07			
175	0.390	4.47	1.65	0.72	2.84	0.55	0.24	1.97	0.22	0.10		8"	
200	0.446	5.11	2.12	0.92	3.25	0.70	0.30	2.25	0.29	0.12	1.30	0.08	0.03
250	0.557	6.39	3.20	1.39	4.06	1.06	0.46	2.81	0.43	0.19	1.62	0.11	0.05
300	0.668	7.67	4.49	1.94	4.87	1.49	0.64	3.37	0.61	0.26	1.94	0.16	0.07
350	0.780	8.95	5.97	2.58	5.69	1.98	0.86	3.93	0.81	0.35	2.27	0.21	0.09
400	0.891	10.23	7.64	3.31	6.50	2.54	1.10	4.49	1.03	0.45	2.59	0.27	0.12
450	1.003				7.31	3.15	1.36	5.06	1.29	0.56	2.92	0.34	0.15
500	1.114				8.12	3.83	1.66	5.62	1.56	0.68	3.24	0.41	0.18
600	1.337				9.75	5.37	2.33	6.74	2.19	0.95	3.89	0.57	0.25
700	1.560				11.37	7.15	3.09	7.87	2.92	1.26	4.54	0.76	0.33
800	1.782		18"					8.99	3.73	1.62	5.18	0.98	0.42
900	2.005	1.30	0.03	0.01				10.11	4.64	2.01	5.83	1.22	0.53
1000	2.228	1.45	0.04	0.02							6.48	1.48	0.64
1250	2.785	1.81	0.06	0.03		20"					8.10	2.24	0.97
1500	3.342	2.17	0.08	0.04	1.75	0.05	0.02				9.72	3.14	1.36
2000	4.456	2.89	0.14	0.06	2.33	0.08	0.04		24"				
2500	5.570	3.62	0.21	0.09	2.91	0.12	0.05	2.01	0.05	0.02			
3000	6.684	4.34	0.29	0.13	3.49	0.17	0.08	2.41	0.07	0.03			
3500	7.798	5.06	0.39	0.17	4.07	0.23	0.10	2.81	0.09	0.04			
4000	8.912	5.79	0.50	0.22	4.65	0.30	0.13	3.22	0.12	0.05			
4500	10.026	6.51	0.62	0.27	5.24	0.37	0.16	3.62	0.15	0.06			
5000	11.140	7.23	0.76	0.33	5.82	0.45	0.19	4.02	0.18	0.08			
5500	12.254	7.96	0.91	0.39	6.40	0.53	0.23	4.42	0.22	0.09			
6000	13.368	8.68	1.06	0.46	6.98	0.63	0.27	4.83	0.25	0.11			
6500	14.482	9.40	1.23	0.53	7.56	0.73	0.31	5.23	0.30	0.13			
7000	15.596	10.13	1.42	0.61	8.14	0.83	0.36	5.63	0.34	0.15			
7500	16.710				8.73	0.95	0.41	6.03	0.39	0.17			
8000	17.824				9.31	1.07	0.46	6.43	0.43	0.19			
8500	18.938				9.89	1.19	0.52	6.84	0.49	0.21			
9000	20.052				10.47	1.33	0.57	7.24	0.54	0.23			
9500	21.166							7.64	0.60	0.26			
10000	22.280							8.04	0.66	0.28			

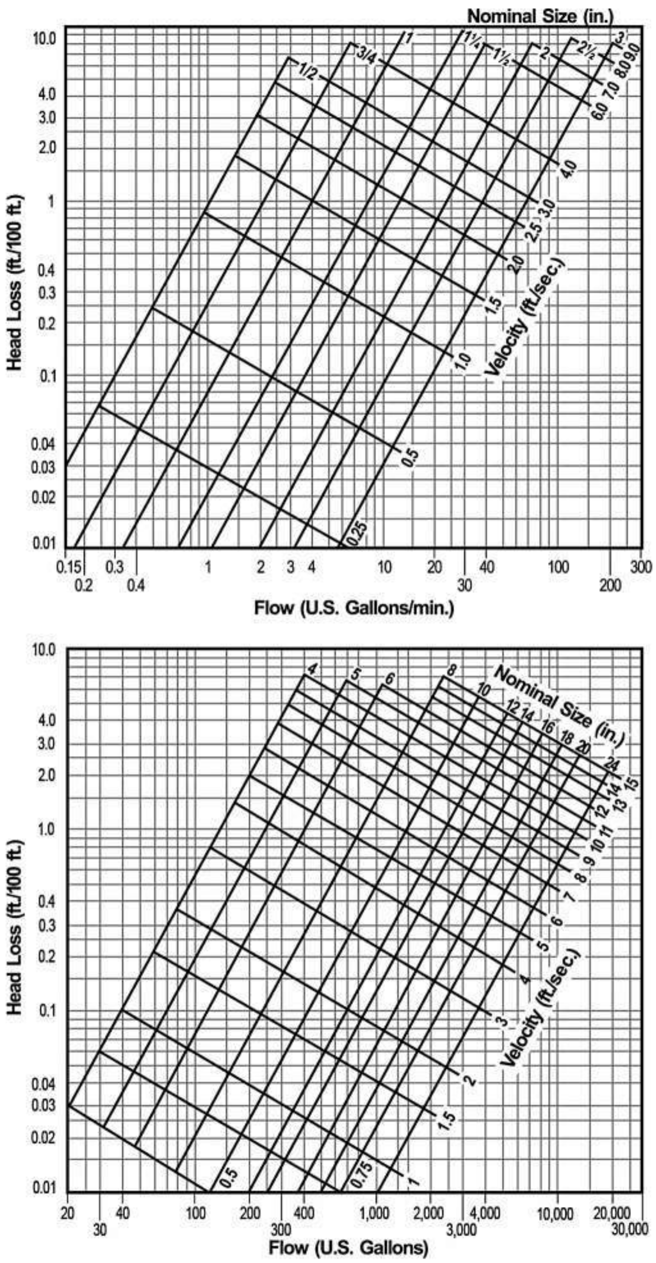


Figure A.1 Graphical depiction of friction loss through PVC pipe. Data courtesy IPEX Inc.

Table A.3 Friction Loss Through Fittings in Equivalent Footage of Pipe. Data Courtesy IPEX Inc.

	FITTINGS			
Size (in.)	Tee Run	Tee Branch	90° Elbow	45° Elbow
½	1.0	3.8	1.5	0.8
¾	1.4	4.9	2.0	1.1
1	1.7	6.0	2.5	1.4
1 ¼	2.3	7.3	3.8	1.8
1 ½	2.7	8.4	4.0	2.1
2	4.0	12.0	5.7	2.6
2 ½	4.9	14.7	6.9	3.1
3	6.1	16.4	7.9	4.0
4	7.9	22.0	11.4	5.1
6	12.3	32.7	16.7	8.0
8	14.0	49.0	21.0	10.6
10	17.5	57.0	26.0	13.5
12	20.0	67.0	32.0	15.5
14	25.0	78.0	37.0	18.0
16	27.0	88.0	43.0	20.0
18	32.0	107.0	53.0	23.0
20	35.0	118.0	58.0	25.0
24	42.0	137.0	67.0	30.0

Appendix C Buoyancy Calculations

FREEMAN STORM BUOYANCY CALCULATIONS

- **SD Pump Manhole, Type 2 - 54 inches**
  Rim: 32.64
  Inside Bottom = 8.10
  Outside Bottom = 7.43

- **Weight of Manhole**

  Top Slab = ~2,600 lbs
  Barrell = 1,100 lb/lf x (32.64 -0.67- 12.43) = 21,494 lbs
  Bottom 5' base = 7,600 lbs
  Total (manhole) = 31,694 lbs
  $P_{Manhole}$ = 31.7 Kip↓

- **Water Weight**

  Max groundwater height (~5' bge) = 27.64 feet
  Manhole displacement = (27.64 – 7.43) x πr^2 = 20.21 $\pi (2.625)^2$ = 437.3 CF
  Water unit weight = 62.4 lb/ft^3
  P_{Water} = 437.3 x 62.4 = 27,285 lb = 27.3 Kip↑

- **Buoyancy**

  $\sum_F = P_{Manhole} - P_{Buoyancy}$ = 31.7K↓ - 27.3K↑ = 4.4 K↓

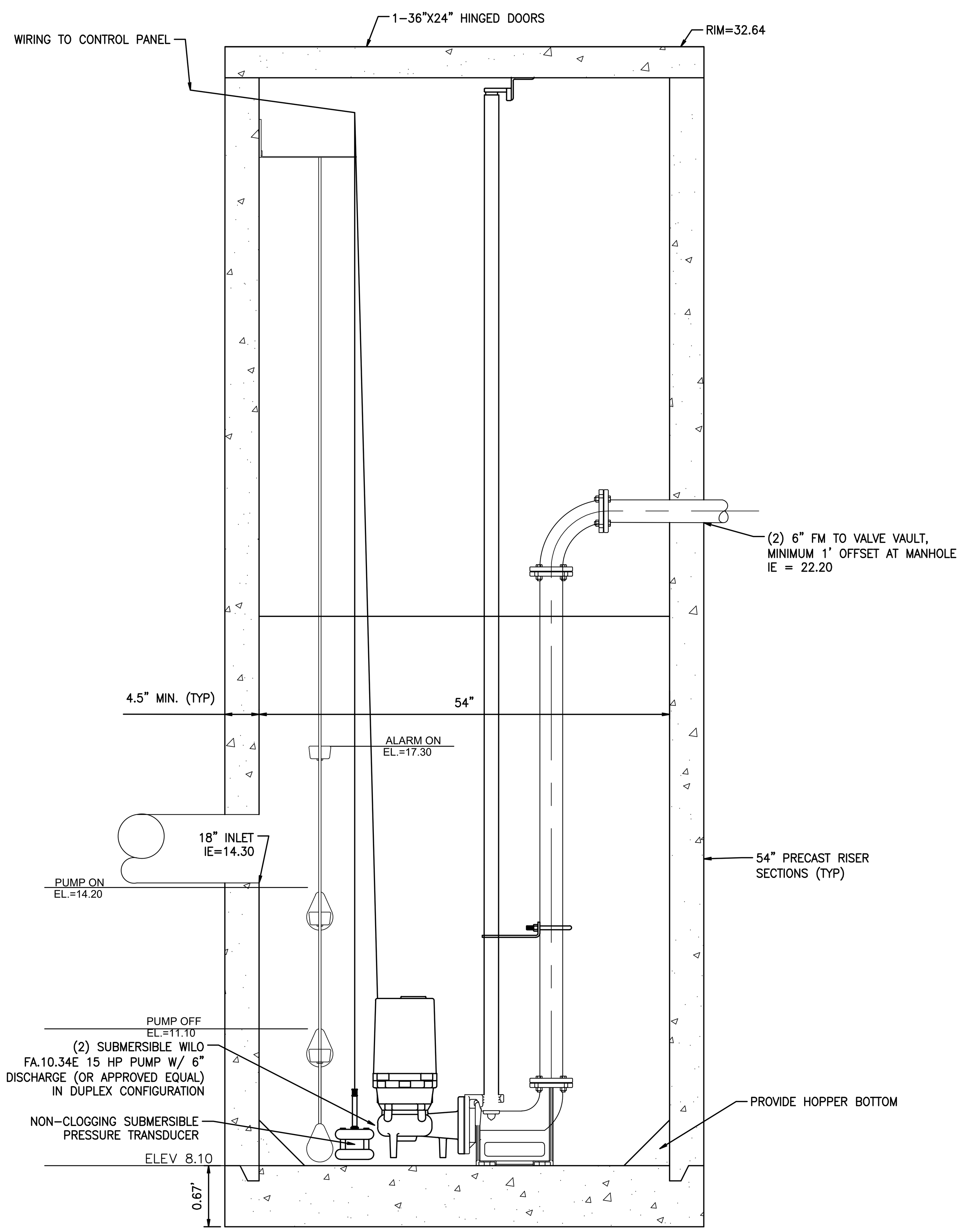
  $FS = \frac{31.7}{27.3}$ = 1.16

PRELIMINARY STORM PUMP DETAILS

OF

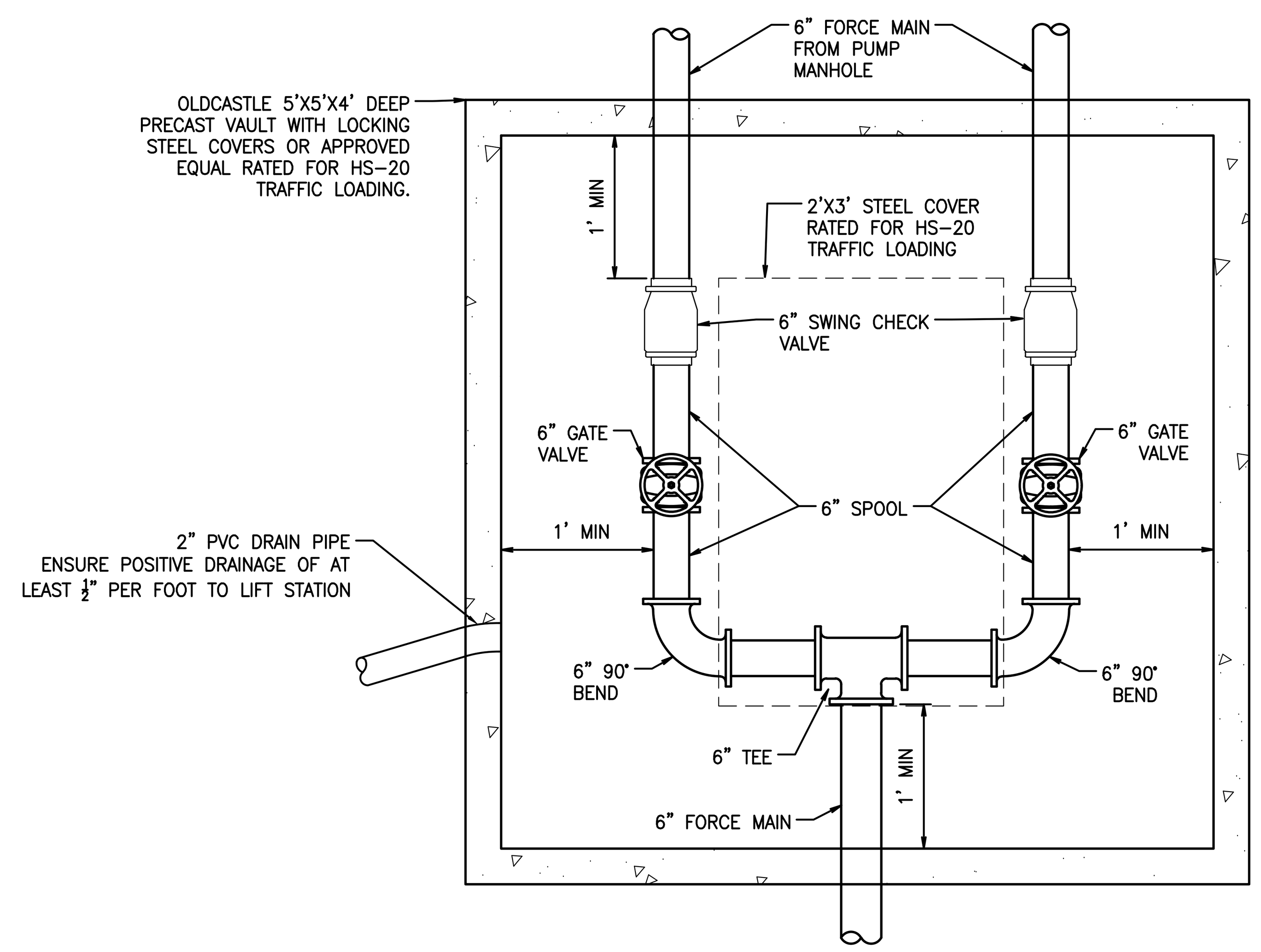
FREEMAN LOGISTICS

PTNS. OF THE SE1/4, OF SEC. 17, TWP. 20 N., RGE 4 EAST, W. M.
AND PTNS. OF THE NE1/4, OF SEC. 20, TWP. 20 N., RGE 4 EAST, W. M.
PIERCE COUNTY, WASHINGTON



STORM PUMP MANHOLE DETAIL

SCALE: HOR. 1"=2' VER. 1"=1'



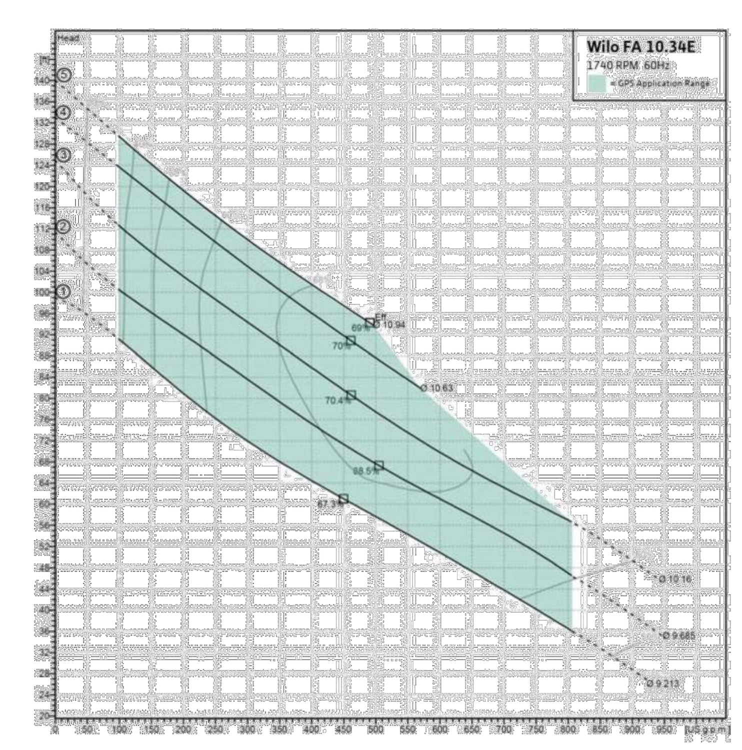
STORM VALVE VAULT DETAIL

SCALE: NTS

Wilo Quick Ship Equipment Submittal

wilo®

FA 10.34E – 4 pole, 1740 RPM, Non-clog Vane Type



Installation Type	
Installation Type	Wet Pit
	Dry Pit
Voltage	230v
	460v
Suction Size	4"
Discharge Size	4"

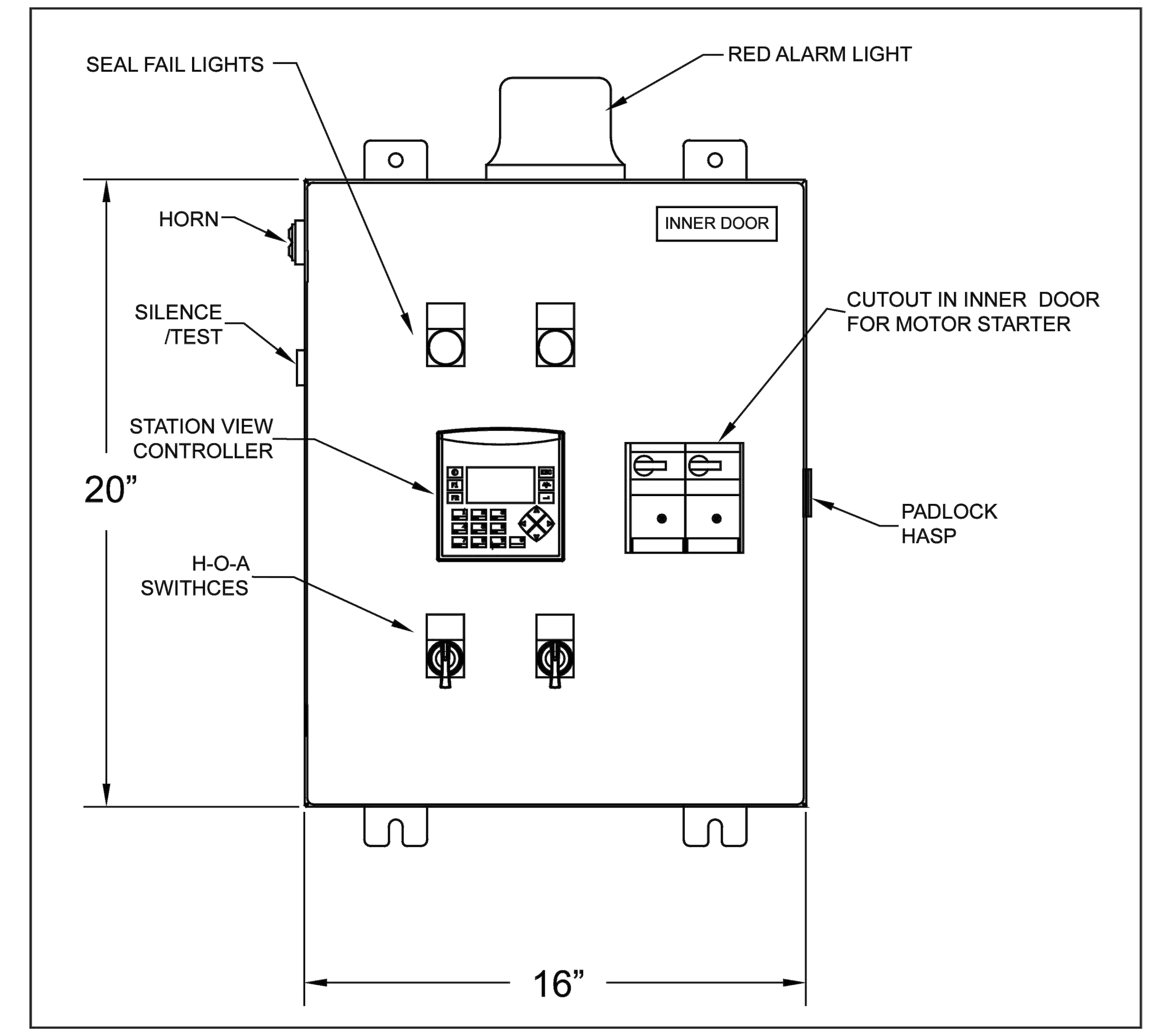
Impeller Number	Impeller Diameter in	Impeller Diameter mm	Motor HP
1	9.213	234	15.5
2	9.685	246	15.5
3	10.16	258	25
4	10.63	270	25
5	10.94	278	25

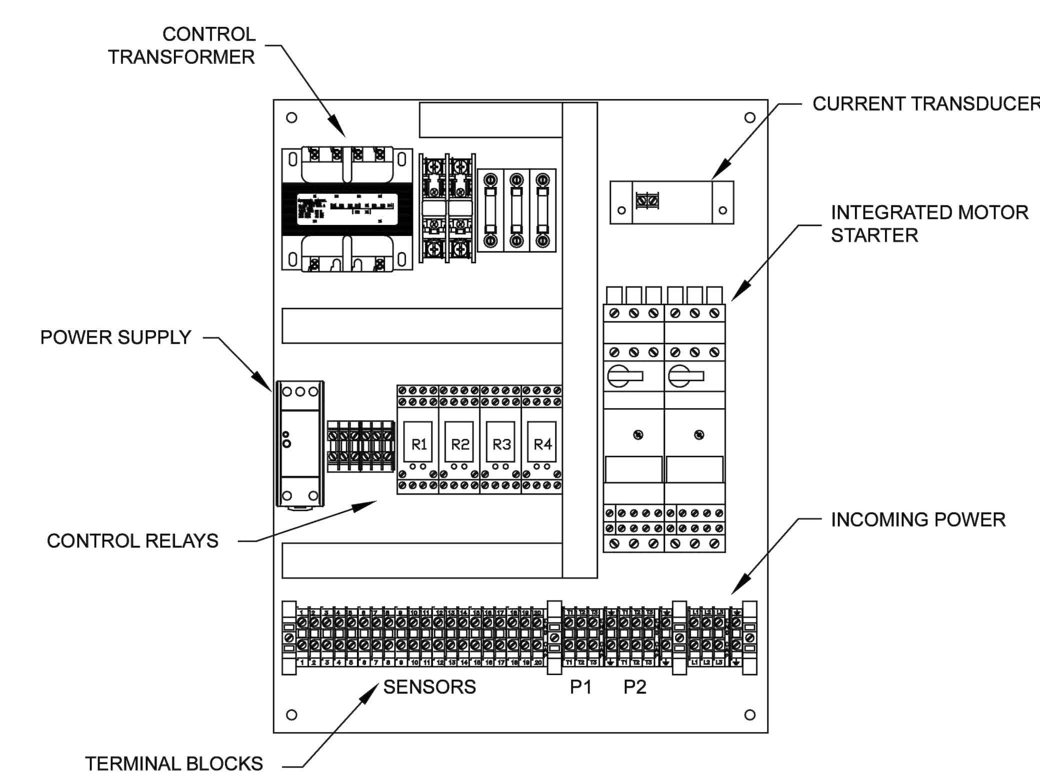
Materials of Construction	
Volute	ASTM A48 Class 35 Cast Iron
Impeller	ASTM A48 Class 35 Cast Iron
Volute Wear Ring	AISI 304 Stainless Steel
Impeller Wear Ring	AISI 329 Duplex Stainless Steel

WILO USA LLC
86 Genesis Parkway
Thomasville, GA 31792

T + 888-945-6872
F + 888-945-6873
www.wilo-usa.com

STORM PUMP CURVE





EXAMPLE THREE PHASE DUPLEX LIFT STATION CONTROL PANEL

SCALE: NTS

NOTES:

1. EMERGENCY BACKUP GENERATOR TO BE PROVIDED BY CONTRACTOR. SIZING TO BE DETERMINED BASED ON FINAL PUMP SELECTION. GENERATOR TO BE SIZED TO ACCOMMODATE BOTH PUMPS OPERATING. CONTROL PANEL TO BE EQUIPPED WITH AUTOMATIC TRANSFER SWITCH. SEE SITE PLAN FOR SUGGESTED GENERATOR LOCATION.
2. CONTROL PANEL TO BE EQUIPPED WITH VARIABLE FREQUENCY DRIVES (VFD) FOR BOTH PUMPS.

APPROVED

BY ____________
CITY OF PUYALLUP
DEVELOPMENT ENGINEERING

DATE ____________

NOTE: THIS APPROVAL IS VOID AFTER 180 DAYS FROM APPROVAL DATE. THE CITY WILL NOT BE RESPONSIBLE FOR ERRORS AND/OR OMISSIONS ON THESE PLANS. FIELD CONDITIONS MAY DICTATE CHANGES TO THESE PLANS AS DETERMINED BY THE DEVELOPMENT ENGINEERING MANAGER.

No.	Date	By	Ckd.	Appr.	Revision
5	12/13/24	DTC	JSM	JSM	SEPA RESUBMITTAL

Title: PRELIMINARY STORM PUMP DETAILS FOR FREEMAN LOGISTICS

For: VECTOR DEVELOPMENT COMPANY
11411 NE 124TH STREET
SUITE 190
KIRKLAND, WA 98034

JASON S. MCARDLE
STATE OF WASHINGTON
54927
REGISTERED PROFESSIONAL ENGINEER
12/18/24

Scale: Horizontal AS SHOWN; Vertical N/A

Designed JSM
Drawn DTC
Checked JSM
Approved JSM
Date 12/18/24

Barghausen Consulting Engineers, Inc.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222
barghausen.com

Job Number 21585

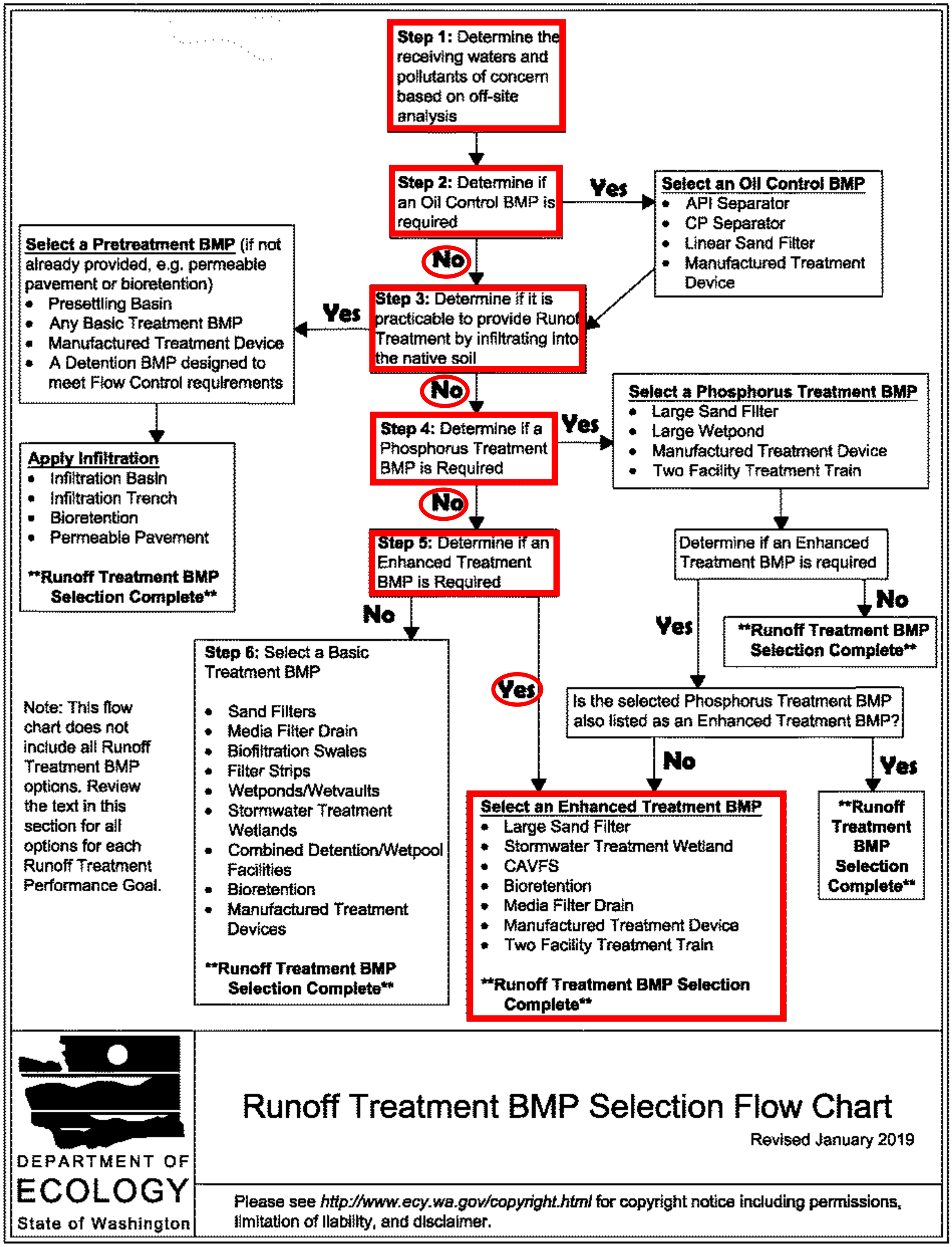
Sheet C39 of 44

P:\21000s\21585\engineering\SEPA SET\21585-D.dwg 12/10/2024 12:20 PM DCASEY

RUNOFF TREATMENT BMP SELECTION FLOW CHART

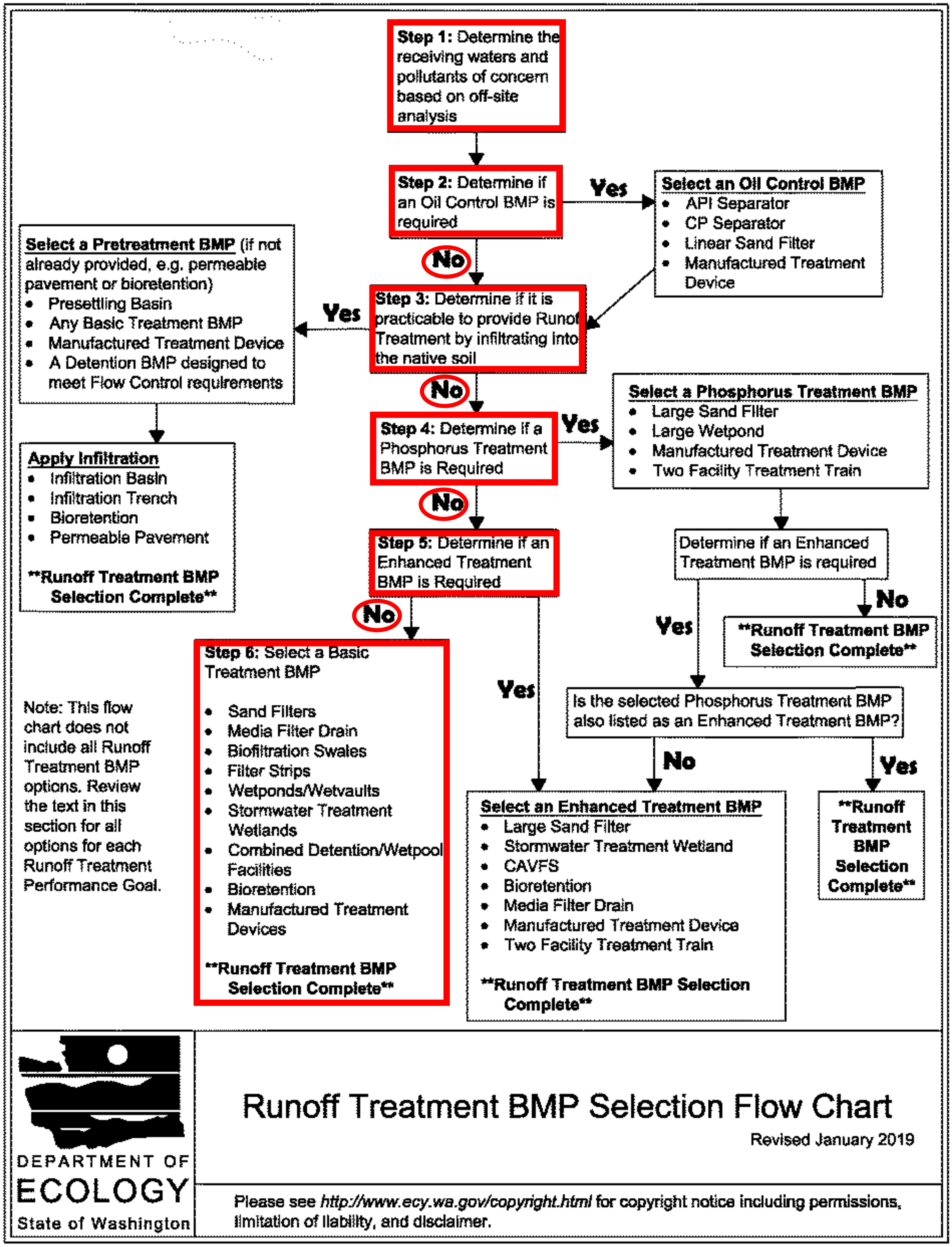
ONSITE

Figure III-1.1: Runoff Treatment BMP Selection Flow Chart



OFFSITE

Figure III-1.1: Runoff Treatment BMP Selection Flow Chart



Tab 6.0

6.0 SPECIAL REPORTS AND STUDIES

December 2024
Freeman Road Logistics

Critical Areas Report

Prepared for Vector Development Company

December 2024
Freeman Road Logistics

Critical Areas Report

Prepared for
Vector Development Company
11411 NE 124th Street
Kirkland, Washington 98034

Prepared by
Anchor QEA
1201 3rd Avenue, Suite 2600
Seattle, Washington 98101

Project Number: 212141-02.01

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

ABBREVIATIONS

2010 Regional Supplement	*Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region*
BFE	base flood elevation
BMP	best management practice
CAR	*Critical Areas Report*
CY	cubic yard
DP	data plot
EC	Employment Center zoning designation
Ecology	Washington State Department of Ecology
ESA	Endangered Species Act
FAC	facultative
FACU	facultative upland
FACW	facultative wetland
FEMA	Federal Emergency Management Agency
FMC	Fife Municipal Code
FRO	Freeman Road Overlay
HGM	hydrogeomorphic
I-5	Interstate 5
LM/W	Light Manufacturing/Warehousing zoning designation
Mitigation Bank	Port Tacoma Upper Clear Creek Mitigation Bank
NAVD88	North American Vertical Datum of 1988
NMFS	National Marine Fisheries Service
NRCS	National Resources Conservation Service
NWI	National Wetlands Inventory
NWSA	Northwest Seaport Alliance
OBL	obligate wetland
OHWM	ordinary high water mark
PEM	palustrine emergent
PFO	palustrine forested
PHS	Priority Habitats and Species
PMC	Puyallup Municipal Code
Port	Port of Tacoma
Project	Freeman Road Logistics project
PSS	palustrine scrub-shrub
redox	redoximorphic
Third-Party Review Report	Third-Party Review of Critical Areas Report

Third-Party Second Review Report	Third-Party Second Review of Critical Areas Report
Third-Party Third Review Report	Third-Party Third Review of Critical Areas Report
UPL	obligate upland
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
Washington rating system	*Washington State Wetland Rating System for Western Washington: 2014 Update*
WDFW	Washington Department of Fish and Wildlife
WSDOT	Washington State Department of Transportation

1 Introduction

Vector Development Company is proposing construction of two new warehouse buildings as part of the Freeman Road Logistics Project (Project), east of Freeman Road East and west of the future Washington State Department of Transportation (WSDOT) State Route 167 Completion Project. The Project includes redevelopment of 15 adjacent parcels, henceforth referred to as the Main Development Area (parcels 0420174075, 0420201040, 0420201039, 0420201045, 0420201066, 0420201101, 0420205003, 0420205017, 0420201027, 0420201052, 0420201034, 0420201036, 0420201042, 0420205004, 0420205016) in Puyallup, Washington. Utilities routing to and from the Main Development Area will be routed through existing right of ways for Freeman Road East and North Levee Road East. Eight other parcels (0420201008, 0420201104, 0420201114, 0420201115, and 0420212073), as well as Freeman Road East and North Levee Road, will support the development through transportation or utility improvements, henceforth referred to as the Transportation and Utility parcels. A vicinity map is shown in Figure 1, and an aerial photograph of existing conditions at the Study Area, which includes the WSDOT-owned parcels and Transportation and Utility parcels is shown in Figure 2.

The proposed development would include two warehouses, associated utilities, vehicle and truck parking and maneuvering space, widening of access roads, stormwater management, landscaping, and improvements along Freeman Road East (Appendix A). The Project has been designed to be consistent with local regulations, including the City of Fife and City of Puyallup Shoreline Master Plans.

This *Critical Areas Report* (CAR) has been prepared by Anchor QEA scientists to support the local permitting and land use review of the Project. The CAR evaluates the presence of critical areas within the Main Development Area, Transportation and Utility parcels, and WSDOT-owned parcels and addresses potential impacts to existing critical areas and associated regulated buffers, as defined in the City of Puyallup Municipal Code (PMC) Chapter 21 (City of Puyallup 2024a). The format of this CAR has been prepared consistent with PMC 21.06. Critical areas regulated under PMC Chapter 21 include wetlands, streams, fish and wildlife habitat conservation areas, frequently flooded areas, and minor lakes.

Additionally, the CAR evaluates the presence of critical areas within the Transportation and Utility parcels and roadways and addresses potential impacts to existing critical areas and associated regulated buffers, as defined in the City of Fife Municipal Code (FMC) Chapter 17 (City of Fife 2024a). The format of this CAR has been prepared consistent with FMC 17.05. Critical Areas regulated under FMC Chapter 17 include wetlands and wildlife habitat conservation areas.

Anchor QEA scientists gathered and reviewed existing information consistent with PMC Chapter 21 and FMC Chapter 17 to identify and assess existing critical areas. To support this review, Anchor QEA biologists performed critical areas site visits to the Study Area on April 1 and September 28, 2021; March 11, 2022; March 23, 2023; May 19, 2023; April 12, 2024; and May 17, 2024. The information provided in this CAR has been prepared by professional biologists using the best available science to provide an accurate evaluation of critical areas and potential impacts.

1.1 Review of Existing Information

As part of the analysis to identify critical areas, Anchor QEA biologists reviewed the following sources of information to support field observations:

- PMC (City of Puyallup 2024a)
- City of Puyallup GIS Portal Wetland and Stream Maps (City of Puyallup 2024b)
- FMC (City of Fife 2024a)
- City of Fife Wetlands Map (City of Fife 2024b)
- Pierce County PublicGIS Interactive Mapping Tool (Pierce County 2024)
- U.S. Department of Agriculture Natural Resources Conservation Service Web Soil Survey (USDA 2024)
- National Marine Fisheries Service (NMFS) Endangered Species Act (ESA) status reviews and listing information (NMFS 2024)
- U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) Wetlands Mapper (USFWS 2024a)
- USFWS ESA Status Reviews and Listing Information (USFWS 2024b)
- Washington Department of Fish and Wildlife (WDFW) Priority Habitats and Species (PHS) Maps (WDFW 2024a)
- WDFW SalmonScape Mapping System (WDFW 2024b)
- Publicly available aerial photographs
- Third-Party Review of Critical Areas Report (Third-Party Review Report), Third-Party Second Review of Critical Areas Report (Third-Party Second Review Report), and Third-Party Third Review of Critical Areas Report (Third-Party Third Review Report) produced by Confluence Environmental Group (2022, 2024a, 2024b)

1.2 Qualifications

This CAR was prepared following site visits conducted by Anchor QEA on the following dates:

- April 1, 2021
- September 28, 2021
- March 11, 2022
- March 23, 2023
- May 19, 2023
- April 12, 2024

- May 17, 2024

Personnel who contributed to the surveys and preparation of this CAR are listed as follows:

- Laura Caron: Former Anchor QEA Natural Resource Scientist now working as a Fisheries and Wetlands Biologist at WSDOT. Responsible for 2021 and 2022 field investigations and reporting; BA Environmental Studies and Geology, University of Colorado; MNRS Natural Resource Management and Ecological Restoration, Colorado State University; Certified Wetland Delineator, U.S. Army Corps of Engineers (USACE); Certified Wetland Rater, Washington State Department of Ecology (Ecology); Qualified Junior Author for Biological Assessment, WSDOT, through 2028; Qualified Biologist for Preliminary Hydraulic Stream Design and Restoration, WSDOT.
- Calvin Douglas: Former Anchor QEA Wetland Scientist, now working as a Senior Ecologist at Confluence Environmental Group. Responsible for 2021 and 2022 field investigations and reporting; BS Wildlife Biology, University of Washington; Pierce County Certified Wetland Scientist and Wildlife Biologist; Qualified Senior Writer for Biological Assessment, WSDOT, through 2024.
- Hannah Fotherby: Anchor QEA Wetland Biologist supporting 2023 and 2024 field investigation and reporting; BA Environmental Studies, University of Washington; MEH Restoration Ecology and Environmental Horticulture, University of Washington; Pierce County Certified Wetland Scientist.
- Jakob Rowny, PWS: Anchor QEA Senior Wetland Biologist and Environmental Scientist responsible for 2023 and 2024 field investigations and reporting; BS Ecology and Evolutionary Biology, University of California; MS Environmental Sciences and Engineering, University of North Carolina; Pierce County Certified Wetland Scientist; 10 years of wetland delineation, categorization, and critical area assessment and reporting experience in Washington State and Oregon.
- Josh Jensen: Anchor QEA Senior Managing Planner responsible for field oversight and code compliance; BS Economics and Environmental Studies, Western Washington University; MEM, Duke University.
- Dan Berlin, PWS: Anchor QEA Principal Scientist responsible for directing and reviewing all field work and documentation; BA Biology, Kalamazoo College; MEM Wetland Science, Duke University.

2 Project Purpose and Need

2.1 Project Purpose

The overall purpose of the Project is to provide 500,000 square feet of warehouse capacity and logistical support for receiving and distribution. The Project is intended to use existing and planned transportation infrastructure, including the WSDOT State Route 167 Completion Project, a portion of which is located just east of the Main Development Area, and includes construction of 4 miles of new highway between Meridian Avenue and Interstate 5 (I-5) and several new interchanges. The State Route 167 Completion Project will provide east-west linkages between the Port of Tacoma (Port) and manufacturing and industrial areas in Pierce County and will improve overall regional mobility by reducing congestion on surrounding local roads and highways.

The Project is also intended to use the nearby Pierce County Canyon Road Regional Connection Project that will extend Canyon Road East from Pioneer Way East to 70th Avenue East in Fife by constructing a new bridge across the Puyallup River. This Project will also improve regional mobility by providing freight haulers and other traffic faster, safer, and more direct access to State Route 167, I-5, and Port facilities.

The Project is situated in an area that was recently rezoned to support the planned receiving and distribution use by the City of Puyallup, as documented in the Freeman Road Comprehensive Plan Map Amendment, Case Number L-20-0001, and the Freeman Road Overlay (FRO), which was adopted by City of Puyallup Ordinance No 3278, passed June 27, 2023. The Freeman Road Comprehensive Plan Map Amendment and FRO annexed and provided Light Manufacturing/Warehousing (LM/W) zoning for 11 previously unincorporated parcels east of Freeman Road East and west of the WSDOT State Route 167 Completion Project. The proposed Project layout satisfies City of Puyallup requirements and achieves the applicant's purpose of providing additional warehouse capacity and logistical support in an area zoned for those uses and will be consistent with current and anticipated future land uses of the surrounding areas.

In the context of Pierce County and WSDOT projects—and the City of Puyallup's goals of bolstering a vibrant local economy by supporting land supply for business opportunities, and providing a safe, livable, and healthy community—the Project purpose provides an appropriate land use solution. The Project will create safer neighborhoods by separating truck activity away from residential uses, support the local economy by providing well-paying jobs, and protect and enhance environmental functions and values as part of the Project.

2.2 Project Need

The overall need of the Project is to address an existing shortage of receiving and distribution facilities east of Tacoma, which is expected to be more significant considering projected growth in the region and associated shipping though the Port and other regional ports. The Northwest Seaport Alliance (NWSA), which includes Port shipping activities, is one of the largest marine cargo gateways in the United States. More than 3.7 million 20-foot equivalent units carrying 26.1 million metric tons of containerized cargo were handled at NWSA facilities (NWSA 2019). Shipping at the Port is anticipated to increase above pre-pandemic tonnages and will continue to be a primary driver of the regional economy (Pierce County 2023). To support this growing demand for shipping and distribution, USACE, and NWSA plan to deepen the Port's Blair Waterway, which will allow extra-large container ships access to the Port. The Port is also planning future redevelopment to support economic growth, job creation, and trade, including several cleanup projects, completion of habitat and wetland mitigation bank projects, and ongoing maintenance and improvements to stormwater systems and Port-specific infrastructure such as dock, pier, and fender system upgrades (Port 2023).

The Freeman Road Logistics Project is designed to provide needed warehouse capacity and logistical receiving and distribution support in an area that is regionally important to continued economic growth and resiliency. The rezone of the properties within the Main Development Area acknowledges the need for more warehouse and logistical projects within the City of Puyallup, as described in the City of Puyallup's Freeman Road Comprehensive Plan Map Amendment and FRO. The design elements and standards included in the Freeman Road Comprehensive Plan Map Amendment and FRO were developed through a multiyear, multi-stakeholder planning process to achieve appropriate land use zoning for the area, provide high-quality amenities, support regional transportation, water, sewer, and stormwater infrastructure, and include reasonable setbacks for the neighborhood residents to retain the aesthetic character of the area and improve the safety of residents and visitors.

While meeting the specific purpose and need of the Project by supplying improved warehousing capacity and logistical support in the area, the Project is expected to result in no net loss of ecological function to the critical areas evaluated in this report. The Project will comply with federal, state, and local regulations that require mitigation for unavoidable net adverse impacts to fish and wildlife species that rely on highly functioning shoreline, stream, and wetland areas.

3 Study Area Description

The Study Area of this CAR encompasses 154.33 acres and is composed of the following sections (Figure 2):

- The Main Development Area, which is made up of the 15 adjacent parcels where the Project is located and encompasses 24.04 acres
- The Transportation and Utility parcels, which are eight parcels in total, with four in the City of Puyallup and four in the City of Fife. The four parcels in the City of Puyallup are located south of the Main Development Area and include three undeveloped parcels (parcels 0420201008, 0420201114, and 0420201115) and the O'Reily-owned parcel 040212073. The four parcels in the City of Fife include the two parcels located immediately west of the Main Development Area and Freeman Road East (parcels 0420201104 and 0420174032), and the two parcels north of 48th Street East. In total, the Transportation and Utility parcels encompass 105.26 acres. This area also includes portions of 48th Street East and 78th Avenue East in the City of Fife
- The five WSDOT-owned parcels located north and east of the Main Development Area (parcels 0420201110, 0420201111, 0420174028, 0420174054, and 0420178009) that encompass 25.03 acres

The Main Development Area is currently developed for residential and agricultural uses and consists of open lawn areas, residential housing, agricultural fields, and paved and gravel roadways. Many of the residential buildings were demolished and removed prior to Anchor QEA's May 2023 site visit. An agricultural drainage ditch is located off site on WSDOT properties, adjacent to the undeveloped northeast corner of the Main Development Area. The west boundary of the Main Development Area is bounded by Freeman Road East. Photographs of the Study Area are included in Appendix B. One wetland, Wetland A, was identified off site to the south and one wetland, Wetland B, was identified on site. WSDOT and WDFW have provided a preliminary jurisdictional determination for the agricultural ditch, and WSDOT has provided boundary delineations and categorizations for wetlands located on their property off site to the north and east (Herrera 2022). Regulated buffers associated with the off-site ditch and wetland areas partially extend into the Main Development Area (per PMC 21.06). An area mapped as unverified wetland by the City of Puyallup located at Transportation and Utility parcel 0420201104 within the City of Fife was investigated by Anchor QEA biologists in May 2023 and was determined to be an upland area.

3.1 Soils

Natural Resources Conservation Service (NRCS)-mapped soils are shown in Figure 3. The underlying soils in the Study Area consist of Sultan silt loam and Puyallup fine sandy loam, with Pilchuck fine sand mapped at the Transportation and Utility parcels to the south (USDA 2024). The NRCS Web Soil Survey (Figure 3; USDA 2024) identifies the following soil series in the vicinity of the Study Area:

- Pilchuck fine sand: This soil is very deep, excessively drained, and formed in recent sandy and gravelly alluvium on floodplains and moderate hill slopes. Pilchuck fine sand is not listed as hydric (USDA 2024). Permeability is very fast, and it has very low water table. Typically, the surface layer to 10 inches is very dark gray fine sand and the subsurface layer to 60 inches is black and very dark gray gravelly sand.
- Puyallup fine sandy loam: This soil is very deep, well drained with high saturated hydraulic conductivity and formed in mixed recent alluvium on floodplains and low stream terraces. Puyallup fine sandy loam is not listed as hydric (USDA 2024). Permeability is fast and it has a low water table. Typically, the surface layer to 10 inches is dark brown fine sandy loam and the subsurface layer to 60 inches is very dark grayish brown gravelly sand.
- Sultan silt loam: This soil is very deep, moderately well drained formed in recent alluvium on floodplains. Sultan silt loam is not listed as hydric (USDA 2024). Permeability is moderately slow, and it has a moderately high water table. Typically, the surface layer to 10 inches is very dark grayish brown silt loam and the subsurface layer to 60 inches is olive gray very fine sandy loam stratified with light gray medium sand.

Table 1 summarizes the soil mapping information for the Study Area. Puyallup silt loam, Puyallup fine sandy loam, and Sultan silt loam are not classified as hydric soils. but all three include minor hydric soil inclusions.

Table 1
Soils Mapped Within the Study Area by the NRCS Web Soil Survey

Map Unit	Soil Type Name	Drainage Class	Hydrologic Soil Group[1]	Hydric Soil Rating[2]	Hydric Inclusions[3]	Approx. % of Study Area
29A	Pilchuck silt loam	Excessively drained	A	No	Yes	45%
31A	Puyallup fine sandy loam	Well drained	A	No	Yes	25%
42A	Sultan silt loam	Moderately well drained	C/D	No	Yes	30%

Notes:

1. Hydrologic soil groups are based on runoff potential 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.
   i. Group A soils have low runoff potential and high infiltration rates even when thoroughly wetted. They chiefly consist of deep, well- to excessively drained sands or gravels and have a high rate of water transmission.
   ii. Group B soils have moderately low runoff potential when thoroughly wet, and water transmission through the soil is unimpeded.
   iii. Group C soils have slow infiltration rates when thoroughly wet, caused by either an underlying layer that impedes the downward movement of water or soils of moderately fine or fine texture.

    iv. Group D soils have a very slow infiltration rate (high runoff potential) when thoroughly wet and include soils consisting of clays with high shrink-swell potential, soils that have a high water table, soils that have a clay or claypan layer at or near the surface, and soils that are shallow over nearly impervious material.
2. Hydric soil rating indicates the components of soil map units that meet the criteria for hydric soils.
3. Non-hydric soils may have inclusions of hydric soil in the lower positions on the landform.

3.2 Hydrology

The Study Area is located within Water Resource Inventory Area 10, the Puyallup-White Watershed, in the Puyallup subbasin (Hydrologic Unit Code [HUC] 17110014); the Lower Puyallup River Watershed (HUC 1711001405); and the Puyallup River Subwatershed (HUC 171100140502; Ecology 2023). Hydrologic characteristics within the property are influenced primarily by local precipitation, surface water runoff, and a high groundwater table, the areas that drain to the Puyallup River, which originates on Mount Rainier, and Wapato Creek, which is located several thousand feet to the north.

Two streams, Stream 14 and Stream 15, were identified within an off-site WSDOT-owned portion of the Study Area. Both Streams 14 and 15 are categorized as non-fish, perennial waters in WSDOT critical areas reporting (Herrera 2022; WSDOT 2023). One wetland, Wetland A, was identified to the south of the Main Development Area at parcels 0420201008, 0420201114, and 0420201115, and has been delineated and categorized as a Category II wetland (Section 4.2.2). During the Anchor QEA March 2022 field investigation, a small, disturbed area containing ponded water approximately 3 inches deep was identified at the east side of parcel 0420174075. This area has since been delineated and categorized as a Category III wetland (Wetland B; Section 4.2.2). WDFW PHS and SalmonScape data do not identify any freshwater surface stream channels to the Puyallup River or Wapato Creek within the Study Area (WDFW 2024a, 2024b).

3.3 Plant Communities

Some undisturbed native vegetation communities are located within the Study Area, but most of the vegetation is composed of open lawn areas, residential homes, grazing pastures, and paved and gravel roads, with small patches of planted native and ornamental trees and shrubs. The majority of the plantings are shrubs and ground cover species appear to receive regular maintenance. Areas of native vegetation are present within the undeveloped portions of the Transportation and Utility parcels located off site to the south and within the undeveloped portions of the WSDOT-owned parcels off site to the east of the Main Development Area. Photographs of the Study Area are included in Appendix B. Existing plant species within the Study Area are described in Section 4.4.2.

The Pierce County critical area maps (Figure 4; Pierce County 2024), USFWS NWI Wetlands Mapper (Figure 5; USFWS 2024a), and City of Puyallup wetland and stream maps (Figure 5; City of Puyallup 2024b) do not identify any freshwater wetland habitat within the Main Development Area (see

Figures 5, 6, and 7). Anchor QEA biologists did not identify any wetlands in the Main Development Area during the field investigation in October 2021. During the Anchor QEA March 2022 field investigation, Anchor QEA biologists identified and delineated Wetland B in a disturbed area at the east side of parcel 0420174075. Wetland B has since been rated as a Category III emergent, depressional wetland. Additional wetlands information is provided in Section 4.2. Buffers in association with the off-site wetlands and ditch in the WSDOT right-of-way are depicted in Figure 6.

4 Critical Areas Assessment

This section describes and assesses critical areas within and near the Study Area as defined per PMC Chapter 21 (City of Puyallup 2024a) and FMC Chapter 17 (City of Fife 2024a) including wetlands, streams, fish and wildlife habitat conservation areas, and frequently flooded areas.

4.1 Methods

To document and describe wetlands, streams, fish and wildlife habitat conservation areas, and frequently flooded areas within the Study Area, Anchor QEA reviewed existing information (Section 1.1) and performed an aerial photograph assessment. Anchor QEA biologists performed critical areas site visits to the Study Area on April 1 and September 28, 2021; March 11, 2022; May 19, 2023; April 12, 2024; and May 17, 2024, as part of the analysis for the Project. The entire Study Area was accessible during the investigation. During the site visits, Anchor QEA biologists documented general information regarding habitats and dominant plant species and communities. Potential wetland features were evaluated according to methods presented in the *U.S. Army Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory 1987); the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region* (2010 Regional Supplement; USACE 2010); and *Field Indicators of Hydric Soils in the United States: A Guide for Identifying and Delineating Hydric Soils, Version 8.1, 2017* (USDA and NRCS 2016). Soil colors were classified by their numerical description as identified on a *Munsell Soil Color Chart* (Munsell 2000).

The ordinary high water mark (OHWM) of the streams—located off site in the WSDOT-owned portion of the Study Area to the east of the Main Development Area—was not delineated during the site visits. Additional information about the off-site streams was provided by WSDOT consultants (Herrera 2022; WSDOT 2023). All wildlife species, tracks, and other signs observed during the site visits were documented. These observations were qualitative; no quantitative wildlife surveys were performed. Photographs taken to document vegetation and habitat conditions are included in Appendix B.

This CAR evaluates terrestrial and aquatic habitats and plant communities based on physical observations. Existing information described in WDFW-documented species and priority habitats and ESA-listed species and critical habitats, within and near the Study Area, are also evaluated.

4.2 Wetlands

4.2.1 Main Development Area

One on-site wetland (Wetland B) was identified by Anchor QEA biologists at the east side of parcel 0420174075 and within the Main Development Area during the September 2021 and March 2022 site visits and categorized following the May 2023 site visit. Wetland data sheets for two data plots

(DPs) explored during the March 2022 site visits are provided in Appendix C. At DP-13, located at the center and at the lowest elevation of Wetland B, hydric soil and wetland hydrology were identified, but the area had no vegetation. However, during Anchor QEA's May 2023 site visit, it was observed that the previously unvegetated area had been recolonized by typical pasture grasses and other locally common emergent species.

Wetland conditions in this area are not documented by the City of Puyallup sensitive areas maps (City of Puyallup 2024b), Pierce County critical area maps (Figure 4; Pierce County 2024), USFWS NWI data (Figure 5; USFWS 2024a), or WDFW PHS data (WDFW 2024a), and do not identify wetland areas within at least 1,500 feet of the Study Area, except to the south of 19th Avenue Northwest at Transportation and Utility parcels 0420201008 and 0420201114.

Wetland B was previously thought to be regulated as an artificial wetland, based on excavation conducted by the previous landowner prior to the sale in November 2021. While the excavation was intentional, the creation of wetland conditions was not intentional. Ecology has determined that Wetland B will not be treated as an artificial wetland and is therefore regulated by state and local protections. An approved jurisdictional determination request was made to USACE and their decision (USACE 2024) is that "Wetland B is not a water of the U.S. and as such, work that would occur within these areas does not require Department of the Army authorization under Section 404 of the Clean Water Act" because it has no surface water connection to other known waters of the United States, meaning no permit from USACE is required to fill Wetland B.

4.2.2 Transportation and Utility Parcels 0420201008, 0420201114 and 0420201115

Transportation and Utility parcels 0420201008, 0420201114, and 042021115, located south of 19th Avenue Northwest and east of Freeman Road East in the City of Puyallup contain Wetland A and associated buffers (Figures 7 and 8). These buffers do not extend onto the Main Development Area north of 19th Avenue Northwest or west of Freeman Road East, because the buffer area is interrupted by the existing 19th Avenue Northwest and Freeman Road East roadways. Regulatory buffers only occur on the same side of an existing roadway as the wetland and do not extend to the opposite side from the sensitive area.

4.2.2.1 Sewer and Water Line Improvements

The Project proposes sewer and water utility lines that will be installed by connecting to and improving existing City of Puyallup public utility lines located within Freeman Road East. The utility lines will be routed south through Freeman Road East and then follow Levee Road East to the east. All sewer and water utility line construction will be located within the Freeman Road East and Levee Road East roadway prisms and within the public right-of-way. During the March 2022, May 2023, and May 2024 site investigations, Anchor QEA conducted additional wetland delineation work at Wetland A, located east of Freeman Road East and North of Levee Road East, to confirm the utility work would not extend into the Wetland A or Wetland A buffer area. Anchor QEA Wetland A findings are recorded in 11 Wetland Determination Data Forms, and a preliminary rating is provided in Appendix C. The wetland delineation and data plot locations are depicted in Figure 7. Off-site Wetland A buffers will be avoided during construction of sewer and water utilities.

4.2.2.2 Stormwater Line and Facility Construction and Improvement

The Project proposes a new stormwater discharge utility line that will be constructed along Freeman Road East and a portion of Levee Road East between the Main Development Area and an existing stormwater discharge utility line located at Levee Road East. All stormwater utility line construction will be located within the Freeman Road East and Levee Road East roadway prisms and within the public right-of-way. The stormwater utility line design plan will not extend into Wetland A or Wetland A buffer area, and no impacts are anticipated. The existing stormwater line continues east along Levee Road East before ultimately being conveyed into the Puyallup River through an existing 84-inch culvert, located approximately 3/4 of a mile from the proposed discharge connection (Barghausen 2024). The Project also proposes a new stormwater facility located directly under the new road section of Freeman Road East just north of the intersection of Freeman Road East and Levee Road East. The stormwater facility will consist of a trench of clean, drainage rock. Collected stormwater runoff will be treated by proprietary storm filters prior to infiltration. The stormwater facility design plan and will not extend into Wetland A or Wetland A buffer area, alter the Wetland A hydrology, and no impacts are anticipated (Barghausen 2024).

4.2.2.3 Freeman Road, Levee Road and Intersection Improvements

The Project proposes to widen Freeman Road East onto parcel 0420201104 from two 11-foot-wide lanes to two 14-foot-wide lanes. The proposed east edge alignment of Freeman Road East will match the current location (with no impacts to parcel 0420201008), and all widening will occur on the west side of Freeman Road. The roadway widening will not impact Wetland A or the Wetland A buffer.

4.2.2.4 Gas Line Construction

The Project proposes a new Puget Sound Energy gas line that will be constructed along Freeman Road East and Levee Road East between the Main Development Area, and an existing stormwater gas utility line located at Levee Road East. All gas utility line construction will be located within the Freeman Road East and Levee Road East roadway prisms and within the public right-of-way. The gas utility line design will not extend into Wetland A or Wetland A buffer area, and no impacts are anticipated.

4.2.3 Transportation and Utility Parcel 0420201104

During the May 2023 site investigation, the full extent of Transportation and Utility parcel 040201104 in the City of Fife was walked by Anchor QEA biologists, and wetland conditions were not observed. Vegetation at Transportation and Utility parcel 040201104 is dominated by black cottonwood (*Populus balsamifera*), common snowberry (*Symphoricarpos albus*), osoberry (*Oemleria cerasiformis*), stinging nettle (*Urtica dioica*), Himalayan blackberry (*Rubus armeniacus*), and Japanese knotweed (*Reynoutria japonica*). Although the City of Fife (2024b) maps no wetlands on this parcel, the City of Puyallup maps a small low-lying portion near the southwest corner of parcel 040201104 as an unverified wetland (City of Puyallup 2024b). Anchor QEA biologists established DP-12 at this location (Figure 7) during the growing season and determined that hydrophytic vegetation was present, but that hydric soils and wetland hydrology were absent, meaning the area is not a wetland. A Wetland Determination Data Form for this location is included in Appendix C, and Site Photography is provided in Appendix B.

4.2.4 Transportation and Utility Parcel 0420174032

The Third-Party Review Report (Confluence 2022) also indicates an additional off-site wetland located to the northwest of the Main Development Area on the western edge of Freeman Road East at parcel 0420174032. Because Anchor QEA did not have permission to access the property, no delineation or rating information is provided in this report. A review of historical aerial imagery and observations from Freeman Road East made during the March 2022, May 2023, and April 2024 site investigations support the likely presence of wetlands at this location. The wetlands may cover much of the central portion of the parcel, and it likely contains PM1C and PSS1C Cowardin components. Any wetland buffers associated with this wetland are interrupted by Freeman Road East, which lies between the off-site wetland and the Main Development Area, and 48th Street East which would interrupt any wetland buffer at the northern edge of the existing roadway.

4.2.5 WSDOT-Owned Parcels 0420178009, 0420201110, 0420201111, 0420174028, and 0420174054

WSDOT provided documentation that show four off-site wetlands, identified as Wetland 87, Wetland 89, Wetland 93, and Wetland 146/148, located to the north and east of the Main Development Area at parcels 0420178009, 0420201110, 0420201111, 0420174028, 0420174054 and within the WSDOT right-of-way (Herrera 2022; WSDOT 2023; Figure 6). Wetland 87 is located east of Main Development Area parcel 0420205016 on WSDOT-owned parcel 0420201110. Wetland 89 is located on WSDOT-owned parcel 0420201111 and is about 300 feet directly east of Main Development Area parcel 0420201027. Wetland 93 is an emergent wetland within an agricultural field located northeast of Main Development Area parcel 0420174075 and covers much of WSDOT-owned parcel 0420178009. Wetland 146/148 is located north of Main Development Area parcel 0420174075 and covers the southern portion of WSDOT-owned parcels 0420174028 and 0420174054. Rating and buffer information for Wetlands 87, 89, 93, and 146/148 is provided in Section 5.2.3, and rating forms and figures are provided in Appendix C.

4.3 Streams

No streams, drainage channels, seeps, or associated riparian habitats were observed by Anchor QEA biologists within the Main Development Area during the 2021, 2022, 2023, and 2024 site visits. Additionally, WDFW PHS data (WDFW 2024a), SalmonScape data (WDFW 2024b), and City of Puyallup sensitive areas maps (City of Puyallup 2024b) do not identify any stream channels other than the Puyallup River within 2,000 feet of the Study Area. Pierce County critical area maps (Pierce County 2024) identify Wapato Creek north of the Study Area and the Puyallup River south of the Main Development Area, but they are not located within the Study Area and will not be affected by the Project.

Two streams (Streams 14 and 15) are located adjacent to the Main Development Area within the off-site WSDOT-owned parcels 0420174028, 0420178009, 0420201110, and 0420201111. They appear to be artificially created linear features that join off site to the east of Main Development Area parcel 0420174075. The combined stream (Stream 15) drains from the southeast to the northwest, turns to the west, crosses Freeman Road East, then flows through City of Fife parcels 0420174032, 0420174031, 0420174015, and 0420174707. Anchor QEA's review of the preliminary WSDOT State Route 167 Completion Project critical area assessment indicates that Streams 14 and 15 will be regulated as Type III streams protected by 50-foot-wide buffers, per PMC Chapter 21 (City of Puyallup 2024a), which will partially project onto parcel 0420174075 and 0420205016. For the purposes of this assessment, a 50-foot-wide stream buffer has been applied to the off-site Streams 14 and 15. Preliminary mitigation planning for the WSDOT State Route 167 Completion Project provided in Appendix D indicates that the streams will be relocated further to the east within the WSDOT-owned parcels and that the riparian buffer areas will no longer project into the Main Development Area parcels (WSDOT 2023).

The City of Puyallup and Third-Party Review Reports (Confluence Environmental Group 2022, 2024a) indicated in previous comments that a potential stream or ditch was present along the west side of Freeman Road on or adjacent to parcel 0420174032. During the May 2023 and April 2024 site visits, Anchor QEA biologists inspected this area and found no evidence of an OHWM or other indicators that suggested the presence of flowing water along the west side of Freeman Road East. The area includes a narrow swale at lower elevation, but this does not necessarily qualify as a stream.

4.4 Fish and Wildlife Habitat Conservation Areas

Per PMC 21.06.210 fish and wildlife habitat conservation areas are areas that serve a critical role in sustaining needed habitats and species for the functional integrity of the ecosystem, and which, if altered, may reduce the likelihood that the species will persist over the long term. These areas may include, but are not limited to, rare or vulnerable ecological systems, communities, and habitat or habitat elements including seasonal ranges, breeding habitat, winter range, and movement corridors, and areas with high relative population density or species richness. These areas also include locally important habitats and species as determined by the City of Puyallup. These areas do not include such artificial features or constructs as irrigation delivery systems, irrigation infrastructure, irrigation canals, or drainage ditches that lie within the boundaries of and are maintained by a port district or an irrigation district, unless these features are documented as being used by salmonids for habitat.

4.4.1 Streams

Streams 14 and 15 are located outside of the Main Development Area off site to the north, east, and southeast of parcel 0420174075. The preliminary WSDOT State Route 167 Completion Project critical area assessment indicates that Streams 14 and 15 are degraded ditches with poor riparian buffer conditions that convey water through off-site WSDOT-owned parcels 0420201111, 0420201110, 0420178009, and 0420174028, from the southeast to the northwest, where the combined stream then crosses Freeman Road and flows to the west through City of Fife parcels 0420174032, 0420174031, 0420174015, and 0420174707. Instream conditions in Streams 14 and 15 are poor with a lack of channel complexity and substrate dominated by mud and silt. WDFW fish passage data indicates that a culvert crossing beneath Freeman Road East about 650 feet downstream of Streams 14 and 15 prevents fish passage onto the WSDOT-owned parcels in the vicinity of the Study Area (WDFW 2021; Herrera 2022). The preliminary WSDOT State Route 167 Completion Project critical area assessment indicates that Streams 14 and 15 are Type III Streams and are protected by a standard 50-foot-wide buffer per PMC 21.06.1050. A 3,447-square-foot portion of Stream 14 and 15 buffers extends onto the Main Development Area parcel 0420174075 and 0420205016.

4.4.2 Vegetation

Some undisturbed native vegetation communities are located within the Study Area. Areas of native vegetation occur east and south of the Main Development Area. Native plant species observed include black cottonwood (*Populus balsamifera*), red alder (*Alnus rubra*), red osier dogwood (*Cornus sericea*), Oregon ash (*Fraxinus latifolia*), Pacific crabapple (*Malus fusca*), common snowberry (*Symphoricarpos albus*), Nootka rose (*Rosa nutkana*), salal (*Gaultheria shallon*), northern bracken fern (*Pteridium aquilinum*), and field horsetail (*Equisetum arvense*). Many invasive species or noxious weeds were also noted as present, including include English ivy (*Hedera helix*), English holly *(Ilex aquifolium*), Himalayan blackberry (*Rubus armeniacus*), evergreen blackberry (*Rubus laciniatus*), Canada thistle (*Cirsium arvense*), and reed canary grass *(Phalarais arundinacea*).

Areas located west of the fence line in the agricultural pastures included varieties of *Agrostis* and *Fescue* grasses, which appeared to be regularly mowed or were previously grazed by sheep and llamas. Photographs of vegetation in the Study Area are included in Appendix B.

4.4.3 Wildlife and Habitat

The majority of the Study Area includes a managed landscape with mowed grass and ornamental vegetation. Potential habitat is limited to the small patches of native vegetation along the eastern and southern property boundaries. Wildlife use of the terrestrial habitat is likely dominated by disturbance-tolerant species typical of urban areas. Habitat surrounding the Study Area includes fragmented and disturbed areas associated with residential and industrial development. Wildlife species observed during the site visits included bird species common in urban areas of Pierce County, including crows (*Corvus brachyrhynchos*), house sparrows (*Passer domesticus*), and gull species (*Larus* spp.). No amphibian, reptile, or mammal species; tracks or other signs were observed during the site visits.

The Study Area hydrology provides limited habitat for aquatic species. The habitat within Wetland B and Streams 14 and 15 located on the WSDOT-owned parcels north and east of the Main Development Area are dominated by shallow standing water with little to no noticeable flow, degraded riparian areas and do not provide habitat for salmonid species due to a downstream culvert crossing at Freeman Road East that blocks fish passage further upstream.

Streams 14 and 15 are regulated as Type III streams because they are not used by anadromous fish (no fish species have been documented in the streams; WDFW 2021; Herrera 2022; WSDOT 2023) and it is wider than 2 feet. According to PMC 21.06.1050, Type III, streams require buffers of 50 feet.

4.4.4 Priority Species and Habitats

The WDFW PHS data (WDFW 2024a) do not document occurrences of any terrestrial species or priority habitats in the Study Area. No fish species have been documented in off-site Streams 14 and 15 according to the WDFW PHS and SalmonScape (WDFW 2024b) websites.

4.4.4.1 ESA-Listed Species and Critical Habitat

The assessment for ESA-listed species and critical habitats for this Project was performed based on data provided for the Study Area. The following subsections describe ESA-listed species and critical habitats that may occur in the vicinity of the Study Area.

ESA-listed species and critical habitats under NMFS and USFWS jurisdiction in Western Washington are referenced on the agencies’ websites. NMFS identifies ESA-listed species that occur or may occur within a broad geographic area, such as an evolutionarily significant unit or a distinct population segment, rather than a project-specific location (NMFS 2024). The USFWS identifies ESA-listed species that occur or may occur within a specific location where a project is proposed (USFWS 2024b).

4.4.4.2 Federally Listed Species That May Occur in the Study Area

The May 2024 status of federally listed species and critical habitats protected under the ESA that occur or may occur within the Study Area is presented in Table 2. As shown in Table 2, three ESA-listed bird species occur or may occur within the Study Area. One ESA candidate insect species is identified as potentially occurring within the Study Area. Four ESA-listed fish species are present in the nearby Puyallup River: steelhead trout (*Oncorhynchus mykiss*), Chinook salmon (*O. tshawytscha*), bull trout (*Salvelinus confluentus*), and Dolly Varden (*S. malma*). All four have designated critical habitat in the Puyallup River. However, these species do not occur or are very unlikely to occur in the Study Area based on the species' life history and habitat requirements. Fish species listed in Table 2 are located within the Puyallup River but not in off-site Streams 14 and 15. These species would not be susceptible to impacts related to construction, as no in-water work is proposed, but they are relevant considering the Project is located within the Puyallup River floodplain. No ESA-listed plant or mammal species are identified as potentially occurring within the Study Area.

Table 2
Federally Listed Species That May Occur in Study Area

Species	Status	Agency	Critical Habitat
Birds			
Marbled murrelet (*Brachyramphus marmoratus*)	Threatened	USFWS	Designated (does not include Study Area)
Streaked horned lark (*Eremophila alpestris strigata*)	Threatened	USFWS	Designated (does not include Study Area)
Yellow-billed cuckoo (*Cocczyus americanus*)	Threatened	USFWS	Designated (does not include Study Area)
Insects			
Monarch butterfly (*Danaus plexippus*)	Candidate	USFWS	Not designated
Fish			
Steelhead trout (*Oncorhynchus mykiss*)	Threatened	NMFS	Designated – Puyallup River
Chinook salmon (*Oncorhynchus tshawytscha*)	Threatened	NMFS	Designated – Puyallup River
Bull trout (*Salvelinus malma/S. confluentus*)	Threatened	USFWS	Designated – Puyallup River
Dolly Varden (*S. malma/S. confluentus*)	Threatened	USFWS	Designated – Puyallup River

Marbled murrelets are more commonly associated with marine habitat instead of the freshwater habitat in the Study Area. The urbanized and industrial areas within the Study Area are unfavorable to marbled murrelets, streaked horned larks, and yellow-billed cuckoos.

4.5 Special Flood Hazard Areas

The Puyallup River flows approximately 1,200 feet south of the Main Development Area, south of North Levee Road East. The Study Area is located within the 100-year floodplain of the Puyallup River within Federal Emergency Management Agency (FEMA) Flood Zone AE (FEMA 1999). The base flood elevation (BFE) for the Puyallup River is 33 feet North American Vertical Datum of 1988 (NAVD88); however, the levee along North Levee Road East is not officially certified, meaning the floodplain is mapped as extending onto the Study Area. Per PMC 21.07, the floodplain within the Study Area is a special flood hazard area and a habitat assessment has been prepared by a qualified professional to evaluate the effects and/or indirect effects of the proposed development (during both construction and operation) on floodplain functions. Section 6.3 of this report includes this assessment and documents that the proposed development will not result in impacts to any species listed as threatened or endangered under the ESA.

5 Wetland Delineation

Anchor QEA wetland scientists performed wetland delineation field work on March 11, 2022; May 19, 2023; and May 17, 2024. One wetland was delineated off site: Wetland A, a Category II emergent, scrub-shrub and forested depressional wetland located to the south of 19th Avenue Northwest, east of Freeman Road East, and north of Levee Road East. One wetland was delineated on site: Wetland B, a Category III emergent depressional wetland located on the eastern portion of parcel 0420174075. Following Anchor QEA's review of the Third-Party Review Reporting (Confluence Environmental Group 2022; 2024a) and WSDOT mitigation plans (WSDOT 2023), Anchor QEA also identified five other off-site wetlands, with four delineated on the WSDOT-owned properties to the north and east and one possible, unstudied wetland located to the west of Freeman Road East on parcel 0420174032. Figure 6 provides a preliminary depiction of the off-site wetlands and how their anticipated buffers may extend onto the Main Development Area portion of the Study Area. The possible wetlands located to the west of Freeman Road East on parcel 0420174032 and on either side of 78th Avenue East are not discussed further because they have not been delineated or categorized, and because any associated buffer is interrupted by the existing Freeman Road East, 48th Avenue East, and 78th Avenue East roadways.

The following sections describe the methodology and results of the wetland delineations. Critical areas figures are attached to this CAR, including wetland delineation results in Figures 6 and 7. Site photos are included in Appendix B, wetland determination data forms and wetland rating forms are provided in Appendix C.

5.1 Methodology

This section describes the methodology used to perform the wetland delineation, including a review of existing information and field investigation procedures. These methods are consistent with current federal and state agency requirements, as well as local jurisdiction requirements, for performing wetland delineations and identifying protective wetland buffer widths.

Field work was conducted according to methods presented in the *U.S. Army Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory 1987); 2010 Regional Supplement (USACE 2010); and *Field Indicators of Hydric Soils in the United States: A Guide for Identifying and Delineating Hydric Soils, Version 8.1, 2017* (USDA and NRCS 2016). Soil colors were classified by their numerical description as identified on a *Munsell Soil Color Chart* (Munsell 2000).

The U.S. Army Corps of Engineers defines wetlands as follows:

> Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for

> life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. (Environmental Laboratory 1987)

The method for delineating wetlands is based on the presence of three parameters: hydrophytic vegetation, hydric soils, and wetland hydrology. Hydrophytic vegetation is "the macrophytic plant life that occurs in areas where the frequency and duration of inundation or soil saturation produce permanently or periodically saturated soils of sufficient duration to exert a controlling influence on the plant species present" (Environmental Laboratory 1987). Hydric soils are "formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part" (Environmental Laboratory 1987). Wetland hydrology "encompasses all hydrologic characteristics of areas that are periodically inundated or have soils saturated to the surface for a sufficient duration during the growing season" (Ecology 1997). Data collection methods for each of these parameters are described in the following subsections.

A total of 14 DPs were sampled and recorded. Vegetation, soils, and hydrology information were collected at each of the plots and recorded on field data sheets (Appendix C). Wetland boundaries were determined based upon plot data and visual observations of the wetland. The wetland location, wetland boundary, and DP locations were flagged and recorded by Anchor QEA wetland scientists using a Trimble Geo7x GPS unit.

5.1.1 Vegetation

Plant species occurring in each plot were recorded on field data forms, with one data form per plot. Percent cover for each plant species was estimated in the plot, and dominant plant species were identified. At each plot, trees within a 30-foot radius, shrubs and saplings within a 15-foot radius, and herb and forb species within a 5-foot radius from the center of the plot were identified and recorded. Plant indicator status was determined using the National Wetland Plant List: 2016 Wetland Ratings (Lichvar et al. 2016), and a determination was made as to whether the vegetation in the plot was hydrophytic. To meet the hydrophytic parameter, more than 50% of the dominant species, with 20% or greater cover, must have an indicator of obligate wetland (OBL), facultative wetland (FACW), or facultative (FAC). Table 3 shows the definitions for each wetland indicator status category.

Table 3
Wetland Plant Indicator Status Definitions

Indicator Status	Description
Obligate Wetland (OBL)	Plant species occur almost always in wetlands (estimated probability greater than 99%) under natural conditions.
Facultative Wetland (FACW)	Plant species usually occur in wetlands (estimated probability 67% to 99%) but are occasionally found in non-wetlands.

Indicator Status	Description
Facultative (FAC)	Plant species are equally likely to occur in wetlands or non-wetlands (estimated probability 34% to 66%).
Facultative Upland (FACU)	Plant species usually occur in non-wetlands (estimated probability 67% to 99%) but are occasionally found in wetlands.
Obligate Upland (UPL)	Plant species occur almost always in non-wetlands (estimated probability greater than 99%) under natural conditions.

Source: Reed 1988

5.1.2 Soils

Soils were sampled in each plot and evaluated for hydric soil indicators. Soil pits were dug to a depth of 18 inches, unless a restrictive layer was present. Hydric soil indicators include low soil matrix chroma, gleying, and redoximorphic (redox) features. Redox features are spots of contrasting color that occur within the soil matrix (the predominant soil color). Gleyed soils are predominantly bluish, greenish, or grayish in color.

5.1.3 Hydrology

Wetland hydrology was evaluated at each plot to determine whether it "encompasses all hydrologic characteristics of areas that are periodically inundated or have soils saturated to the surface for a sufficient duration during the growing season" (Ecology 1997). Field observations of saturation, inundation, and other indicators of wetland hydrology, such as water-stained leaves and drainage patterns in wetlands, were recorded.

5.1.4 Wetland Community Types

Wetland community types are discussed according to the USFWS classification developed by Cowardin et al. (1979) for use in the NWI (Cowardin system). This system, published in 1979 by a team of USFWS scientists led by L.M. Cowardin, bases the classification of wetlands on their physical characteristics, such as the general type of vegetation in the wetland (e.g., trees, shrubs, grass) and how much, and where, water is present in the wetland. The Cowardin system provides a classification for every known wetland type that occurs throughout the United States, and under this system a wetland can be classified as having one or more wetland community types. The community types found during this investigation included the following:

- **Palustrine emergent (PEM):** These wetlands have erect, rooted, herbaceous vegetation present for most of the growing season in most years.
- **Palustrine scrub-shrub (PSS):** These wetlands have 30% cover of woody vegetation that is less than 20 feet high.
- **Palustrine forested (PFO):** These wetlands have at least 30% cover of woody vegetation that is at least 20 feet high.

5.1.5 *Wetland Ratings*

Wetland ratings were determined using the most current version of the *Washington State Wetland Rating System for Western Washington: 2014 Update* (Washington rating system; Hruby 2014) and according to the City of Puyallup wetland rating criteria, as defined in the PMC. The Washington rating system was updated by Ecology as of January 1, 2015.

The system developed by Ecology is used to differentiate wetlands based on their sensitivity to disturbance, their significance in the watershed, their rarity, our ability to replace them, and the beneficial functions they provide to society. The Washington rating system requires the user to collect specific information about the wetland in a step-by-step process. Three major functions are analyzed: water quality improvement, hydrologic functions, and wildlife habitat. Ratings are based on a point system, where points are given if a wetland meets specific criteria related to the wetland's potential and opportunity to provide certain benefits.

Per the Washington rating system, wetlands are categorized according to the following criteria and associated point system where points are awarded to three functional value categories (water quality improvement, hydrologic functions, and habitat):

- **Category I wetlands** (23 or more points) represent a unique or rare wetland type, are more sensitive to disturbance, or are relatively undisturbed and contain ecological attributes that are impossible to replace within a human lifetime.
- **Category II wetlands** (20 to 22 points) are difficult, though not impossible, to replace and provide high levels of some functions.
- **Category III wetlands** (16 to 19 points) have moderate levels of functions. They have been disturbed in some ways and are often less diverse or more isolated from other natural resources in the landscape than Category II wetlands.
- **Category IV wetlands** (less than 16 points) have the lowest levels of functions and are often heavily disturbed.

PMC classifies wetlands into four categories (categories I, II, III, and IV) based on the Washington rating system.

5.1.6 *Wetlands Function Assessment*

The functions of wetlands were rated according to the Washington rating system. Using this system, wetlands were rated based on points awarded to three categories of functions: water quality, hydrologic functions, and wildlife habitat. Detailed scoring, based on Washington wetland rating forms, is provided in Appendix C.

5.1.7 *State Hydrogeomorphic Classification System*

Scientists have come to understand that wetlands can perform functions in different ways. The way a wetland functions depends to a large degree on hydrologic and geomorphic conditions. To recognize these differences among wetlands, a way to group or classify them has been developed. This classification system, called the hydrogeomorphic (HGM) classification, groups wetlands into categories based on the geomorphic and hydrologic characteristics that control many functions.

The Washington rating system incorporates the HGM classification as part of the questionnaire for characterizing a wetland's functions. The Washington rating system uses only the highest grouping in the HGM classification: wetland class. Wetland classes are based on geomorphic settings, such as riverine, slope, lake fringe, or depressional. A classification key is provided within the rating form to help identify which of the following HGM classifications apply to the wetland: riverine, depressional, slope, lake fringe, tidal fringe, or flats.

5.2 Results

Anchor QEA wetland scientists delineated one wetland (Wetland A; off site) and one wetland (Wetland B; on site) within the Study Area (Figure 7). These wetlands are summarized in Tables 4 and 5 and described in more detail in the following subsections. Site photographs showing these features are included in Appendix B. Wetland determination data forms and wetland rating forms are provided in Appendix C.

Table 4
Wetlands Delineated by Anchor QEA Within the Study Area

Wetland	Cowardin Class[1]	HGM Class	Category	Total Wetland Area	
				Square Feet	Acres
A	PEM1C, PSS1C PFO1C	Depressional	II	468,674	10.76
B	PEM1C	Depressional	III	1,218	0.03

Note:
1. PEM1C: palustrine, emergent, persistent, seasonally flooded; PSS1: palustrine, scrub-shrub, persistent, seasonally flooded: PFO1C: palustrine, forested, persistent, seasonally flooded

For the Washington rating system, a low, moderate, or high rating is based on three functions: improving water quality, hydrologic, and habitat. Within each of these three functions are three subfunction categories: site potential, landscape potential, and value. Each of these subfunction categories is rated as low, moderate, or high. Wetland functions and scores for Wetland A and Wetland B using the Washington rating system are shown in Table 5. The Washington wetland rating forms are provided in Appendix C.

Table 5
Summary of Scores for Wetland Functions and Values

Wetland and Function	Improving Water Quality	Hydrologic	Habitat	Total Functions Score[1]	Washington State Rating	Puyallup Rating
Off-Site Wetland A						
Site Potential	Moderate	High	Moderate	--	--	--
Landscape Potential	Moderate	High	Low	--	--	--
Value	High	High	High	--	--	--
Score Based on Rating[1]	7	9	6	22	II	II
On-Site Wetland B						
Site Potential	Moderate	Moderate	Low	--	--	--
Landscape Potential	Moderate	Moderate	Low	--	--	--
Value	High	High	High	--	--	--
Score Based on Rating[1]	7	7	5	19	III	III

Notes:
Potential total score per function is 9, for a potential total score of 27.

The following sections describe the wetlands identified during Anchor QEA's field investigations and wetland delineation. The wetland is classified and rated according to the Cowardin system and the Washington rating system.

5.2.1 Wetland A

Wetland A is 10.76 acres (468,674 square feet) with PEM, PSS, and PFO vegetation classes and has a depressional HGM classification. The approximate wetland position is mapped on Pierce County's PublicGIS wetland inventory (Figure 4; Pierce County 2024). In March 2022, Anchor QEA biologists provided an additional delineation along the northern and eastern boundaries of Wetland A. In May 2023 and May 2024, Anchor QEA biologists provided additional delineations along the western and southern boundaries and the current extent was confirmed (Figure 7).

5.2.1.1 Vegetation

Wetland A is dominated by forest vegetation species such as black cottonwood (*Populus trichocarpa*; FAC), red alder (*Alnus rubra*; FAC), Oregon ash (*Fraxinus latifolia*; FACW), and red osier dogwood (*cornus sericea*; FACW), interspersed with a few patches of Himalayan blackberry (*Rubus armeniacus*; FAC). Other species found along the edge of the wetland include Sitka spruce (*Picea sitchensis*; FAC), osoberry (*Oemleria cerasiformis;* FACU), snowberry (*Symphoricarpos albus*; FACU), red current (*Ribes* *sanguineum*; FACU), salmonberry (*Rubus spectabilis*; FAC), and common ivy (*Hedera helix*; FACU). Wetland A Cowardin vegetation classes are presented in Appendix C.

Overall, the vegetation in Wetland A meets the dominance test for hydrophytic vegetation indicator and satisfies the hydrophytic vegetation criteria of the 2010 Regional Supplement (USACE 2010).

5.2.1.2 Soils

Soils in Wetland A are mapped as Pilchuck fine sand, a soil type that is classified as hydric. The soils observed in Wetland A were generally dark at the surface, with a depleted matrix below and redoximorphic features increasing with depth. Upon inspection, the predominant textures were confirmed to be silt loam and sandy loam.

Overall, soil samples met the Depleted Below Dark Surface (A11) hydric soil indicator, satisfying the hydric soil criteria of the 2010 Regional Supplement.

5.2.1.3 Hydrology

Wetland hydrology was confirmed in Wetland A at two data points by surface water (A1), high water table (A2), saturation (A3), inundation visible on aerial imagery (B7), sparsely vegetated concave surface (B8), and water-stained leaves (B9). The primary water regimes of Wetland A were determined to be permanently flooded, seasonally flooded, and saturated.

5.2.1.4 Boundary Determination

The wetland and upland boundaries of Wetland A were determined by an abrupt change in topography and the presence of hydric soils, wetland hydrology, and hydrophytic vegetation. To confirm the current Wetland A extent, Anchor QEA biologists delineated the northern and eastern wetland boundaries in March 2022 and the southern and western boundaries of Wetland A were delineated in May 2023 and May 2024.

5.2.1.5 Wetland Functions Scores and Rating

Wetland A is rated as a Category II wetland, with a score of seven for water quality functions, a score of nine for hydrologic functions, and a score of six for habitat functions. The ratings are discussed in more detail in the following sections, and the wetland rating form for Wetland A is provided in Appendix C.

5.2.1.5.1 Water Quality Functions

Wetland A has moderate function for improving water quality site potential, moderate function for landscape potential components, and high function for the value component based on the Washington rating system. Contributing factors to this functional rating include that the wetland is in a depression with no surface water leaving it (no outlet), persistent ungrazed plants covering more than 50% of the wetland, the absence of septic systems within 250 feet, and the presence of a 303(d)-listed aquatic resource within the subbasin.

5.2.1.5.2 Hydrologic Functions

Wetland A has high hydrologic functions for site potential, landscape potential, and value based on the Washington rating system. Factors that contribute to this functional rating include marks of ponding greater than 3 feet deep, intensive land uses within the subbasin, stormwater discharging directly into the wetland, and surface flooding problems in a subbasin immediately downgradient from the wetland.

5.2.1.5.3 Habitat Functions

Wetland A has moderate, low, and high habitat functions for site potential, landscape potential, and value, respectively, based on the Washington rating system. Factors that contribute to this functional rating include: the presence of three Cowardin plant classes and three hydroperiods; large, downed woody debris; standing snags; stable steep banks of fine material; thin-stemmed persistent plants for amphibian habitat; adjacent high land use intensity; and the lack of nearby undisturbed habitat.

5.2.2 Wetland B

Wetland B is 0.03 acre (1,218 square feet) with PEM vegetation and has a depressional HGM classification (Figure 7). The approximate wetland position is not mapped on Pierce County's PublicGIS wetland inventory (Pierce County 2024) or on the USFWS NWI (Figure 5; USFWS 2024a). In May 2023 Anchor QEA biologists provided an additional delineation and confirmed the current wetland extent.

5.2.2.1 Vegetation

Wetland B is dominated by emergent vegetation species including pasture grasses (*Agrostis and Fescue species*; assumed FAC).

Overall, the vegetation in Wetland A meets the dominance test hydrophytic vegetation indicator and satisfies the hydrophytic vegetation criteria of the 2010 Regional Supplement (USACE 2010).

5.2.2.2 Soils

Soils in Wetland B are mapped as Sultan silt loam, a soil type that is not classified as hydric. The soils observed in Wetland B were found to have a depleted matrix below and redoximorphic features increasing with depth. Upon inspection, the predominant textures were confirmed to be silt loam.

Overall, soil samples met the depleted matrix (F3) hydric soil indicator, satisfying the hydric soil criteria of the 2010 Regional Supplement.

5.2.2.3 Hydrology

Wetland hydrology was confirmed in Wetland B at one data point by surface water (A1), and saturation (A3). The primary water regimes of Wetland B were determined to be seasonally flooded, and saturated. Wetland B shares no permanent or continuous connection to other surface water features.

5.2.2.4 Boundary Determination

The wetland and upland boundaries of Wetland B were determined the presence of hydric soils, wetland hydrology, and hydrophytic vegetation.

5.2.2.5 Wetland Functions Scores and Rating

Wetland B is rated as a Category III wetland, with a score of seven for water quality functions, a score of seven for hydrologic functions, and a score of five for habitat functions. The ratings are discussed in more detail in the following sections, and the wetland rating form for Wetland B is provided in Appendix C.

5.2.2.5.1 Water Quality Functions

Wetland B has moderate, moderate, and high water quality functions based on the Washington rating system for site potential, landscape potential, and value, respectively. Contributing factors to this functional rating the wetland's position within a depression with no surface water leaving it (no outlet), persistent ungrazed plants covering more than 50% of the wetland, the absence of septic systems within 150 feet, and the presence of a 303(d)-listed aquatic resources within the subbasin.

5.2.2.5.2 Hydrologic Functions

Wetland B has moderate, moderate, and high hydrologic functions based on the Washington rating system for site potential, landscape potential, and value, respectively. Factors that contribute to this functional rating include marks of ponding less than 6 inches deep, the relatively small size of the contributing basin, a lack of stormwater discharging directly into the wetland, and surface flooding problems in a subbasin immediately downgradient from the wetland.

5.2.2.5.3 Habitat Functions

Wetland B has low, low, and high habitat functions based on the Washington rating system for site potential, landscape potential, and value, respectively. Factors that contribute to this functional rating include: the presence of a single Cowardin plant classes and two hydroperiods; the absence of downed woody debris, standing snags, stable steep banks of fine material and thin-stemmed persistent plants for amphibian habitat; low richness of plant species and interspersion of habitat, adjacent high land use intensity; and the lack of nearby undisturbed habitat.

5.2.3 WSDOT-Owned Parcel Wetlands

Four wetlands, identified as Wetland 87, Wetland 89, Wetland 93, and Wetland 146/148 (Figure 6), were delineated by WSDOT consultants on the WSDOT-owned parcels (Herrera 2022; WSDOT 2023). Wetland 87 is located southwest of the confluence of Stream 14 and Stream 15 at the northeast portion of parcel 0420201110. WSDOT consultants assigned Wetland 87 a Category III rating with a habitat score of six points. Wetland 89, located directly north of 19th Avenue Northwest, was assigned a Category II rating by WSDOT consultants with a habitat score of five points. Wetland 93 is located north of Stream 14 and east of Stream 15 and covers much of parcel 0420178009. WSDOT consultants assigned Wetland 93 a Category III rating with a habitat score of four points. Wetland 146/148 is located south of Stream 15 at the southern portion of parcels 0420174028 and 0420174054. WSDOT consultants assigned Wetland 146/148 a Category III rating with a habitat score of four points. Table 6 provides a summary of the off-site WSDOT wetland information.

Table 6
Off-Site WSDOT Wetlands

Wetland	Cowardin Class[1]	HGM Class	Category	Total Wetland Area	
				Square Feet	Acres
WL87	PSS, PFO	Depressional	III	2,745	0.63
WL89	PSS	Depressional	II	5,645	0.13
WL93	PEM	Depressional	III	293,494	6.74
WL146/148	PEM, PSS	Depressional	III	22,128	0.53

Note:
1. PEM: palustrine, emergent wetland; PSS: palustrine, scrub-shrub wetland; PFO: palustrine, forested wetland.

For the Washington rating system, a low, moderate, or high rating is based on three functions: improving water quality, hydrologic, and habitat. Within each of these three functions are three subfunction categories: site potential, landscape potential, and value. Each of these subfunction categories is rated as low, moderate, or high. Wetland functions and scores for Wetlands 87, 89, 93, and 146/148 using the Washington rating system are shown in Table 7. The Washington wetland rating forms provided by WSDOT consultants are included in Appendix C.

Table 7
Summary of Scores for WSDOT Wetland Functions and Values

Wetland and Function	Improving Water Quality	Hydrologic	Habitat	Total Functions Score[1]	Washington State Rating	Puyallup Rating
Wetland 87						
Site Potential	Moderate	Moderate	Moderate	--	--	--

Wetland and Function	Improving Water Quality	Hydrologic	Habitat	Total Functions Score[1]	Washington State Rating	Puyallup Rating
Landscape Potential	Moderate	Moderate	Low	--	--	--
Value	High	Moderate	High	--	--	--
Score Based on Rating[1]	7	7	6	19	III	III
Wetland 89						
Site Potential	Moderate	Moderate	Low	--	--	--
Landscape Potential	High	High	Low	--	--	--
Value	High	Moderate	High	--	--	--
Score Based on Rating[1]	8	7	5	20	II	II
Wetland 93						
Site Potential	Low	Moderate	Low			
Landscape Potential	High	High	Low			
Value	High	Moderate	Moderate			
Score Based on Rating[1]	7	7	4	18	III	III
Wetland 146/148						
Site Potential	Moderate	Low	Low			
Landscape Potential	High	High	Low			
Value	High	Moderate	Moderate			
Score Based on Rating[1]	8	6	4	18	III	III

Note:
Potential total score per function is 9, for a potential total score of 27.

5.3 Puyallup Wetland Buffer Guidance

Required wetland buffers have been identified according to the current PMC. PMC 21.06.930 identifies minimum protective buffer widths for wetlands based on the Ecology habitat rating score, per the Washington rating system, level of function for habitat and water quality improvement, and land use intensity.

Per PMC 21.06.930 2 (C), the minimum proposed buffer width for a Category II wetland with a high land use intensity on the upland side of the buffer, low level for habitat function (less than six points) and high level of function for water quality improvement (eight to nine points) is 100 feet, measured from the wetland boundary as delineated in the field. Therefore, the proposed buffer width for Wetland 89 is 100 feet. The Wetland 89 buffer does not project onto the Main Development Area (Figure 6).

Per PMC 21.06.930 2 (C), the minimum proposed buffer width for a Category II wetland with a moderate habitat score of six to seven points and high land use intensity on the upland side of the buffer is 150 feet. Therefore, the proposed buffer width for Wetland A is 150 feet. However, any Wetland A buffer that may project onto the Main Development Area is interrupted by an existing roadway (19th Avenue Northwest) that lies between Wetland A and the Main Development Area. The Wetland 93 buffer partially projects onto the Main Development Area and is not interrupted by a roadway or other existing development (Figure 6).

Per PMC 21.06.930 2 (D), the minimum proposed buffer width for a Category III wetland with a habitat score of less than six points and high land use intensity on the upland side of the buffer is 80 feet, measured from the wetland boundary as delineated in the field. Therefore, the proposed buffer width for Wetland B, Wetland 93, and Wetland 146/148 is 80 feet.

Per PMC 21.06.930 2 (D), the minimum proposed buffer width for a Category III wetland with a moderate habitat score of six to seven points, and high land use intensity on the upland side of the buffer is 150 feet. Therefore, the proposed buffer width for Wetland 87 is 150 feet. The Wetland 87 buffer partially projects onto the Main Development Area and is not interrupted by a roadway or other existing development (Figure 6).

Table 8 provides a summary of wetland functional ratings and proposed wetland buffer widths.

Table 8
Proposed Wetland Buffer Widths

Wetland	Improving Water Quality	Habitat	Category	Buffer Width (feet)
On-Site Wetlands				
Wetland B	7	5	III	80
Off-Site Wetlands				
Wetland A	6	4	II	150
WL87	7	6	III	150
WL89	8	5	II	100
WL93	7	4	III	80
WL146/148	8	4	III	80

6 Critical Areas Impact Assessment

This section provides a summary of potential impacts to wetlands and to fish and wildlife habitat conservation areas. Mitigation to address the anticipated wetland and buffer impacts will be implemented by on-site mitigation planting, and by a purchase of mitigation credits from the Port of Tacoma Upper Clear Creek Mitigation Bank (Mitigation Bank) that would generate higher-value wetlands off site but within the Mitigation Bank's service area. Table 9 provides a summary of wetland and wetland buffer impacts related to the proposed Project. Proposed wetland and wetland buffer impacts are presented in Figure 9.

Table 9
Proposed Freeman Road Logistics Project Wetland Impacts

Wetland	Wetland Category[1]	Wetland Size (acre)	Permanent Direct (acre)	Permanent Indirect (acre)	On-site Buffer (acre)
Wetland A	II	10.76	0	0	0
Wetland B	III	0.03	0.03	0	0
WL87	III	0.63	0	0.01	0.02
WL89	II	0.13	0	0	0
WL93	III	6.74	0	0.	0
WL146/148	III	0.53	0	0.45	0.97
Total	**NA**	**18.82**	**0.03**	**0.46**	**0.99**

Notes:
1. Source: Hruby 2014

Proposed Project construction activities will not occur within streams or within the approximately 3,447 square feet of the Stream 14 and 15 fish and wildlife habitat conservation buffer areas that projects onto the Main Development Area (Appendix A; Figures 8 and 9).

Indirect impacts are adverse effects on wetlands that occur outside the footprint of direct impacts caused by the placement of dredged or fill material (Ecology et al. 2021). The extent of indirect wetland impact to off-site Wetlands 87 and 146/148 was determined by calculating the areas of the wetlands that are superimposed by the recommended buffers needed to protect those wetland functions, as measured from the outward edge of the development. While the proposed development proposes no impacts resulting from the actual placement of fill material directly into the off-site wetlands, portions of buffers for Wetland 87 and 146/148 would be developed and that would reduce the width of the buffers below local critical area requirements for wetland protection. However, Wetlands 87 and 146/148 will be directly and permanently impacted by construction of the State Route 167 Completion Project, which will be mitigated as part of that project. Therefore, only mitigation for direct on-site buffer impacts caused by the Freeman Road Logistics Project is proposed as part of this Project (Section 6.1.5).

Buffer averaging is proposed for Wetland 87 buffer that extends into the Main Development Area development footprint. Proposed project construction activities will unavoidably impact approximately 0.02 acre of Wetland 87 buffer area that projects onto Main Development Area parcel 0420205016. The Wetland 87 buffer will be averaged by expanding a 0.03-acre area that is contiguous with and outside of the combined Wetland 93 and Wetland 146/148 buffer area. This expanded buffer area will be enhanced to improve buffer function, as described in Sections 8.4.2.2 and shown in Figure 9.

The Project will not have measurable short-term or long-term impacts on wildlife species. Noise associated with construction activities could result in avoidance behavior by some wildlife species if they are present. However, the Main Development Area is an agricultural and residential area that experiences ongoing human disturbance. Noise levels associate d with operation of the Project after construction are expected to be consistent with current ambient noise levels.

6.1 On-Site and Off-Site Wetland Impacts

6.1.1 On-Site Wetland B Impacts

The Project proposes the total fill (1,218 square feet) of on-site Wetland B, which offers poor water quality, hydrologic, and habitat functions. No practicable alternatives exist that could avoid filling the wetland due to the size, shape, location, and extent of the wetland and the required warehouse and parking capacity, building code requirements, zoning, and other factors supporting the Project purpose and need (Section 2). A detailed description of Project screening criteria and avoidance and minimization measures are provided in Section 7. The Project proposes to provide compensatory mitigation for impacts to Wetland B through purchase of wetland mitigation credits from the Mitigation Bank, which is in the same subbasin as the Main Development Area and proposed impact, pending Port review.

6.1.2 Off-Site Wetland A

The proposed water, sewer, and stormwater line improvements and the Puget Sound Energy gas line work will entirely avoid Wetland A and Wetland A buffer impacts The design has been modified to avoid any temporary or permanent impacts to the Wetland A buffer (Appendix A).

6.1.3 Off-Site Freeman Road East Widening Adjacent to Parcels 0420201104 and 0420201008

Road-widening is expected at the intersection of Freeman Road East and North Levee Road East. The Project proposes to widen Freeman Road west of parcel 0420201008 along parcel 0420201104 from two 11-foot-wide lanes to two 14-foot-wide lanes. The proposed east edge alignment of Freeman Road will match the current location and fall outside of the 150-foot buffer associated with Wetland A. The roadway improvements will not impact Wetland A or Wetland A buffer. Current design plans (Appendix A) depict a centered road crown, which will result in a minor increase in impervious surfaces (3 feet additional width, 2,100 square feet in area) that will generate runoff directed toward parcel 0420201008. However, the proposed increased flow volumes will be collected and treated by a stormwater detention facility and no stormwater will enter directly into Wetland A or its buffer. These flows are not expected to appreciably alter surface and groundwater hydrology in or around Wetland A (Barghausen 2024).

During the May 2023 site visit, no other wetlands or wetland buffers were present within the road-widening area on parcel 0420201008. Similarly, no wetlands or wetland buffers were identified on parcel 0420201104 to the west of Freeman Road East. Therefore, no critical area impacts will occur because of road-widening. A portion of the road-widening area is within the shoreline zone of the Puyallup River. During Project permitting, two memoranda will be prepared that describe how the proposed work is consistent with shoreline regulations, one for the City of Puyallup and one for the City of Fife.

6.1.4 Off-Site Road-Widening Adjacent to Parcel 0420174032

Widening and improvement of off-site segments of Freeman Road East are anticipated to be required by the City of Puyallup and City of Fife north of 48th Street East, where road-widening may impact a swale along Tribal trust land at parcel 0420174032. This area was assessed during the May 2023 and April 2024 field investigations. No OHWM was observed within the ditch, and this swale area is not a regulated stream.

6.1.5 Off-Site Wetland 87 and Wetland 146/148 Buffer Impacts

In total, approximately 43,035 square feet (0.99 acres) of off-site Wetland 87 and Wetland 146/148 extend onto Main Development Area parcels 0420205016 and 0420174075 and are proposed to be impacted by the Project (Figure 9). The combined area of the buffers has been used to determine the total area of unavoidable on-site buffer impacts that will require compensatory mitigation. Buffer impacts for multiple critical areas within the same location are not double counted (Figure 8).

The consideration of Project impacts to on-site portions of off-site wetland buffers is complicated by the planning for the future use of the WSDOT-owned properties as part of the State Route 167 Completion Project and the mitigation for that project's impacts to wetlands and streams occurring on the WSDOT-owned parcels. Preliminary State Route 167 Completion Project designs indicate that Wetlands 87, 93, and 146/148 and Streams 14 and 15 and all associated buffers will be impacted by State Route 167 construction. The proposed State Route 167 Completion Project mitigation for those unavoidable impacts will be extensive and is planned to include the total regrading of the WSDOT parcels adjoining to the Main Development Area, including Wetlands 87, 93, and 146/148, relocation of Streams 14 and 15, and wetland re-establishment, rehabilitation, and enhancement to compensate for direct and indirect wetland and wetland buffer impacts within the WSDOT-owned parcels (Appendix D).

Because the Freeman Road Logistics Project will occur prior to the State Route 167 Completion Project, wetland buffer impacts within the Main Development Area parcels are proposed to be mitigated by the Freeman Road Logistics Project. However, because the State Route 167 Completion Project will result in significant permanent, direct disturbance and wetland mitigation within Wetlands 87, 93, and 146/148 and within Streams 14 and 15, no mitigation for indirect wetland impacts caused by the Freeman Road Logistics Project is proposed. It is important to note that the future WSDOT mitigation will be provided with buffers that will be fully located within the WSDOT properties and that these buffers will not extend onto the Main Development Area. The proposed credit purchase from the Mitigation Bank and on-site mitigation planting will sufficiently compensate for the on-site buffers impact that will occur in the short-term prior to the direct, permanent critical area impacts proposed to result from the State Route 167 Completion Project.

6.1.6 Off-Site Wetland 89 Impact

No impact to Wetland 89 or associated wetland buffers are proposed as part of the Freeman Road Logistics Project.

6.1.7 Off-Site Parcels Considered During Design Analysis

According to the Third-Party Second Review Report and Third-Party Third Review Report (Confluence Environmental Group 2024a, 2024b), a wetland located on parcel 0420174707 has been identified in association with a Tribal mitigation project. An earlier project design included utility routing within the existing 78th Avenue East roadway envelope in the vicinity of the wetland and associated buffer. The current project design no longer includes utility or other work along 78th Avenue East, and potential impacts to the Tribal mitigation project have been entirely avoided.

6.2 On-Site Stream Buffer

Off-site Streams 14 and 15 are regulated as Type III streams and protected by 50-foot buffers, per PMC Chapter 21 (City of Puyallup 2024a), which will partially project onto parcels 0420174075 and 0420205016. A 50-foot buffer projected onto the Main Development Area results in an approximately 3,447-square-foot buffer area, with 2,544 square feet on parcel 0420174075 and 933 square feet on parcel 0420205016. The current Project design (Appendix A) fully avoids impacts to the Stream 14 and Stream 15 buffer areas.

6.3 Special Flood Hazard Areas Habitat Assessment

The Main Development Area is located within the 100-year floodplain of the Puyallup River and within a Pierce County designated special flood hazard area. As discussed in Section 3.2, the Puyallup River flows approximately 1,200 feet south of the Main Development Area, south of Levee Road East. The proposed Project includes construction activities within the 100-year floodplain (Appendix A). The Project will be constructed within the footprint of current low-density residential lots and agricultural fields that experience ongoing human use and disturbance from automobiles, livestock, and agricultural activities.

The BFE varies across the Main Development Area between 32 and 33.7 feet NAVD88, and the two warehouse buildings will be elevated so that the finished floor is elevated approximately 1 foot above the BFE. This will place all electrical and other equipment at least 1 foot above the BFE as well. These design features will avoid or minimize potential impacts to the floodplain, reduce the potential for inundation during flood events, and meet Cities of Puyallup and Fife requirements. The orientation of the proposed warehouses will be situated in line with one another (the northern warehouse will be within the hydraulic shadow of the southern building to align with anticipated flood flows through the property when they occur). This design is intended to minimize potential impacts on floodwater velocity.

To construct the proposed structures, a net cut of material will be achieved within the floodplain through proposed final grades and by the use of compensatory storage west of the northern building (Building A). The proposed grading will result in an increase of local floodwater storage volume. Material removed from the floodplain will be located within the same floodplain cross section and perpendicular to the flow. These mitigation measures are anticipated to result in zero net fill and will not cause any rise to the BFE within the floodplain, consistent with PMC 21.07.

The federal habitat assessment guidelines require an analysis of other potential impacts to the floodplain environment. The following includes an analysis of habitat assessment elements per the minimum habitat assessment standards:

- **Project and action area description, maps, and site plans have been provided.** See Preliminary Plan Set in Appendix A.
- **Methods of work are described.** See Preliminary Plan Set in Appendix A.
- **Projects in the Protected Area are designed to inherently avoid detrimental impacts without mitigation.** The Project is located within the footprint of residential and agricultural fields that experience ongoing human use and disturbance. The Project is designed to avoid or minimize potential detrimental impacts through the orientation of the buildings relative to flood flows, stormwater facilities, and removal of soils from other properties within the floodplain.

- **Direct and indirect impacts.** Direct impacts include minor impacts to the floodplain from construction as described in this CAR. Long-term impacts include the presence of structures within the floodplain in an area previously used for residences and agriculture. The long-term environmental benefits from the Project, including improved water quality from runoff, are anticipated to offset any potential short-term impacts from construction and operation of the facility. Indirect impacts from the Project may include improved downstream water quality in the Puyallup River and reductions in nutrient loads to the Puyallup River from runoff and during flood events.
- **Interrelated and interdependent activities.** All development impacts associated with this Project are described in this CAR. No other projects are known that would result in interrelated and interdependent activities.
- **Cumulative impacts.** Cumulative impacts are those that could result in the combination of effects from individual Project actions occurring over time. If left unmitigated, the cumulative or incremental effects of these actions have the potential to result in significant environmental impacts. The Project is located within an area characterized by residences, agricultural fields and associated structures, and industrial buildings, such as warehouses. At the time of publication, there are no nearby projects that are anticipated to contribute to cumulative impacts. However, it is anticipated that future projects in the area would be required to conduct a separate, Project-specific environmental review, as appropriate. It is anticipated that mitigation measures implemented for each project would decrease the potential for cumulative adverse effects on the environment.
- **Other habitat assessment elements include the following:**
  - **Water quantity and quality.** As described previously, the Project is anticipated to result in a net improvement to water quality from runoff and during flood events due to the construction of stormwater facilities. During construction, stormwater control measures will be implemented to avoid or minimize potential short-term construction impacts on water quality to be shown in a Stormwater Pollution Prevention Plan and Temporary Erosion and Soil Control Plan. A Stormwater Site Plan will also be prepared, describing the stormwater control best management practices (BMPs) incorporated into the Project to meet the requirements of the Cities of Puyallup and Fife stormwater regulations. The Project will have no impact on water quantity.
  - **Flood velocities and volumes.** As described previously, the Project has been designed to accommodate flood velocities through orientation of the structures (with the north warehouse designed to be within the hydraulic shadow of south warehouse) and to align them with floodwaters. The Project will not create any rapid water runoff conditions and therefore will not impact flood flows downstream. The Project will have a negligible impact on flood volumes.

- **Flood storage capacity.** Earthwork cuts and fills will be balanced at the site to the extent possible. The construction of improvements at the proposed stormwater facilities will provide no net loss to flood storage capacity.
- **Riparian vegetation.** The Project is located over 1,200 feet from the Puyallup River and associated riparian buffers. No riparian vegetation will be impacted by the Project.
- **Measures to preserve habitat forming processes.** No in-water work is proposed, and no impacts to habitat forming processes will occur from the Project; therefore, no measures to preserve habitat forming processes are proposed.
- **Refuge from higher velocity floodwaters is provided.** The presence of the structures within the floodplain may provide limited refuge from higher velocity floodwaters. No additional measures are proposed.
- **Spawning substrate is provided or protected.** No in-water work or work in the vicinity of salmonid spawning habitat is proposed, and no impacts to spawning substrate will occur from the Project; therefore, no spawning substrate needs to be provided by the Project.

- **No adverse effects from habitat isolation, bank armoring, channel straightening, construction effects (transport of sediment from the work area, noise, etc.), or direct effects.** No habitat isolation, bank armoring, or channel straightening is proposed as part of the Project. To avoid or minimize potential construction effects from the Project, stormwater control measures will be implemented to avoid or minimize potential construction impacts on water quality and will be shown in the Stormwater Pollution Prevention Plan and Temporary Erosion and Soil Control Plan. As described above, a Stormwater Site Plan will also be prepared describing the stormwater control BMPs incorporated into the Project to meet the requirements of the Cites of Puyallup and Fife stormwater regulations. Overall, the long-term environmental benefits from the Project, including improved water quality from runoff, are anticipated to offset any potential short-term impacts from construction and operation of the facility.

For the reasons stated above, the proposed Project may affect, but is not likely to adversely affect, listed fish NMFS species, as evaluated per the NMFS Biological Opinion for the National Flood Insurance Program (NMFS 2008), or listed USFWS species.

7 Site Selection Screening and Alternatives Analysis

7.1 Site Selection Screening Criteria

To meet the Project purpose and need described in Section 2), site selection criteria were developed to evaluate potential alternatives. The primary criterion is a site large enough to accommodate the stated purpose and need for development of a 505,000-square-foot commercial warehouse with employee parking, truck loading bays, truck parking and area for truck maneuvering within proximity to the Port and transportation infrastructure linkages. This area was selected in accordance with market demand for this product (i.e., very large commercial warehouse vacancy is low) and Pierce County's Comprehensive Plan.

In order to accommodate such a development, the property must be between 20 and 30 acres to accommodate the 505,000-square-foot warehouse building capacity and car and trailer parking to meet local codes for setbacks, off-street parking, landscaping and screening, truck movements, fire access, and trailer parking, and it must be zoned LM/W. Other site requirements include the presence of well-developed infrastructure (e.g., road network, utility systems) and a highly qualified regional labor pool to support the land use. The site must also be within 5 miles of the Port and I-5 to support efficient movement of goods with easy access via State Route 167 Completion Project or the Canyon Road Regional Connection Project. This parameter is important due to the nature of the Project. Logistics centers are intended to efficiently receive and distribute goods, and the Project location will support the applicant's intention to minimize or avoid issues with traffic concurrency and impacts to local road conditions from the added truck traffic. In addition, the site should make efficient use of lands designated for LM/W development within the City of Puyallup Freeman Road Comprehensive Plan Map Amendment and FRO, maximize the use of existing infrastructure, and provide jobs in the growing Cities of Puyallup and Fife and greater Pierce County area.

The Project's need to impact wetlands and critical area buffers is related to the location of wetlands and critical area buffers on the Main Development Area, as well as requirements for warehouse capacity, existing roads, access roads, and other infrastructure improvements required to support the proposed Project. Placement of material into wetlands and critical area buffers is unavoidable to facilitate the expansion and improvement of existing roadways and sidewalks; installation of stormwater, sewer and water utilities; and construction of the warehouses and associated parking and vehicle movement areas, including emergency vehicle ingress and egress.

Three sets of screening criteria were selected to evaluate potential alternatives to the proposed Project:

1. Whether or not the alternative would meet the stated Project purpose and need
2. The extent to which the alternative would avoid and minimize impacts to regulated wetlands and other waters

3. The extent to which the alternative is practicable for use for typical warehouse and/or distribution users

Each criterion is further described in the following sections.

7.2 Achievement of Project Purpose and Need

Alternatives were analyzed based on their ability to achieve the stated purpose and need for development of 500,000-square-foot warehouse capacity with employee parking, truck loading bays, and truck parking within 5 miles of the Port and I-5.

In order to achieve this purpose and need, alternative sites must meet the following screening criteria:

- Be zoned for LM/W use, or Employment Center (EC), which is the equivalent zoning designation in use by Pierce County.
- Be within 5 miles of the Port and I-5 with easy access via State Route 167 Completion Project or the Canyon Road Regional Connection Project.
- Be located in an area with a well-developed utility infrastructure, or where necessary improvements could be reasonably afforded.
- Be located in an area that can provide a highly qualified regional labor pool.
- Be able to maximize the use of lands zoned as LM/W of EC.
- Address the regional shortage of 500,000-square-foot warehouse capacity.
- Support traded-sector investments that create high-wage jobs and tax base in the City of Pullup or another portion of Pierce County.

7.3 Avoidance and Minimization of Impacts

Alternatives were also analyzed based on the capacity for a viable site design to avoid and minimize impacts to any wetlands that specifically provide high ecological and societal functions. Wetlands with any of the following characteristics were considered priorities for avoidance and impact minimization:

- Wetland areas with a “high” potential and associated “high” value scores, as determined from the Washington State Wetlands Rating System – Western Washington: 2014 Update (Hruby 2014)
- Palustrine forested or scrub-shrub wetlands; mitigation for these wetlands entails a higher temporal loss of functions and values than occurs for emergent wetlands
- Riverine or slope wetlands, which are more difficult to replace in-kind than depressional wetlands
- Wetlands connected to streams or other waterways that provide habitat to native fish, ESA-listed fish, or other ESA species

- Wetlands containing special characteristics (Hruby 2014)
- Wetlands characterized by predominately native vegetation species
- Wetlands designated as locally “significant” in Pierce County code or plans
- Wetlands that provide connectivity between, or provide buffer functions to, other valuable upland or wetland habitats, either on or off site
- Any wetlands of high conservation value (WDNR 2024)
- Any designated Priority Habitat Area (WDFW 2024a)

Agriculturally degraded or artificially created wetlands were considered more easily replaced through mitigation with no issues associated with temporal loss. In situations where the quality or origin of a wetland or other water was unknown, avoidance and minimization were kept as the higher priority.

7.4 Practicability

Alternatives were analyzed based on their practicability for use by typical warehouse and logistical users. Factors considered in assessing practicability to the end user included the following general and site-specific criteria.

7.4.1 General Practicability Criteria:

- Short timeline to facility construction, with sites available for construction within 12 months being most practicable
- Readily available for warehouse development (e.g., not earmarked or restricted by designated use/zoning)
- Geometry of building shapes (i.e., rectangular, irregular, square): rectangular building shapes generally preferred for efficient interior layout
- Topography of the site (e.g., flat, rolling, sloped) and presence of natural resource constraints (e.g., wetlands or streams): flat sites without wetlands or stream constraints are generally preferred due to a limited ability to incorporate changes in finished floor elevations in warehouse facilities

7.4.2 Site-Specific Practicability Criteria

- Percent building coverage of site: building coverage of between 30% and 50% is targeted for warehouse/distribution facilities depending on the size of the lot
- Ratio of parking spaces to site size and resultant number of parking spaces: minimum “market” parking requirements of 1.0 employee parking space per 3,000 square feet of building and an equal number of truck parking stalls as truck bays are desired by warehouse/distribution facilities

- Capacity of site to support loading, service, and storage requirements of typical warehouse/distribution facility users: warehouse/distribution typically requires access by large trucks

7.5 Alternatives Analysis

Four potential alternatives were identified for the proposed warehouse and logistics development including a “no action” option. Each of these alternatives is discussed in the following sections.

7.5.1 Alternative 1: No Action

Under this alternative, the proposed Main Development Area would not be developed for warehouse and logistical uses and would continue to exist as vacant and disused grassy lots. The Project purpose and need would not be achieved with this alternative.

7.5.2 Alternative 2: Off-Site Alternatives

Under this alternative, a different site or sites would be used for the proposed Project. Potential alternative sites were evaluated through an informal parcel analysis completed by Vector Development Company using the purpose and need criteria provided in Section 2 of this CAR. Parcels were also reviewed to select potential sites that were not encumbered or characterized by any of the following:

- Ownership by a city or county division unless known to be surplus and for sale
- Ownership by a land trust or private club/organization with a mission to protect or preserve the land as open space or for public or private recreation
- Special tax status granted by enrollment in a state authorized program for open space, agriculture, or timber land

No qualifying parcels that were for sale or may potentially be for sale were identified that met the listed criteria and the purpose and need criteria.

7.5.3 Alternative 3: North-South Building Layout No 1

Alternative 3 is an on-site design that involves developing the proposed Freeman Road Logistics Main Development Area using a north-south building layout. Under this alternative, the build-out design would be adjusted so that the footprint of the northern building and associated paved parking areas would be decreased to avoid all impacts to on-site Wetland B and Wetland B buffers. The footprint would also be reduced to avoid impacts to buffers from off-site Streams 14 and 15 and Wetland 93.

Reducing the footprint to avoid impacts to buffers from off-site Streams 14 and 15 and from off-site Wetlands 87, 93 and 146/148 is feasible. However, total elimination of impacts to Wetland B and its buffer and the off-site critical area buffers would require reducing the size of the north building footprint by approximately 119,955 square feet in order to retain required Freeman Road East improvements and buffer setbacks under the FRO, achieve necessary truck parking and maneuvering space, and provide required emergency vehicle ingress and egress. Alternative 3 consists of a north building footprint of approximately 119,955 square feet and a south building footprint of approximately 256,102 square feet, resulting in a total Project warehouse capacity of an approximate 376,057-square-foot warehouse capacity, which is well below the minimum 500,000-square-foot warehouse capacity threshold required to meet the applicant's purpose and need.

7.5.4 Alternative 4: North-South Building Layout No 2

Alternative 4 is an on-site design that involves developing the proposed Freeman Road Logistics Main Development Area using a north-south building layout and total fill of Wetland B, buffer width averaging for the on-site portion of Wetland 87 buffer, and partial development of the on-site portion of Wetland 146/148 buffer. The on-site portion of Stream 14 and 15 buffer areas is fully avoided. Under this alternative, the build-out design of the northern building would use the Main Development Area while retaining required Freeman Road East improvements and buffer setbacks under the FRO, achieving necessary truck parking and maneuvering space, and providing required emergency ingress and egress.

Alternative 4 would consist of a north building footprint of approximately 234,901 square feet and a south building footprint of approximately 256,102 square feet, resulting in a total Project warehouse capacity of 505,436 square feet, which is above the minimum 500,000-square-foot warehouse capacity threshold required to meet the applicant's purpose and need. Additionally, the Alternative 4 layout would meet the Project purpose by making efficient use of lands designated for LM/W uses, maximizing the use of existing infrastructure, providing additional transportation and other infrastructure improvements, and providing high-wage jobs in the growing City of Puyallup and Pierce County areas within 5 miles of the Port and I-5. The north-south building layout is expected to address important market demand for very large commercial warehouses and would provide one parking space for every 3,000 square feet of building, providing the parking space ratio needed for warehouse/distribution facilities of this kind.

Alternative 4 would directly impact 1,218 square feet of Wetland B, a Category III depressional wetland that contains highly degraded PEM habitat. Additionally, Alternative 4 would directly impact 42,067 square feet of Wetland 146/148 buffer and 968 square feet of Wetland 87 buffer and fully avoid impacts to the Streams 14 and 15 buffers occurring on site (Appendix A; Figure 8 and 9). The Wetland 146/148 buffer impacts (42,067 square feet) will be mitigated by purchase of credits from the Mitigation Bank. Wetland 87 buffer impacted by construction (968 square feet) would be averaged by increasing the buffer area by 968 square feet of currently degraded buffer area contiguous with the Wetland 93 and Wetland 146/148 buffer areas The current condition of Wetland B and the on-site portions of the wetland buffers is poor, with low native species diversity and low to moderate functions and values. Off-site wetlands and streams will also be relocated as part of the State Route 167 Completion Project occurring on WSDOT-owned parcels. Functions of on-site wetlands and buffers would be offset by on-site buffer mitigation enhancement and purchase of mitigation credits at the Mitigation Bank. This alternative would achieve a net benefit of wetland function by generating much higher-value wetlands at the Mitigation Bank Site and for remaining on-site buffers.

7.6 Site Selection Screening and Alternatives Analysis Conclusions

Based on the alternatives analysis, Alternative 4, the north-south building layout, with on-site buffer enhancement and purchase of off-site compensatory wetland mitigation credits from the Mitigation Bank, would best meet the Project purpose and need. It would meet the minimum of 500,000 square feet of warehouse capacity within 5 miles of the Port and I-5 via State Route 167. Alternative 3 would not achieve a minimum 500,0000-square-foot warehouse capacity, would not maximize the appropriately zoned use of the property. Alternative 4 would achieve a net improvement in habitat quality through wetland buffer enhancement and the purchase of 0.079 wetland credit at the Mitigation Bank Site by generating higher-value wetlands off-site but within the Mitigation Bank's service area.

8 Avoidance, Minimization, and Mitigation Measures

The results of the critical area assessment identified on-site Wetland B (Category III), five off-site wetlands (Wetland A [Category II], Wetland 87 [Category III], Wetland 89 [Category II], Wetland 93 [Category III], and Wetland 146/148 [Category III]), and two off-site streams (Streams 14 and 15) within the Study Area. The Project has been designed to avoid and minimize impacts to critical areas and their buffers to the maximum extent possible while also satisfying design criteria for the development and City of Puyallup and City of Fife building and zoning requirements. The Project includes unavoidable fill impacts to on-site Wetland B (1,218 square feet), buffer width averaging for on-site Wetland 87 buffer, and to on-site portions of off-site Wetland 146/148 buffer (42,067 square feet), which provide poor water quality and hydrologic and habitat functions. The Project proposes to offset the wetland fill and buffer impacts with on-site buffer enhancement and by purchasing wetland credits from the nearby Mitigation Bank that would generate higher-value wetlands off site but within the Mitigation Bank's service area.

8.1 Mitigation Sequencing

The proposed Project requires the necessary and unavoidable fill of on-site Wetland B, located centrally on parcel 0420174075, and the on-site portions of critical area buffers located on parcels 042174075 and 0420205016. Per PMC 21.06.610, projects should first attempt to avoid impacts all together by not taking certain actions. If actions cannot be eliminated, impacts should be minimized by restraining the magnitude of an action, using different technology, or taking steps to reduce impacts. For impacts that cannot be avoided or minimized, compensation or rectification for the impact should be provided by replacing, enhancing, or providing substitute resources or environments, followed by monitoring and reduction of the impact over time. Mitigation sequencing, outlined under PMC 21.06.210(84), for impacts to critical areas, is as follows:

1. Avoiding an impact altogether by not taking a certain action or parts of actions
2. Minimizing impacts by limiting the degree or magnitude of an action and its implementation
3. Rectifying impacts by repairing, rehabilitating, or restoring the affected environment
4. Reducing or eliminating an impact over time by preservation and maintenance operations during the life of the action
5. Compensating for an impact by replacing or providing substitute resources or environments
6. Monitoring the mitigation and taking remedial action when necessary

As discussed in Section 7, no practicable alternatives could avoid on-site Wetland B and the on-site portions of the off-site critical area buffer impacts and still fulfill the Project purpose and need due to the size, shape, location, and extent of the wetland and the required warehouse and parking capacity, building code requirements, zoning, and other factors. Project avoidance, minimization, and mitigation measures included site selection screening criteria (Section 7.1), alternatives analysis

(Section 7.5), and avoidance and design and construction measures (Sections 8.2 and 8.3, respectively). The Project proposes to provide compensatory mitigation for all impacts to Wetland B and to the on-site potions of off-site critical area buffers by purchase of wetland mitigation credits from the nearby Mitigation Bank and on-site mitigation plantings.

8.2 Avoidance and Minimization Measures

8.2.1 Design Measures

The Project includes unavoidable permanent adverse impacts to all of Wetland B located on parcel 0420174075, unavoidable partial impacts to the on-site portions of off-site Wetland 146/148 buffers, and buffer width averaging for the on-site portion of Wetland 87 buffer located on parcels 0420174075 and 0420205016 within the Main Development Area. The Project has been designed to first avoid and then minimize and offset impacts to both on-site and off-site critical areas and critical area buffers to the extent practicable while also satisfying the City of Puyallup and City of Fife building and zoning code requirements and fulfilling the criteria of the Project's stated purpose and need.

An earlier project design included parking space and associated impervious areas that overlapped with the Stream 14/15 buffers that extend onto the southeast corner of Main Development Area parcel 0420174075 and the northeast corner of Main Development Area parcel 0420205016. The current design has been reconfigured to avoid any impact to the Stream 14/15 buffer areas (Appendix A). Additionally, the current design plan has minimized impacts to Wetland 87 and Wetland 146/148 buffers that project on site to the maximum practicable extent possible while still meeting PMC parking space and emergency access requirements. Unavoidable wetland buffer impacts will be mitigated by purchase of wetland mitigation credits from the nearby Mitigation Bank and on-site buffer enhancement. Further discussion of avoidance and minimization is included in Section 7.

8.2.2 Construction Measures and Best Management Practices

Other measures to avoid and minimize impacts include the implementation of the following BMPs during construction:

- All work will be performed according to the requirements and conditions of the Project permits.
- Impacts to off-site wetlands, off-site streams, and on-site stream and wetland buffers will be minimized during construction through the use of temporary erosion and sediment control BMPs. The contractor will prepare and implement a Temporary Erosion and Sediment Control Plan and a Spill Prevention, Control, and Countermeasures Plan.

- All wash water and concrete-laden water associated with construction will be treated to meet State of Washington surface water quality standards (Chapter 173-201A Washington Administrative Code) prior to discharge into surface waterbodies. Concrete-laden water may also be removed from the site.
- All concrete will be poured in dry conditions, or within confined areas not connected to surface waters, and shall be sufficiently cured prior to contact with surface waters.
- Excess or waste materials will not be disposed of or abandoned within the wetland boundary or waterward of the OHWM or allowed to enter waters of the State.
- No petroleum products, chemicals, or other toxic or deleterious materials will be allowed to enter the wetland or surface waters.
- The contractor will be required to properly maintain construction equipment and vehicles to prevent them from leaking fuel or lubricants; if there is evidence of leakage, the further use of such equipment will be suspended until the deficiency has been corrected.
- The Project will be constructed consistent with the stormwater management design criteria outlined in the Ecology *Stormwater Management Manual for Western Washington* (2019) and the Pierce County *Stormwater Management and Site Development Manual* (2021) to reduce and control surface runoff.

8.3 General Goals of Compensatory Mitigation

The general goals of the critical area and critical area buffer compensatory mitigation include the following:

- Ensure no net loss of critical areas and their buffers as a result of the Project.
- Provide on-site buffer enhancement to compensate for critical area buffer impacts.
- Offset direct critical area and critical area buffer impacts through the purchase of mitigation bank credits.

8.4 Compensatory Mitigation

8.4.1 Wetlands and Critical Area Buffers

Under PMC and state and federal regulations, mitigation is required for unavoidable permanent impacts to 1,218 square feet (0.03 acre) of Category III wetlands, and 42,067 square feet (0.97 acre) of total combined unavoidable permanent impacts to the on-site portion of off-site critical area buffers (Figure 9). The mitigation will also include averaging of a 968-square-foot (0.02-acre) portion of the Wetland 87 buffer that extends onto the Main Development Area.

The project proposes on-site buffer enhancement by planting native vegetation on approximately 0.59 acre of the on-site buffer area. An additional 0.03 acre of the buffer area will be expanded by buffer averaging and will be enhanced by planting native vegetation. On-site mitigation for all adverse unavoidable impacts is not possible because of City of Puyallup design, building, and zoning code requirements and the criteria of the Project's stated purpose and need. Direct impacts to Wetland B (0.03 acre) and on-site critical area Wetland 146/148 buffer impacts not compensated on-site by enhancement (0.38 acre) will be offset through the purchase of mitigation credits from the Mitigation Bank with a service area that includes the Project location. The mitigation purchase will satisfy the no net loss provision required by federal and state executive orders for the protection of wetlands (Presidential Executive Order 11990 and Washington State Executive Order 90-04) and will also fulfill PMC mitigation requirements. Table 10 provides a summary of on-site and off-site mitigation actions provided by the project to adequately compensate for all unavoidable critical area impacts.

Table 10
Summary of Anticipated of Critical Area Impacts and Mitigation Actions

Resource	Impact Area (acres)	Mitigations Type (acres)	Mitigation Ratio	Mitigation Area/Credits
Direct Impacts				
Wetland B	0.03	Mitigation Bank Credit Purchase	1:1	0.03
Indirect Impacts				
Wetland 146/148	0.45	NA[1]	NA[1]	NA[1]
Wetland 87	0.01	NA[1]	NA[1]	NA[1]
Buffer Impacts;				
Wetland 146/148	0.97	On-site Enhancement (0.59)	1:1	0.59
		Mitigation Bank Credit Purchase (0.38)	0.2:1	0.076
Wetland 87	0.02	Buffer Averaging (0.03)[2]	1:1	0.03

Note:

1. Because future WSDOT mitigation areas resulting from the WSDOT State Route 167 Completion Project will be provided with protective buffers located fully within the WSDOT parcels, the Project does not propose additional mitigation for indirect impacts to Wetland 87 and 146/148.
2. Buffer areas "averaged in" will also be enhanced by native planting.

The Project proposes to purchase mitigation credits from the Mitigation Bank, which is a bank in Pierce County approved by the Interagency Review Team to sell credits for wetland and other critical area impacts. Wetland B and the Wetland 87 and Wetland 146/148 buffers that extend onto the Main Development Area are currently degraded and have been highly impacted by previous land use at the site. The existing buffer area provides low water quality, hydrology, and habitat functions to off-site wetlands due to compacted soils, the presence of invasive species, and lack of canopy layer and shading. On-site buffer enhancement will improve wetland buffer functions and values through native plant installation (0.59 acre). The remainder of Wetland 146/148 buffer impacts will be mitigated through the purchase of credits from the Mitigation Bank. The goal of the Mitigation Bank is to protect, re-establish, and rehabilitate high-quality riverine Category I wetland habitat and create a mosaic of forested, scrub-shrub, emergent and riverine wetland conditions and buffers in the same watershed. Compensation at the Mitigation Bank and the on-site buffer enhancement area will be preserved in perpetuity.

Guidance from Ecology and the U.S. Army Corps of Engineers (Ecology and USACE 2013) was used to determine the number of bank credits that need to be purchased using the ratios in Table 11. Mitigation bank credit ratios are consistent with the Mitigation Bank Instrument (Port 2023). Direct wetland impacts are required to be mitigated at a 1:1 ratio. Critical area buffer impacts are mitigated on a case-by-case basis per local jurisdictions under the Mitigation Bank Instrument (Port 2023). A ratio of 0.2:1 is consistent with the instrument and is proposed because the existing on-site critical area buffer is highly degraded agricultural and residential land and has poor hydrologic, water quality, and habitat functions. Additionally, the buffers that extend on site are off-site wetlands that will soon be impacted by the State Route 167 Completion Project occurring on WSDOT-owned parcels (Wetlands 87, 93, and 146/148), which will be completely regraded with new protective buffers that will be located entirely within the WSDOT-owned properties and will not extend onto the Main Development Area. Similarly, no mitigation is proposed for indirect impacts to off-site wetlands because of the regrading plan associated with the State Route 167 Completion Project.

Table 11
Proposed Mitigation Debit Ratios in Use at Mitigation Bank

Resource Impact	Bank Credits : Impact Acreage
Wetland, Category III	1:1
Critical Area Buffers	0.2:1

Source: Ecology and USACE 2013

The Project proposes purchase of 0.079 credit as detailed in Table 12. Credits will be purchased following approval of the mitigation plan, as presented in this CAR, by the City of Puyallup and Ecology.

Table 12
Scenario 2 (0.2:1 Ratio): Critical Area Impacts and Proposed Credit Purchase

Critical Area Impact	Bank Credits : Impact Acreage	Impact Acreage	Proposed Credit Purchase
Weland B, Category III direct impacts	1:1	0.03	0.03 credit
Wetland 87, Category III indirect impacts	1:1	0.01	0 credits[1]

Critical Area Impact	Bank Credits : Impact Acreage	Impact Acreage	Proposed Credit Purchase
Wetland 146/148, Category III indirect impacts	1:1	0.45	0 credits[1]
Critical Area Buffers	0.2:1	0.38	0.076 credits
		Total Credit Purchase	**0.079 credits**

Note:

1. Because future WSDOT mitigation areas resulting from the WSDOT State Route 167 Completion Project will be provided with protective buffers located fully within the WSDOT parcels, the Project does not propose additional mitigation for indirect impacts to off-site Wetlands 87 and 146/148.

Vector will enter into a credit purchase agreement with the Port of Tacoma and provide proof of sale documentation to the City of Puyallup and to Ecology.

8.4.2 Functional Benefits of the Mitigation

8.4.2.1 Mitigation for Permanent Wetland Impacts

Compensatory mitigation for permanent direct impacts to Wetland B (0.03 acre) will be achieved by purchase of credits from the Mitigation Bank prior to construction activities. The credit purchase is intended to address the specific loss of wetland and wetland buffer functions at the impact site and replace these functions at a nearby Mitigation Bank, which is located within the same basin of the proposed impacts. The Project is located approximately 5 miles to the east of the Mitigation Bank and is within the Mitigation Bank service area. This Mitigation Bank encompasses approximately 28.64 acres located at 3714 and 4014 Gay Road East, Tacoma, Washington 98443, 36 portions of Pierce County parcels 0320141001 and 0320141086 in Sections 13 and 14 of 37 Township 20 North, Range 3 East, Willamette Meridian. The bank has been constructed and is successfully re-establishing, rehabilitating, and enhancing wetland functions across the site (Mitigation Bank 2020).

The proposed credit purchase is intended to further improve the ecological functions within the Puyallup River watershed and support the following ecological goals of the Mitigation Bank:

- Restore ecological processes and structures including, stream, wetland, and floodplain connections.
- Realign stream channels, re-establish floodplain connectivity, and rehabilitate riverine wetlands and off-channel ponds.
- Establish diverse hydrogeomorphic conditions and vegetation zones, including emergent, scrub-shrub, and forested wetlands.
- Re-establish and rehabilitate wetland habitat to pre-impact conditions to the maximum extent possible.
- Maximize wetland area and functions.

- Establish multiple native wetland plant communities and functional native vegetated upland habitat.
- Protect existing upland forested areas to the extent possible and provide additional forested upland area.
- Restore fish and wildlife habitat, structure, and function.
- Manage invasive and non-native species.

8.4.2.2 Mitigation for Buffer Impacts

Compensatory mitigation for permanent impacts to Wetland 146/148 buffer (0.97 acre) will be achieved by on-site buffer enhancement following construction activities by restoring approximately 0.59 acre of currently degraded Wetland 93 and Wetland 146/148 buffer areas. This buffer enhancement will include a layer of planting soil and mulch placed in the restored buffer area along with installation of native trees, shrubs, and groundcover species. Compensatory mitigation for the remaining 0.38 acre of Wetland 146/148 buffer impacts will be provided by purchasing credits from the Mitigation Bank. Section 8.4.2.1 describes the functional lift provided by the Mitigation Bank.

On-site buffer enhancement of an expanded buffer area will be provided for the reduced portion of Wetland 87 buffer (0.02 acre). Buffer enhancement will be achieved by restoring currently degraded buffer area contiguous with the Wetland 93 and Wetland 146/148 buffer areas. This buffer expansion will restore 0.03 acre and include a layer of planting soil and mulch placed in the restored buffer area along with installation of native trees, shrubs, and groundcover species which will significantly improve habitat conditions currently existing within the existing buffer area.

PMC 21.06.930 allows for buffer averaging if following criteria are met:

- The total area contained in the buffer area after averaging is no less than that which would be contained within the standard buffer;
- The buffer averaging does not reduce the functions or values of the wetland
- The portion of the buffer subject to buffer averaging is less than 20% of the total buffer length on a project site; provided, that:
  - The director may waive the 20% limitation when there are specific topographic conditions adjacent to the wetland that render portions of the buffer nonessential or ineffective in protecting wetland functions, and
  - The director finds that the averaging occurs parallel to the existing wetland boundary;
- The wetland contains variations in sensitivity due to existing physical characteristics or the character of the buffer varies in slope, soils, or vegetation;
- The buffer width for Category I and II wetlands is not reduced by more than 25% of the standard width; and
- The buffer width of a Category III or IV wetland with moderate habitat functions (six to seven points for habitat) may be reduced by no more than 33% of the standard buffer width. The

buffer width of a Category III or IV wetland with low habitat functions (less than six points for habitat) may be reduced to 35 feet.

- In any case where a reduced buffer width is applied consistent with the subsections above, the buffer shall be composed of a dense native plant community; if the buffer area contains over 20% coverage by invasive plant species, the applicant shall provide a vegetation management plan to remove those invasive plants, supplement the buffer area with native trees and shrubs and monitor the buffer area for a period of no less than three years to ensure eradication of invasive plants and establishment of new native plants from the buffer area. The enhanced functions must be documented to the satisfaction of the director through a functions and values analysis prepared by a qualified professional.

The proposed buffer averaging meets all the required criteria. The total area contained in the buffer area after averaging will be greater than that which would be contained in the standard buffer (net increase of 0.01 acre). The buffer averaging will increase the functions and values of the wetland by providing increased plant species diversity and a more complex assemblage of habitat features for use by wildlife adjacent to the off-site wetlands. The portion of the buffer averaging is greater than 20% of the total buffer length on the project site; however, the location averaging will occur parallel to the existing Wetland 87 boundary and may be waived. The character of the Wetland 87 buffer varies in vegetation and will be improved by installing native plants. Wetland 87 is a Category III wetland with a habitat score of 6 and will not be reduced by more than 33% of the standard buffer width (the reduced buffer width is 137 feet, which is a reduction of about 9% of the 150-foot-wide standard buffer width). All buffer areas will be planted with a dense native plant community. Invasive species coverage in the buffer area is currently less than 20%, but the replanted buffer area will be monitored for three years to ensure eradication of invasive species and verify the establishment of the new native plantings.

9 Proposed On-Site Mitigation Planting Plan

9.1 General Description of On-Site Mitigation Planting

The on-site mitigation planting plan addresses the specific loss of wetland buffer functions at the impact site and replaces these functions within the Project area. The general mitigation plan is to enhance currently degraded wetland buffer areas by providing dense native plant to restore and improve species diversity and habitat functions. This will mitigate for unavoidable impacts to wetland buffers due to the extent practicable while also satisfying the City of Puyallup and City of Fife building and zoning code requirements and fulfilling the criteria of the Project's stated purpose and need.

On-site wetland buffer mitigation activities will consist of buffer enhancement, including clearing to prepare the site and remove any invasive plant species, placing a layer of panting soil (952 cubic yards [CY]) and mulch 238 CY) in the in the buffer area to be enhanced, and planting approximately 62 trees, 278 shrubs, and approximately 1,564 ground cover plants. Native plant species to be installed within the created wetland and wetland buffer are listed in the planning schedule in Appendix E. Once completed, a temporary irrigation system will be installed within the restored wetland buffer. Additionally, fencing will be installed around the perimeter of the wetland buffer to protect the restoration area.

9.2 Soil Preparation

The on-site wetland buffer mitigation area will be cleared to the final grade of the proposed mitigation site. The contractor will amend the existing native soils to establish suitable soil conditions to support on-site native plantings.

9.3 Vegetation

Plantings within the on-site wetland buffer mitigation area will be installed to establish a mix of emergent, scrub-shrub, and forest upland communities. The goal of the planting plan is to mimic natural conditions. Plantings will be installed in clusters and grouped and spaced to replicate a natural pattern of plant dispersal and enhance habitat for a variety of wildlife.

Existing vegetation in the wetland buffer mitigation area will be removed, including invasive species such as Himalayan blackberry and reed canary grass prior to the installation of the plantings.

Following construction, invasive species will be controlled in accordance with the monitoring program. Mitigation site management activities are described in Section 9.9.

9.4 Construction and Planting Schedules

Construction plans for the mitigation are included in Appendix A as follows:

- Sheet 1 of 5: Clearing Plan
- Sheet 2 of 5: Soil Preparation
- Sheet 3 of 5: Planting Plan (1 of 2)
- Sheet 4 of 5: Planting Plan (2 of 2)
- Sheet 5 of 5: Planting Schedule and Details

9.5 General Mitigation Goals

The goals for the on-site wetland buffer mitigation include the following:

- Establish native tree, shrub, and/or groundcover vegetation communities in the wetland buffer areas
- Control invasive species.

9.6 Objectives and Standards of Success for Wetland Mitigation

Objective 1: Plant communities will be restored by installing native trees, shrubs, and emergent species.

- **Performance Standard 1:** Average survival of planted trees will be at least 90% at the end of Year 1, at least 80% at the end of Year 2, and 70% by the end of Year 3.
- **Performance Standard 3:** Invasive, non-native trees and shrubs are maintained at levels below 15% total cover within planted wetland buffer areas in all years.

9.7 Monitoring Plan

To ensure success of the mitigation plan, monitoring will be completed to determine the success of the wetland mitigation. Monitoring will occur for a minimum of 3 years following completion of construction. An as-built report will be completed after plant installation and submitted to the City of Bonney Lake for use as a reference document during the monitoring period.

Monitoring of the planted wetland and buffer areas will occur near the end of the peak growing season in summer or early fall in each of the monitoring years after installation. Monitoring reports will be submitted to the City of Puyallup each monitoring year. Data on the number and species of plants (as a measure of diversity), survival rates, canopy (aerial percentage) cover, stem density, and plant heights will be measured and recorded during each monitoring period. Permanent sample plots and photo stations will also be established at control points to document existing conditions during each monitoring period.

Plant community success within the planting area will be evaluated during the monitoring periods. In an effort to assess plant diversity, the assessment will include installed plant survival and vegetation percent cover.

Invasive trees and shrubs will be removed where present in the wetland and wetland buffers. Following planting, all enhanced buffer areas will have less than 15% total cover of invasive trees and shrubs each monitoring year.

9.8 Contingency Plan

If the mitigation and restoration areas fail to meet their performance standards, a contingency plan(s) will be developed. Contingency plans may include, but are not limited to, the following:

- Plant substitutions of type, species, size, quantity, and/or location
- Additional plant installation to address survival or cover problems
- Weeding and additional plant installation to address invasive weed cover
- Regrading or modifications to hydrologic sources to address problems with wetland hydrology
- Erosion control
- If purple loosestrife or knotweeds (Japanese, giant, Himalayan, or related hybrid) are identified on site, weed control will be immediately implemented
- Providing fencing or plant guards around plants to prevent animal damage
- Providing fencing to prevent vandalism or other damage caused by humans
- Hand watering, irrigation, or other watering methods may be employed if planted species within the mitigation or restoration sites appear to be dying from drought, especially in the upland buffers

A contingency plan will be implemented on an as-needed basis. Contingency plans will be developed for review and approval by regulatory agencies as appropriate. In addition, implemented contingency plans will be described in the year-end monitoring report.

9.9 Mitigation Site Management

The mitigation area will be actively managed for a minimum of 3 years following completion of construction. This will include at least one management or maintenance visit per year for a minimum of 3 years following implementation of the mitigation plan. Site management visits will occur during the growing season in May through July. The following tasks will be completed during these visits:

- During Years 1, 2, and 3, the planting area will be weeded by hand to remove any new shoots of non-native and/or invasive vegetation within a 2-foot radius of each installed plant.

- During Year 1, installed plantings in the wetland buffer area must receive a minimum of one inch of water each week from June to September from the temporary irrigation system or natural rainfall.
- During the Year 2 management visit, tree stakes shall be removed.
- Additional management visits may also be required to respond to other monitoring recommendations.

Following completion of the prescribed monitoring and site management periods, the mitigation sites will be protected from development or other alteration in perpetuity.

10 References

Barghausen (Barghausen Engineering), 2024. Personal communication from Jason McArdel, PE, Senior Civil Project Manager, with Jakob Rowny, Anchor QEA.

City of Fife, 2024a. "Fife Municipal Code." Accessed May 6, 2024. Available at: https://www.codepublishing.com/WA/Fife/.

City of Fife, 2024b. Wetlands Map. Accessed May 6, 2024. Available at: https://www.cityoffife.org/DocumentCenter/View/1262/Fife-Wetlands-2016-October---11-by-17-PDF?bidId=.

City of Puyallup, 2024a. "Puyallup Municipal Code." Accessed May 6, 2024. Available at: https://www.codepublishing.com/WA/Puyallup/.

City of Puyallup, 2024b. Inventory of Designated Puyallup Wetlands. City of Puyallup GIS Portal Wetland and Stream Maps. Accessed May 6, 2024. Available at: https://gis-portal-puyallup.opendata.arcgis.com/datasets/puyallup::wetlands/explore?location=47.184207%2C-122.289624%2C13.58.

Confluence Environmental Group, 2022. *Vector Development Company Freeman Road Logistics Warehouse: Third-Party Review of Critical Areas Report*. March 4, 2022.

Confluence Environmental Group, 2024a. *Vector Development Company Freeman Road Logistics Project: Third-Party Second Review of Critical Areas Report*. February 29, 2024.

Confluence Environmental Group, 2024b. *Vector Development Company Freeman Road Logistics Project: Third-Party Third Review of Critical Areas Report*. August 15, 2024.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe, 1979. *Classification of Wetlands and Deepwater Habitats of the United States.* FWS/OBS-79/31. U.S. Fish and Wildlife Service. December 1979.

Ecology (Washington State Department of Ecology), 1997. Washington State Wetland Identification and Delineation Manual. Publication No. 96-94. 1997.

Ecology, 2023. "WRIA 10 Puyallup-White Watershed." Water Resource Inventory Area Maps. Accessed June 6, 2023. Available at: https://ecology.wa.gov/Water-Shorelines/Water-supply/Water-availability/In-your-watershed/Puyallup-White.

Ecology and USACE (Washington State Department of Ecology; U.S. Army Corps of Engineers), 2013. *Credit Guide for Wetland Mitigation Banks*. Publication No. 12-06-014. February 2013.

Ecology, USACE, and EPA (Washington State Department of Ecology; U.S. Army Corps of Engineers; U.S. Environmental Protection Agency), 2021. *Wetland Mitigation in Washington State–Part 1: Agency Policies and Guidance*. Version 2. Washington State Department of Ecology Publication No. 21-06-003.

Environmental Laboratory, 1987. Corps of Engineers Wetland Delineation Manual. Technical Report Y-87-1. U.S. Army Waterways Experiment Station. January 1987.

FEMA (Federal Emergency Management Agency), 1999. FEMA Flood Insurance Rate Map (FIRM). Community Panel Number 53053C0329E. Accessed September 15, 2022. Available at: https://msc.fema.gov/portal.

Herrera (Herrera Environmental Consultants), 2022. Excerpts from "SR 167 Completion Project, Stage 2, Wetland and Stream Assessment Report." Prepared for WSDOT. September 12, 2022.

Hruby, T., 2014. *Washington State Wetland Rating System for Western Washington: 2014 Update*. Washington State Department of Ecology. Publication No. 14-06-029. October 2014.

Lichvar, R.W., D.L. Banks, W.N. Kirchner, and N.C. Melvin, 2016. "The National Wetland Plant List: 2016 Wetland Ratings." *Phytoneuron* 2016(30):1–17.

Mitigation Bank (Port of Tacoma Upper Clear Creek Mitigation Bank), 2020. Mitigation Banking Instrument. Prepared By: Port of Tacoma and GeoEngineers, Inc. Tacoma, Washington. February 2020.

Munsell (Munsell Color), 2000. *Munsell Soil Color Charts.* Grand Rapids, Michigan: Munsell Color.

NMFS (National Marine Fisheries Service), 2008. "Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the On-Going National Flood Insurance Program Carried Out in the Puget Sound Area in Washington State. HUC 17110020 Puget Sound. Accessed September 28, 2023. Available at: https://www.skagitriverhistory.com/FEMA/nfip-final-bo.pdf

NMFS, 2024. "Regions – West Coast." Endangered Species Act status reviews and listing information. Accessed May 6, 2024. Available at: http://www.westcoast.fisheries.noaa.gov/protected_species/salmon_steelhead/salmon_and_steelhead.html.

NWSA (Northwest Seaport Alliance), 2019. *Marine Cargo Economic Analysis*. Prepared by Community Attributes, Inc. January, 2019.

Pierce County, 2023. “News Flash: Moody's Investors Service Upgrades Pierce County's Rating to AAA with Stable Outlook.” Accessed September 11, 2023. Available at: https://www.piercecountywa.gov/CivicAlerts.aspx?AID=6084.

Pierce County, 2024. “GIS Map Applications.” Pierce County PublicGIS Interactive Mapping Tool. Accessed May 6, 2024. Available at: https://www.piercecountywa.gov/2281/GIS-Map-Applications.

Port (Port of Tacoma), 2023. “2023 Environmental Action Plan.” Accessed September 11, 2023. Available at: https://www.portoftacoma.com/environment.

Reed, P.B., 1988. *National List of Plants that Occur in Wetlands: National Summary*. U.S. Fish and Wildlife Service. Prepared for National Wetlands Inventory. Biological Report 88(24). September 1988.

USACE (U.S. Army Corps of Engineers), 2010. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region*. Version 2.0. J.S. Wakeley, R.W. Lichvar, and C.V. Noble (eds). ERDC/EL TR-10-3. Vicksburg, Mississippi: U.S. Army Engineer Research and Development Center.

USACE, 2024. Approved Jurisdictional Determination Memorandum for Record. NWS-2023-620 Vector Development Company. USACE, Seattle District, Regulatory Branch. January 5, 2024.

USDA (U.S. Department of Agriculture), 2024. “Web Soil Survey.” Natural Resources Conservation Service Soil Data. Accessed May 6, 2023. Available at: https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm.

USDA and NRCS (U.S. Department of Agriculture; Natural Resources Conservation Service), 2016. *Field Indicators of Hydric Soils in the United States: A Guide for Identifying and Delineating Hydric Soils*. Version 8.1, 2017.

USFWS (U.S. Fish and Wildlife Service), 2024a. “National Wetlands Inventory – Wetlands Mapper.” Accessed May 6, 2024. Available at: https://www.fws.gov/wetlands/.

USFWS, 2024b. “IPaC Information for Planning and Consultation.” Endangered Species Act Status Reviews and Listing Information. Accessed May 6, 2024. Available at: https://ecos.fws.gov/ipac/.

WDFW (Washington Department of Fish and Wildlife), 2021. Fish Passage & Diversion Screening Inventory Database Report No 935282. Accessed: September 12, 2023. Available at: https://apps.wdfw.wa.gov/fishpassagephotos/Reports/935282_Report.pdf

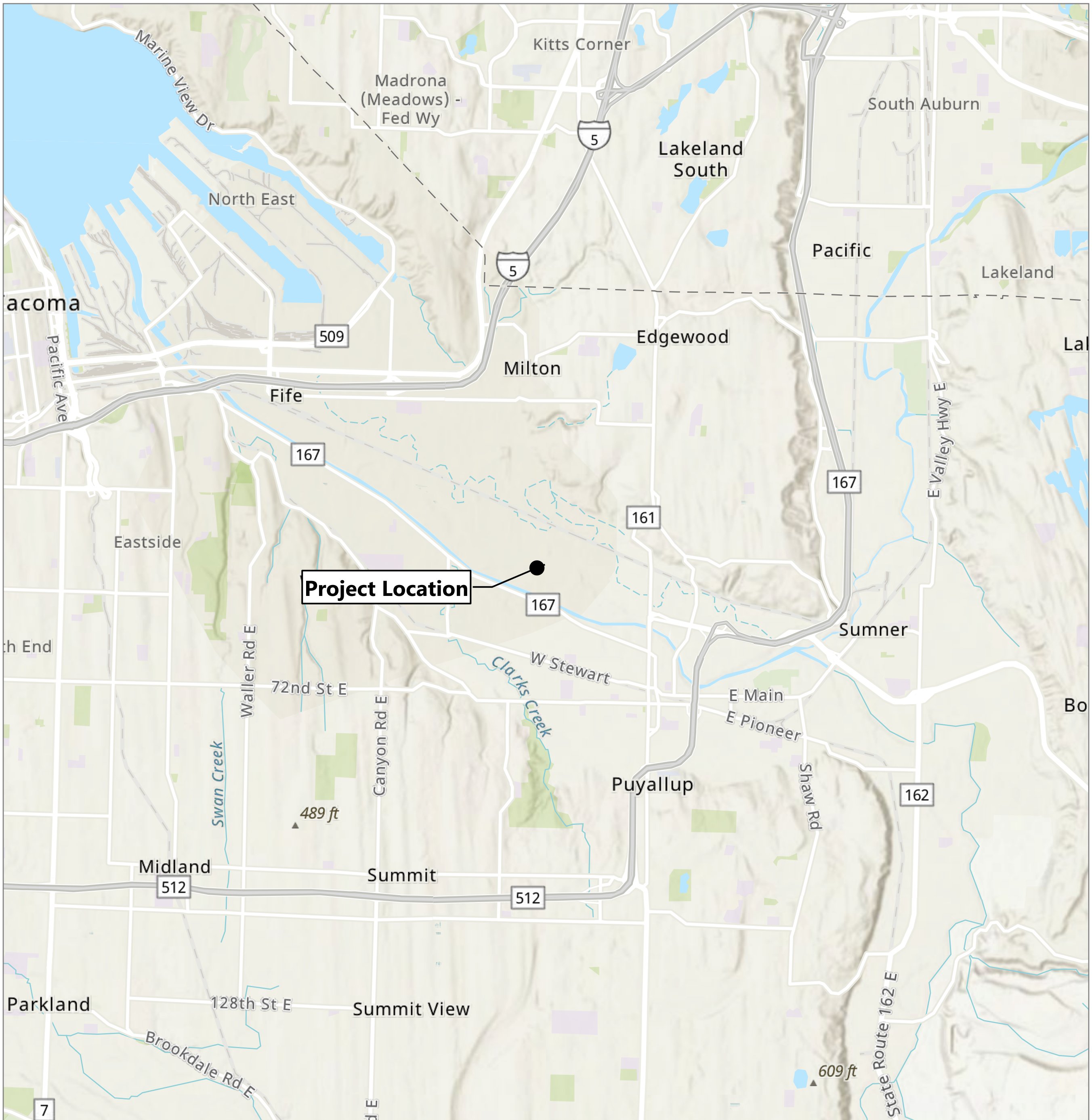
WDFW, 2024a. "Priority Habitats and Species: Maps." Accessed May 6, 2024. Available at: http://wdfw.wa.gov/mapping/phs/.

WDFW, 2024b. "SalmonScape." WDFW Mapping System. Accessed May 6, 2024. Available at: http://apps.wdfw.wa.gov/salmonscape/.

WDNR (Washington Department of Natural Resources), 2024. Wetlands of High Conservation Value. Accessed: May 6, 2024. Available at: https://experience.arcgis.com/experience/174566100f2a47bebe56db3f0f78b5d9/.

WSDOT (Washington Department of Transportation), 2023. *SR 167 Completion Project, Stage 2: SR 167/I-5 to SR 161 – New Expressway Project, Stage 2 Mitigation Plan*. Prepared by Herrera Environmental Consultants, Inc. September 21, 2023.

Figures



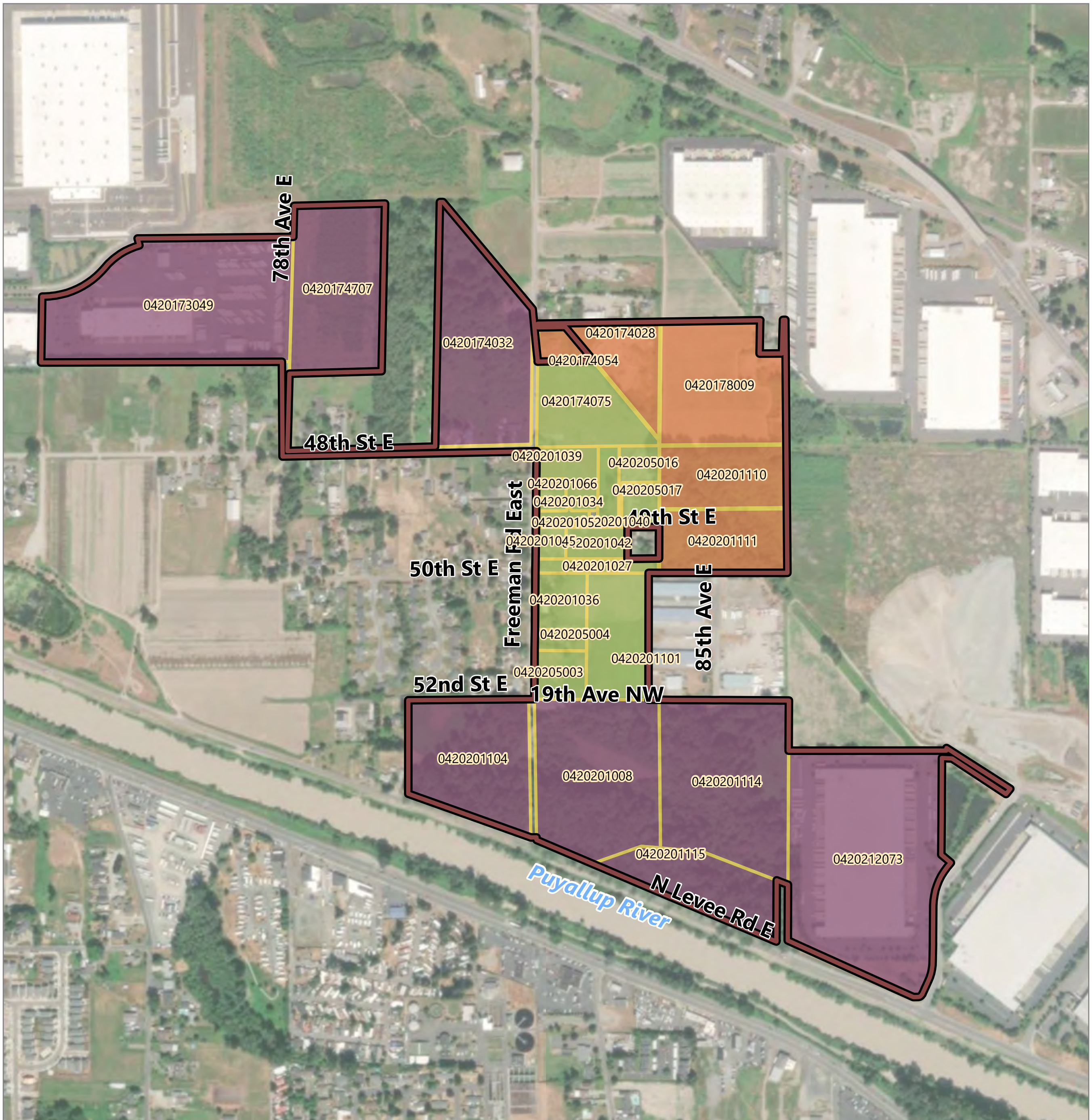
NOTE:
1. Base map: Esri World Topographic Map and Esri World Street Map

0 1
Miles

Publish Date: 2024/05/22, 2:40 PM | User: tweldyFilepath: \\GSTFile01\GIS\Jobs\Vector_Development_Company_2141\Freeman_Road\Maps\CAR\FreemanRoad_CAR.aprx

ANCHOR QEA

Figure 1
Vicinity Map
Critical Area Report
Freeman Road Logistics



LEGEND:

Study Area

Tax Parcel Ownership

Main Development Area

Other Parcels for Transportation and Utility Improvements

WSDOT

SOURCES:
1. Aerial imagery: Esri (2022)
2. Parcel: Pierce County (2023)

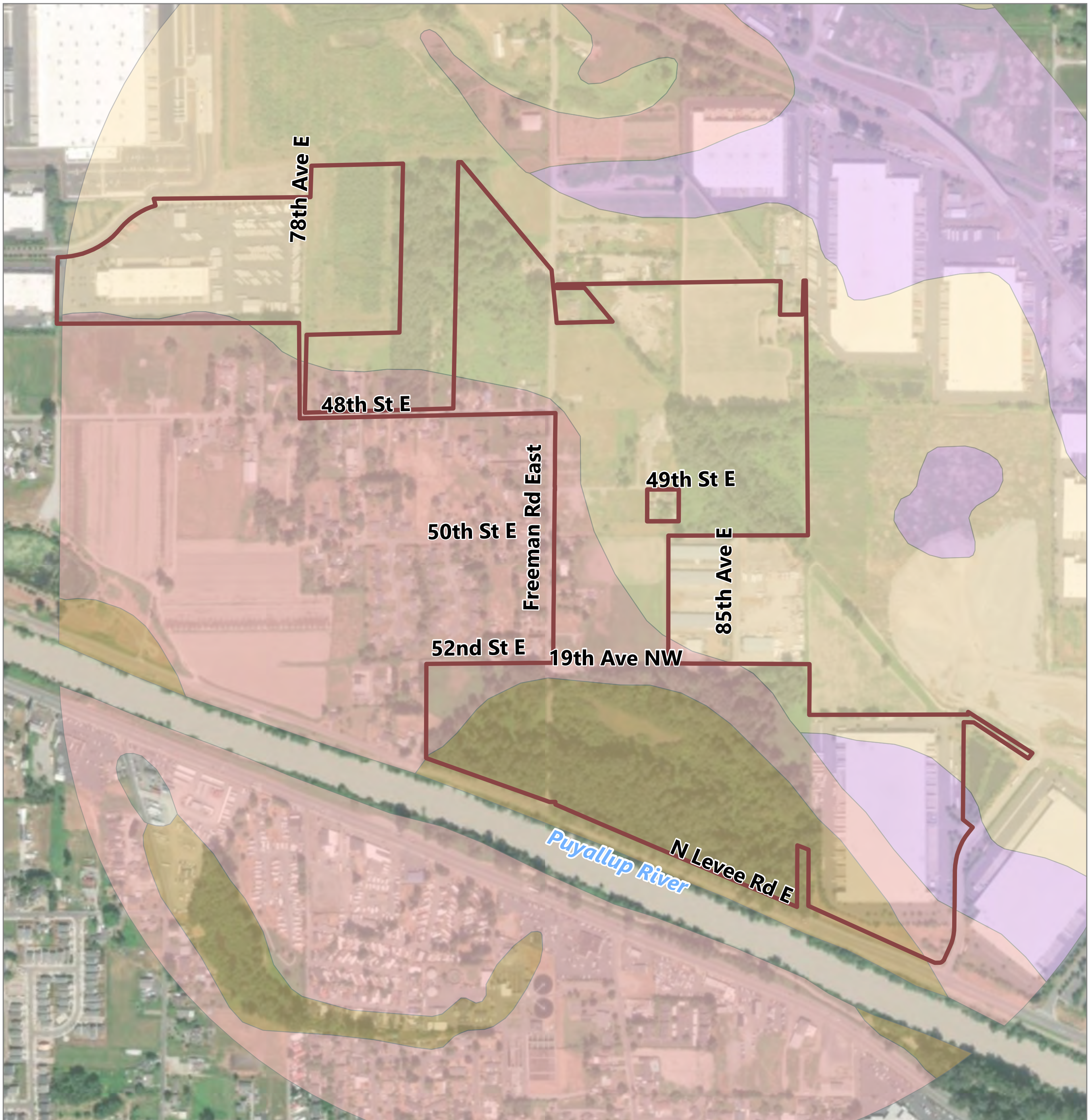
NOTES:
1. USDA: United States Department of Agriculture

0 600
Feet

Publish Date: 2024/06/14, 4:40 PM | User: jquinley
Filepath: \\GSTFILE01\gis\Jobs\Vector_Development_Company_2141\Freeman_Road\Maps\CAR\FreemanRoad_CAR.aprx

ANCHOR QEA

Figure 2
Study Area and Existing Conditions
Critical Area Report
Freeman Road Logistics



LEGEND:

Study Area

NRCS Soils

Briscot loam

Pilchuck fine sand

Puyallup fine sandy loam

Sultan silt loam

SOURCES:
1. Soil: USDA (2023)
2. Aerial imagery: Esri (2022)

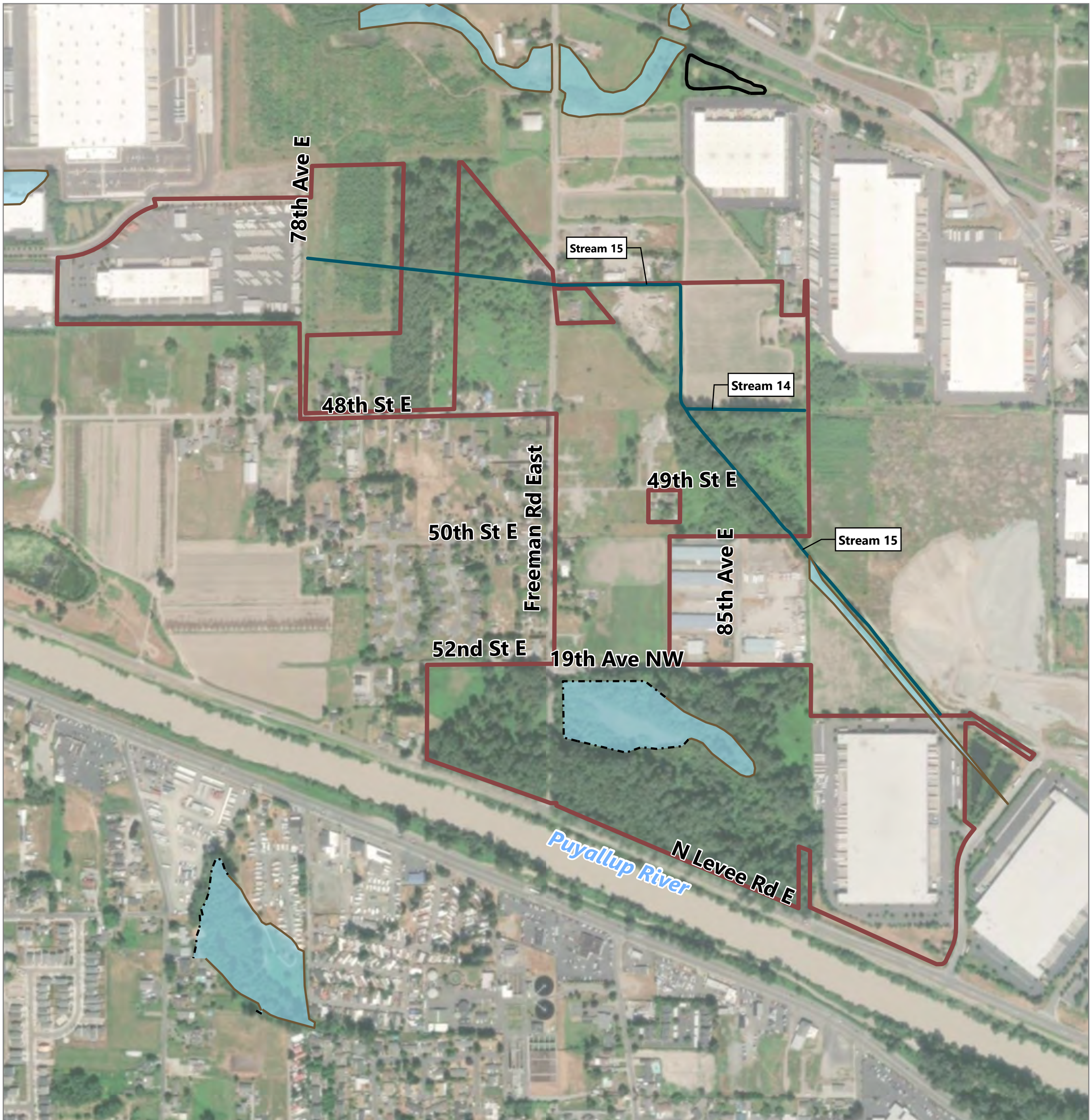
NOTES:
1. NRCS: Natural Resources Conservation Service
2. USDA: United States Department of Agriculture

0 600
Feet

Publish Date: 2024/06/14, 4:00 PM | User: jquinley
Filepath: \\GSTFILE01\gis\Jobs\Vector_Development_Company_2141\Freeman_Road\Maps\CAR\FreemanRoad_CAR.aprx

ANCHOR QEA

Figure 3
NRCS Soils Map
Critical Area Report
Freeman Road Logistics



LEGEND:

Study Area

Stream

CWI Wetlands

Unconfirmed

Delineated

Verified

Unverified

SOURCES:
1. CWI: Pierce County (2023)
2. Stream: Pierce County (2023)
3. Aerial imagery: Esri (2022)

NOTE:
CWI: County Wetland Inventory

0 600
Feet

Publish Date: 2024/06/14, 4:00 PM | User: jquinley
Filepath: \\GSTFILE01\gis\Jobs\Vector_Development_Company_2141\Freeman_Road\Maps\CAR\FreemanRoad_CAR.aprx

ANCHOR QEA

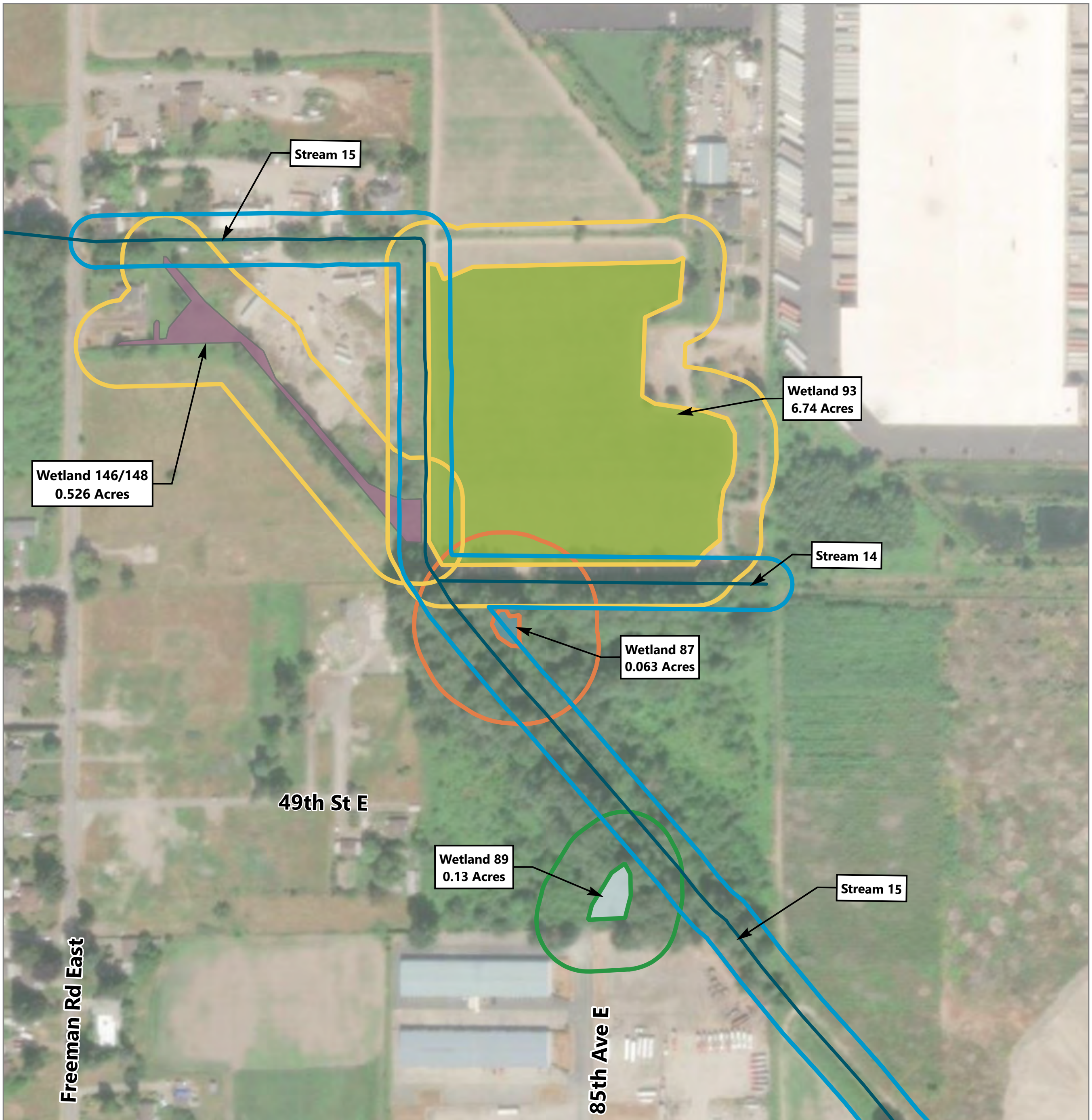
Figure 4
Pierce County Wetlands Inventory Map
Critical Area Report
Freeman Road Logistics

Publish Date: 2024/06/14, 4:01 PM | User: jquinley
Filepath: \\GSTFILE01\gis\Jobs\Vector_Development_Company_2141\Freeman_Road\Maps\CAR\FreemanRoad_CAR.aprx

ANCHOR QEA

Figure 5
USFWS National Wetlands Inventory Map

Critical Area Report
Freeman Road Logistics



LEGEND:

- Stream
- Wetland 87, Category 3
- Wetland 89, Cateogory 2
- Wetland 93, Category 3
- Wetland 146/148, Category 3
- Category 2 - 100' Wetland Buffer
- Category 3 - 80' Wetland Buffer
- Category 3 - 150' Wetland Buffer
- Category 3 - 50' Riparian Buffer

SOURCES:
1. Stream: Pierce County (2023)
2. Parcel: Pierce County (2023)
3. Aerial imagery: Esri (2022)

NOTE:
USDA: U.S. Department of Agriculture

0 300
Feet

Publish Date: 2024/05/23, 1:13 PM | User: tweldy
Filepath: \\GSTFile01\GIS\Jobs\Vector_Development_Company_2141\Freeman_Road\Maps\CAR\FreemanRoad_CAR.aprx

ANCHOR QEA

Figure 6
Off-Site WSDOT Parcels Critical Areas and Buffers

LEGEND:

Study Area

NWI Wetlands

Freshwater Forested/Shrub Wetland

Freshwater Pond

Riverine

Wetland A - 150' Buffer

Wetland B - 80' Buffer

On-Site Wetland B

SOURCES:
1. Aerial imagery: Esri (2022)
2. NWI: USFWS (2023)

NOTES:
1. NWI: National Wetland Inventory
2. USFWS: United States Fish and Wildlife Service

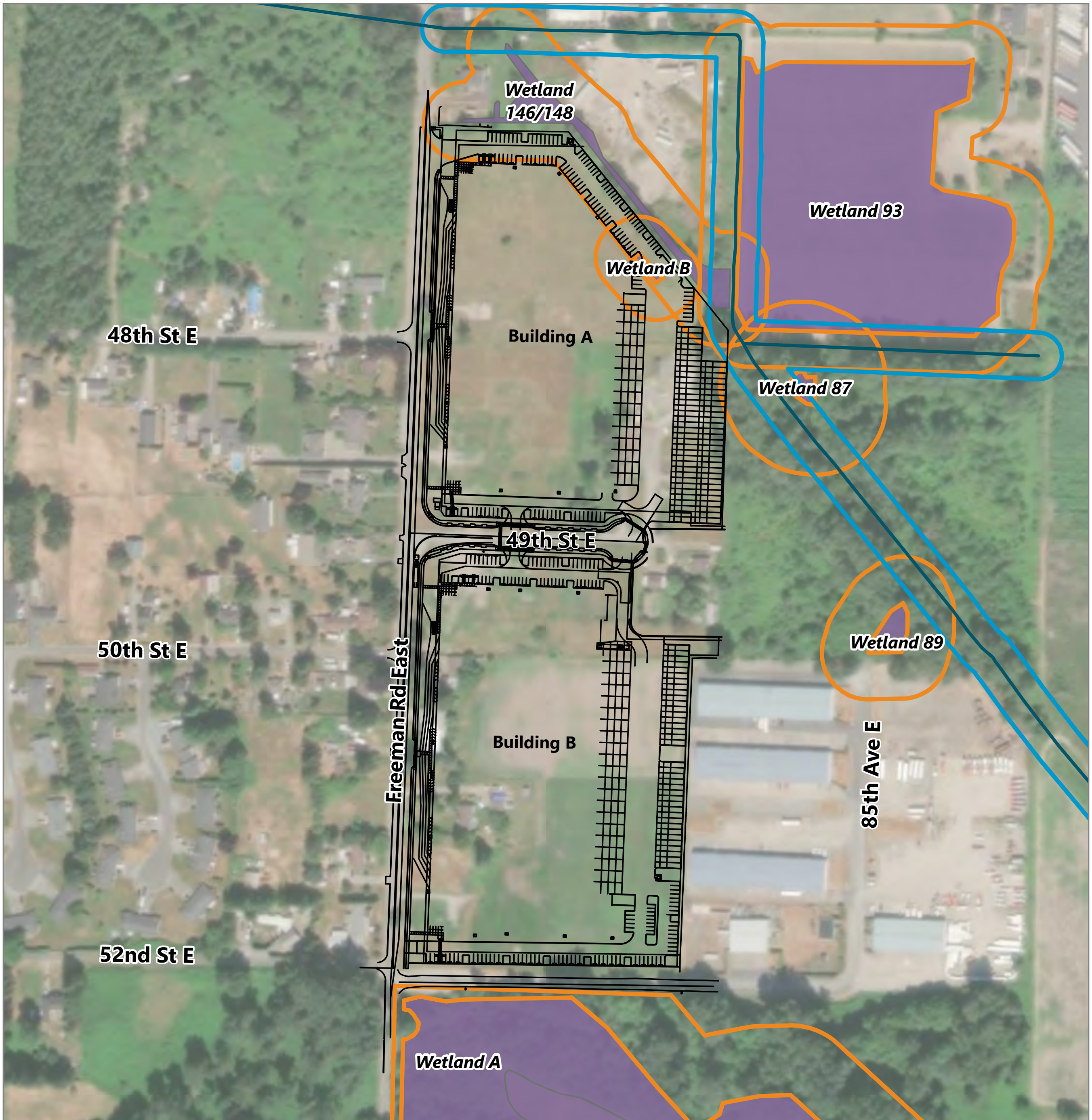
0 500
Feet

Publish Date: 2024/06/14, 4:01 PM | User: jquinley
Filepath: \\GSTFILE01\gis\Jobs\Vector_Development_Company_2141\Freeman_Road\Maps\CAR\FreemanRoad_CAR.aprx

ANCHOR QEA

Figure 7
Wetland Delineation Results

Critical Area Report
Freeman Road Logistics



LEGEND:

- Proposed Development
- Stream
- Stream Buffer
- Wetland
- Wetland Buffer

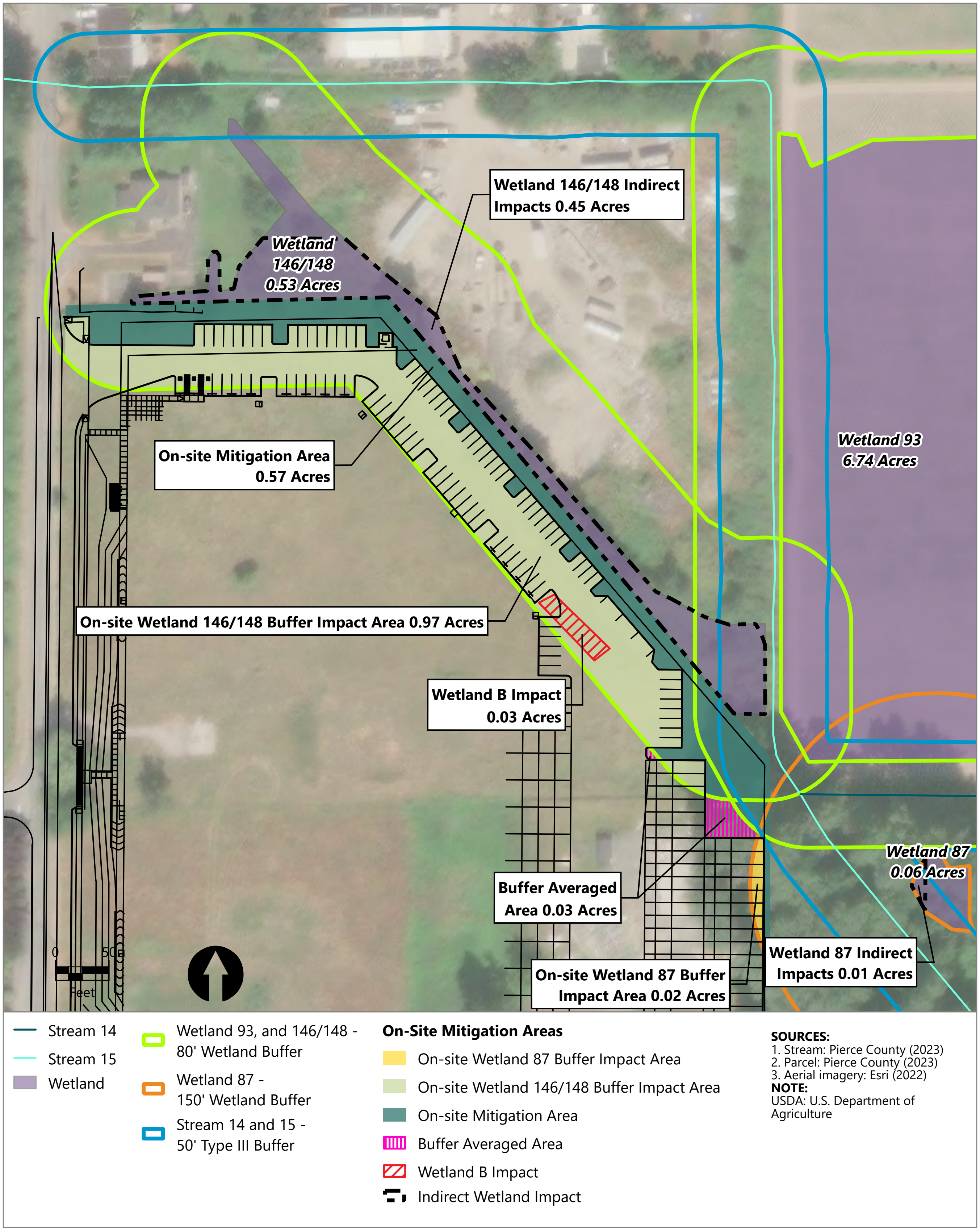
SOURCES:
1. Stream: Pierce County (2023)
2. Aerial imagery: Esri (2022)

0 400
Feet

Publish Date: 2024/12/04, 10:31 AM | User: tweldy
Filepath: \\GSTFile01\GIS\Jobs\Vector_Development_Company_2141\Freeman_Road\Maps\CAR\FreemanRoad_CAR.aprx

ANCHOR QEA

Figure 8
Proposed Freeman Road Development and Critical Areas



Publish Date: 2024/12/12, 12:50 PM | User: tweldy
Filepath: \\GSTFile01\GIS\Jobs\Vector_Development_Company_2141\Freeman_Road\Maps\CAR\FreemanRoad_CAR.aprx

ANCHOR QEA

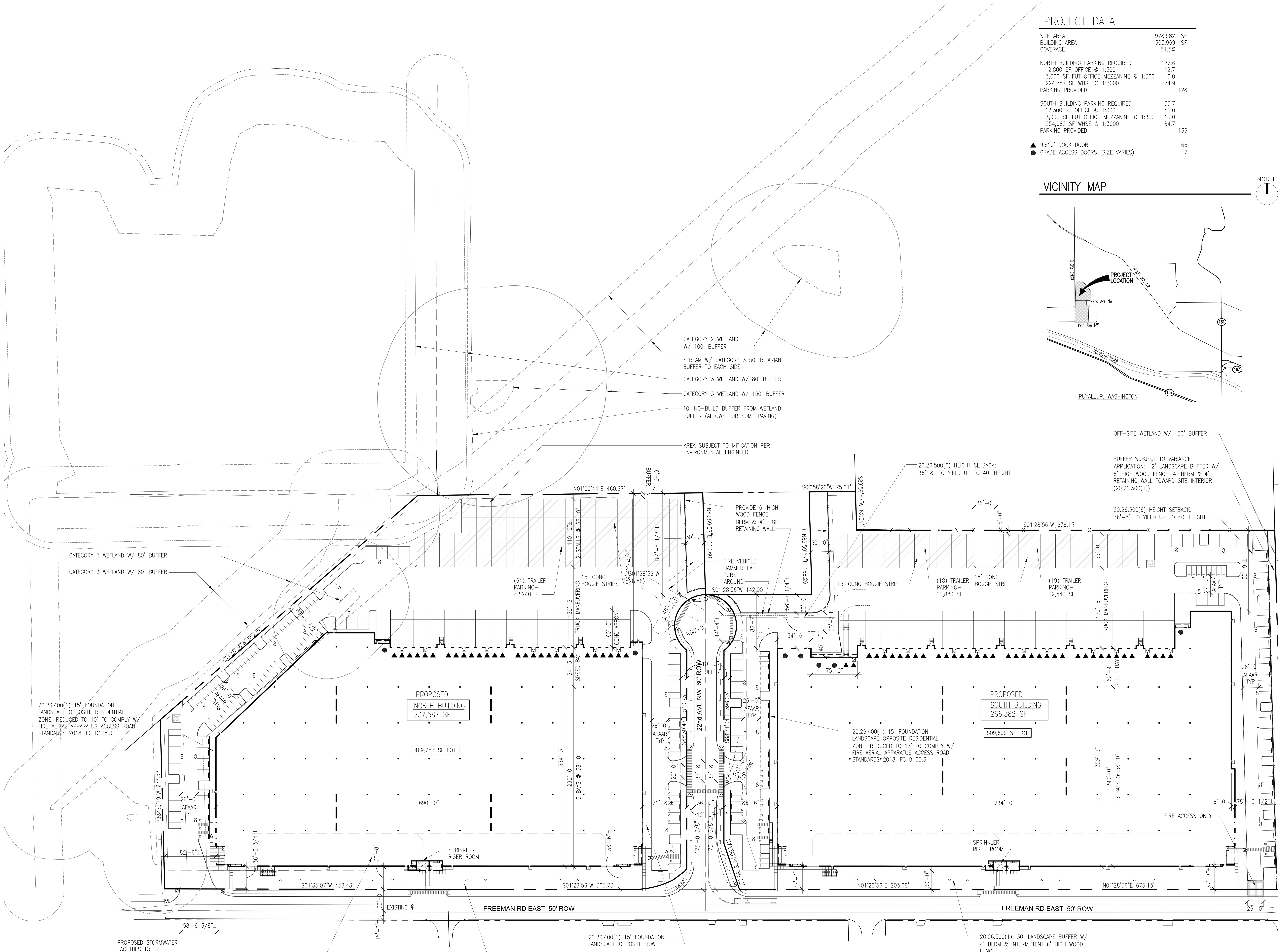
Figure 9
Conceptual Mitigation Plan
Critical Area Report
Freeman Road Logistics

Appendix A
Site Plan and Construction Details

PROJECT DATA

SITE AREA	978,982	SF
BUILDING AREA	503,969	SF
COVERAGE	51.5%	
NORTH BUILDING PARKING REQUIRED	127.6	
12,800 SF OFFICE @ 1:300	42.7	
3,000 SF FUT OFFICE MEZZANINE @ 1:300	10.0	
224,787 SF WHSE @ 1:3000	74.9	
PARKING PROVIDED		128
SOUTH BUILDING PARKING REQUIRED	135.7	
12,300 SF OFFICE @ 1:300	41.0	
3,000 SF FUT OFFICE MEZZANINE @ 1:300	10.0	
254,082 SF WHSE @ 1:3000	84.7	
PARKING PROVIDED		136
▲ 9'x10' DOCK DOOR		66
● GRADE ACCESS DOORS (SIZE VARIES)		7

VICINITY MAP



SITE PLAN

SCALE: 1" = 70'-0"

SYNTHESIS PLLC
THE FUSION OF ARCHITECTURE, DESIGN TECHNOLOGY & PEOPLE

12503 Bel-Red Road, Suite 100
Bellevue, WA 98005
p 425 646 1818 f 425 646 4141

VECTOR
Development Company
11411 NE 124th Street
Suite 190
Kirkland, WA 98034

REVISIONS

ISSUE NO.	DATE	ITEM
3	06 14 24	SEPA RESUBMITTAL
2	11 27 23	SEPA RESUBMITTAL
1	10 14 22	SEPA RESUBMITTAL
D	11 01 21	DESIGN REVIEW APPLICATION
C	09 15 21	PRELIMINARY BID
B	03 19 21	SEPA APPLICATION
A	01 05 21	PRE-APPLICATION

PROFESSIONAL STAMP

PROGRESS PRINTING
November 12, 2024

NOT FOR CONSTRUCTION

PROJECT INFORMATION

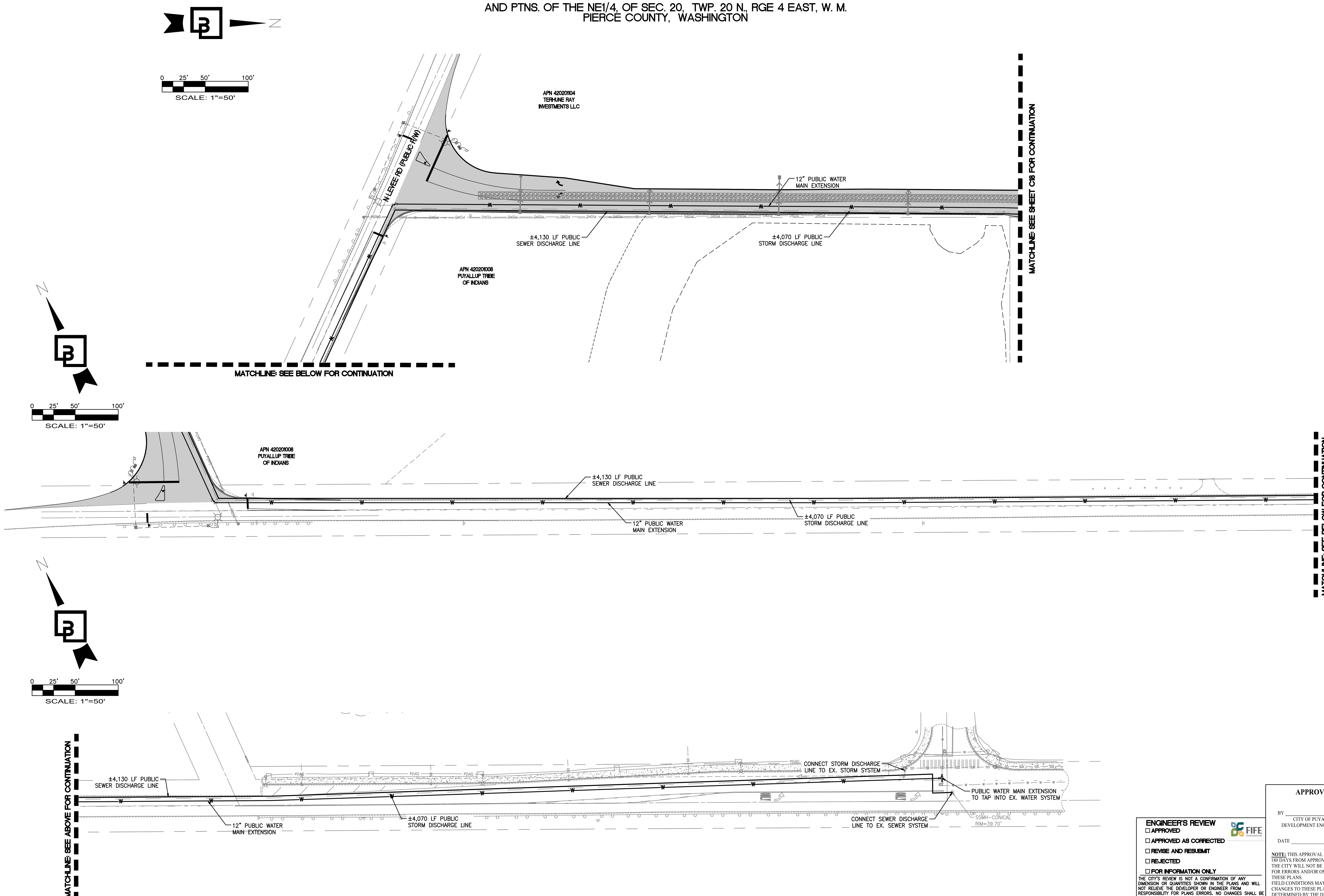
NORTH & SOUTH BUILDINGS
Freeman Road Logistics
Puyallup, WA

SHEET INFORMATION

RELEASE FOR: PERMIT SUBMITTAL
TITLE: SITE PLAN

DESIGNED BY:
REVIEWED BY:
DRAWN BY:
APPROVED BY:
DATE: 01 05 21
SHEET NO: A1.1
PROJECT NO: 201401.13.031

PRELIMINARY WATER AND SEWER PLAN
OF
FREEMAN LOGISTICS
PTNS. OF THE SE1/4, OF SEC. 17, TWP. 20 N., RGE 4 EAST, W. M.
AND PTNS. OF THE NE1/4, OF SEC. 20, TWP. 20 N., RGE 4 EAST, W. M.
PIERCE COUNTY, WASHINGTON



ENGINEER'S REVIEW
- ☐ APPROVED
- ☐ APPROVED AS CORRECTED
- ☐ REVISE AND RESUBMIT
- ☐ REJECTED
- ☐ FOR INFORMATION ONLY

FIFE

THE CITY'S REVIEW IS NOT A CONFIRMATION OF ANY DIMENSION OR QUANTITIES SHOWN IN THE PLANS AND WILL NOT RELIEVE THE DEVELOPER OR ENGINEER FROM RESPONSIBILITY FOR PLANS ERRORS. NO CHANGES SHALL BE MADE TO THE PLANS EXCEPT WITH THE CONSENT OF THE CITY ENGINEER. IF CONSTRUCTION HAS NOT COMMENCED WITHIN A REASONABLE PERIOD OF THE APPROVAL DATE, PLANS WILL REQUIRE RE-APPROVAL BY THE CITY.

BY DATE

APPROVED

BY ______
CITY OF PUYALLUP
DEVELOPMENT ENGINEERING

DATE ______

NOTE: THIS APPROVAL IS VOID AFTER 180 DAYS FROM APPROVAL DATE. THE CITY WILL NOT BE RESPONSIBLE FOR ERRORS AND/OR OMISSIONS ON THESE PLANS.
FIELD CONDITIONS MAY DICTATE CHANGES TO THESE PLANS AS DETERMINED BY THE DEVELOPMENT ENGINEERING MANAGER.

No.	Date	By	Ckd.	Appr.	Revision
5	12/13/24	DTC	JSM	JSM	SEPA RESUBMITTAL

Title: **PRELIMINARY WATER AND SEWER PLAN**
FOR
FREEMAN LOGISTICS

For: VECTOR DEVELOPMENT COMPANY
11411 NE 124TH STREET
SUITE 190
KIRKLAND, WA 98034

JASON S. MCAR... STATE OF WASHINGTON ...4927 REGISTERED PROFESSIONAL ENGINEER
PRELIMINARY
12/13/24

Scale: Horizontal 1"=50' Vertical N/A

Designed JSM
Drawn DTC
Checked JSM
Approved JSM
Date 12/13/24

Barghausen Consulting Engineers, Inc.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222
barghausen.com

Job Number 21585

Sheet C19 of 44

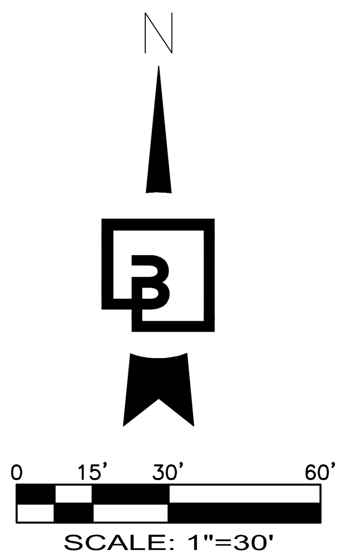
P:\21000s\21585\engineering\SEPA SET\21585-WS.dwg 12/12/2024 1:57 PM DCASEY

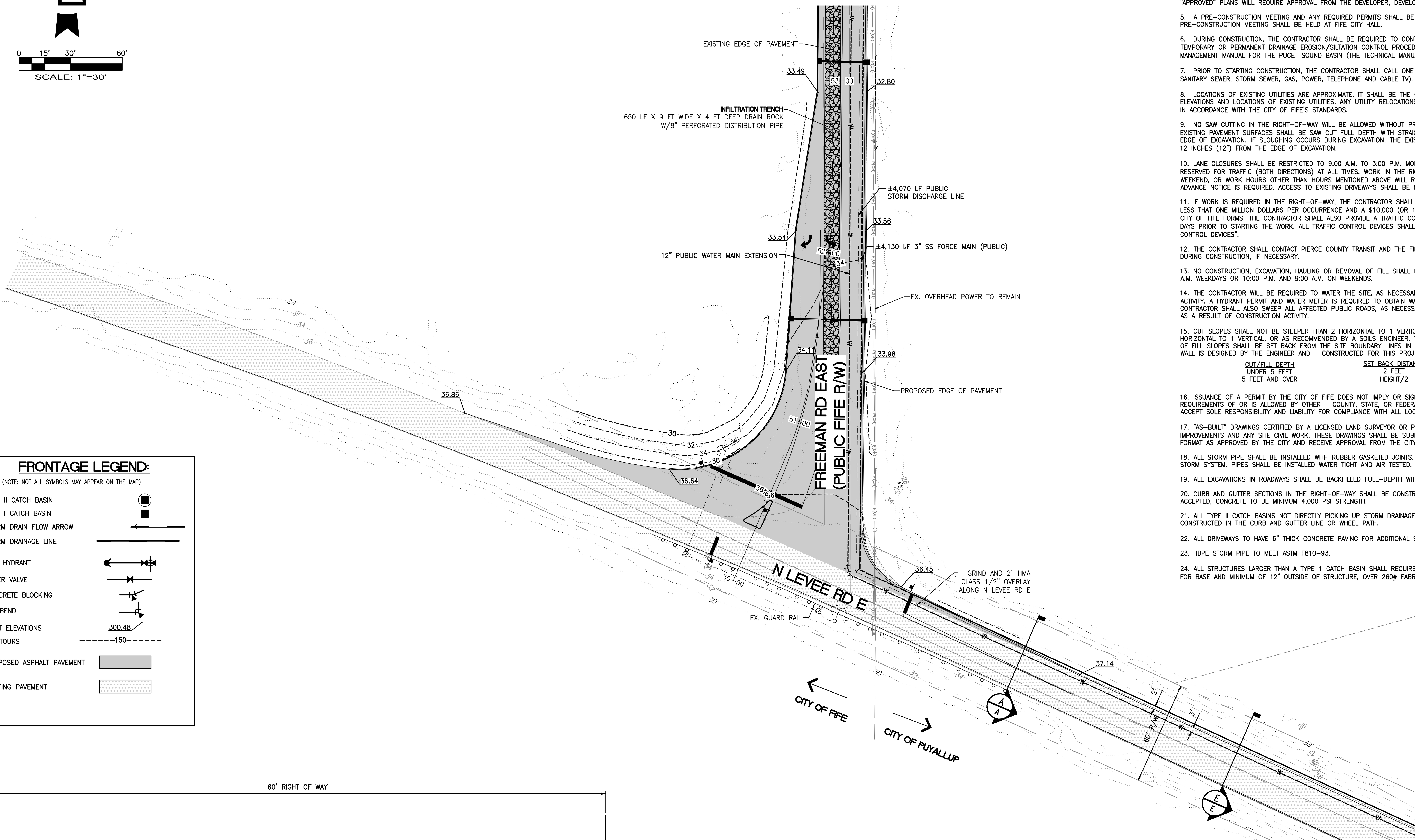
PRELIMINARY ROAD IMPROVEMENT FREEMAN AND LEVEE INTERSECTION

OF

FREEMAN LOGISTICS

PTNS. OF THE SE1/4, OF SEC. 17, TWP. 20 N., RGE 4 EAST, W. M.
AND PTNS. OF THE NE1/4, OF SEC. 20, TWP. 20 N., RGE 4 EAST, W. M.
PIERCE COUNTY, WASHINGTON

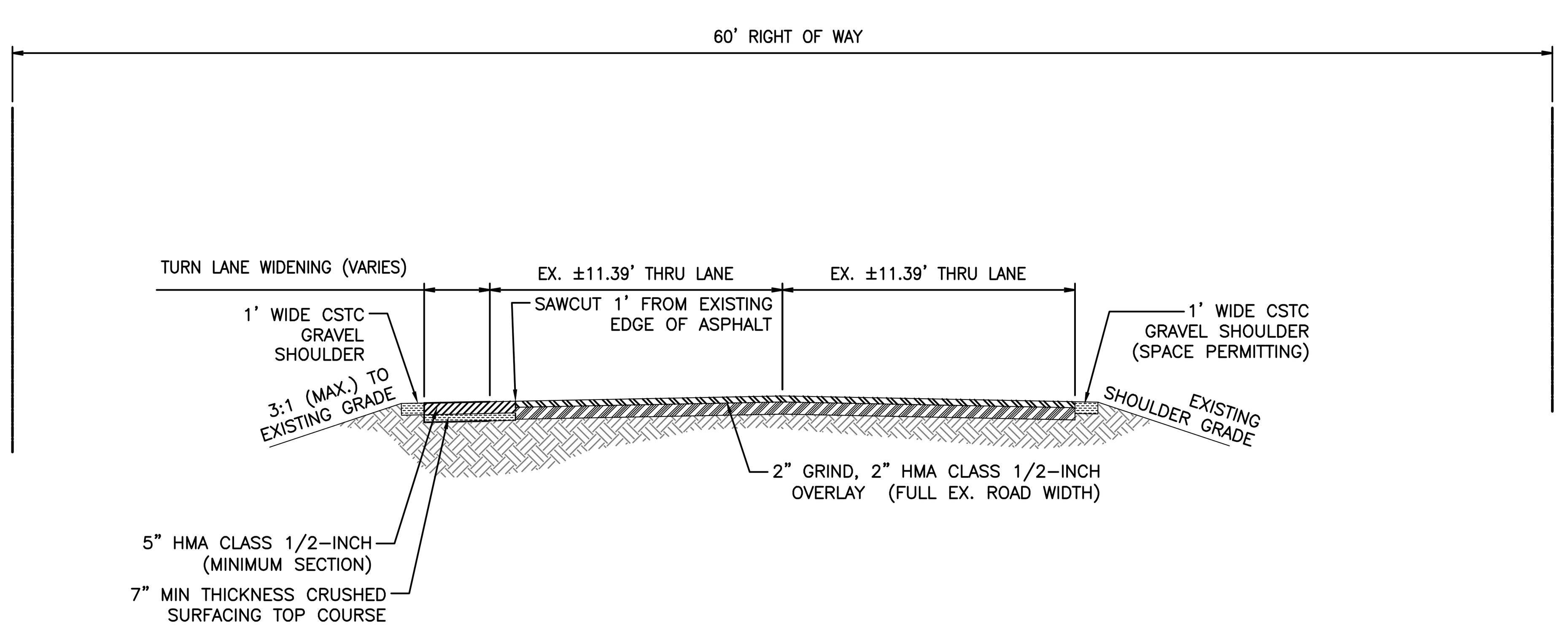




FRONTAGE LEGEND:

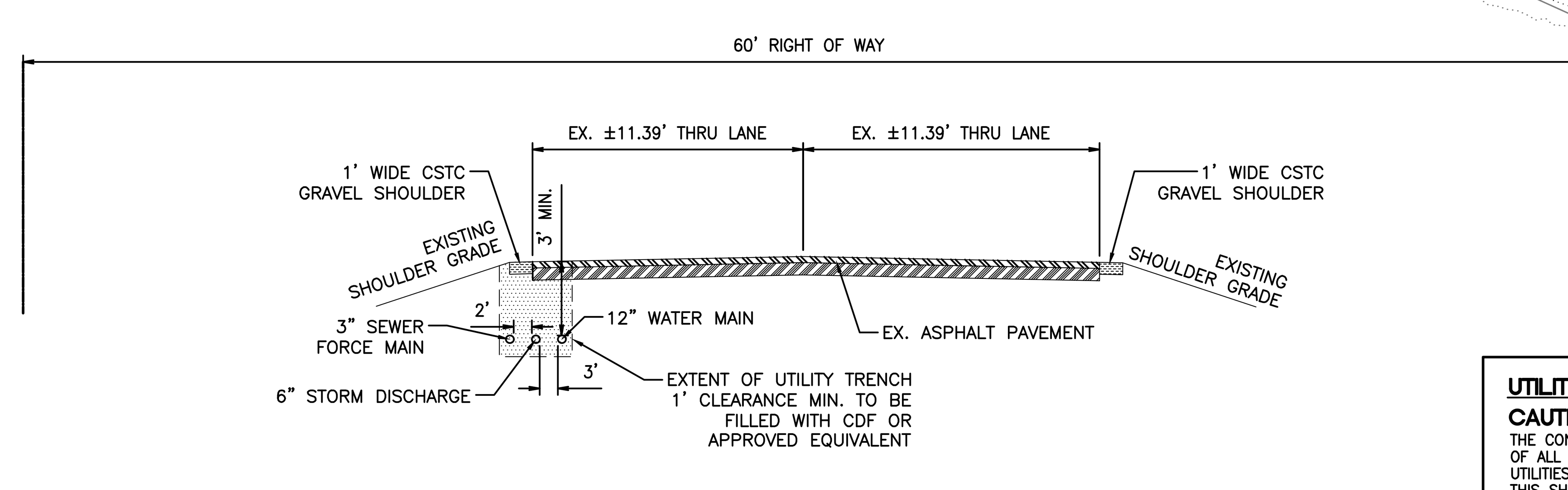
(NOTE: NOT ALL SYMBOLS MAY APPEAR ON THE MAP)

TYPE II CATCH BASIN
TYPE I CATCH BASIN
STORM DRAIN FLOW ARROW
STORM DRAINAGE LINE
FIRE HYDRANT
WATER VALVE
CONCRETE BLOCKING
90° BEND
SPOT ELEVATIONS 300.48
CONTOURS ——150——
PROPOSED ASPHALT PAVEMENT
EXISTING PAVEMENT



NORTH LEVEE ROAD EAST SECTION A

NOT TO SCALE



NORTH LEVEE ROAD EAST SECTION E

NOT TO SCALE

CITY OF FIFE GENERAL NOTES

1. ALL SPECIFICATIONS, MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CITY OF FIFE MUNICIPAL CODE, THE LATEST EDITION OF THE WSDOT/APWA STANDARD SPECIFICATIONS FOR ROAD, BRIDGE, AND MUNICIPAL CONSTRUCTION, AND THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.

2. PLANS AND DETAILS SHALL BE IN ACCORDANCE WITH THE CITY OF FIFE MUNICIPAL CODE AND THE LATEST EDITION OF THE WSDOT/APWA STANDARD PLANS.

3. A COPY OF THE APPROVED PLANS SHALL BE ON SITE DURING CONSTRUCTION.

4. CONSTRUCTION OF PROPOSED IMPROVEMENTS SHALL BE IN ACCORDANCE WITH THE APPROVED PLANS. ANY CHANGES FROM THE "APPROVED" PLANS WILL REQUIRE APPROVAL FROM THE DEVELOPER, DEVELOPERS ENGINEER AND THE CITY OF FIFE.

5. A PRE-CONSTRUCTION MEETING AND ANY REQUIRED PERMITS SHALL BE REQUIRED PRIOR TO ANY WORK ACTIVITY. THE PRE-CONSTRUCTION MEETING SHALL BE HELD AT FIFE CITY HALL.

6. DURING CONSTRUCTION, THE CONTRACTOR SHALL BE REQUIRED TO CONTROL ON SITE STORM WATER RUNOFF BY USING APPROVED TEMPORARY OR PERMANENT DRAINAGE EROSION/SILTATION CONTROL PROCEDURES. THE CITY OF FIFE HAS ADOPTED THE STORMWATER MANAGEMENT MANUAL FOR THE PUGET SOUND BASIN (THE TECHNICAL MANUAL) DEVELOPED BY THE DEPARTMENT OF ECOLOGY.

7. PRIOR TO STARTING CONSTRUCTION, THE CONTRACTOR SHALL CALL ONE-CALL (1-800-425-5555) FOR UTILITY LOCATIONS (WATER, SANITARY SEWER, STORM SEWER, GAS, POWER, TELEPHONE AND CABLE TV).

8. LOCATIONS OF EXISTING UTILITIES ARE APPROXIMATE. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE TRUE ELEVATIONS AND LOCATIONS OF EXISTING UTILITIES. ANY UTILITY RELOCATIONS SHALL BE AT THE EXPENSE OF THE APPLICANT AND MUST BE IN ACCORDANCE WITH THE CITY OF FIFE'S STANDARDS.

9. NO SAW CUTTING IN THE RIGHT-OF-WAY WILL BE ALLOWED WITHOUT PRIOR APPROVAL FROM THE CITY OF FIFE. ONCE APPROVED, EXISTING PAVEMENT SURFACES SHALL BE SAW CUT FULL DEPTH WITH STRAIGHT, UNIFORM EDGES TWELVE INCHES (12") OUT FROM THE EDGE OF EXCAVATION. IF SLOUGHING OCCURS DURING EXCAVATION, THE EXISTING PAVEMENT SHALL BE SAW CUT TO ACHIEVE THE REQUIRED 12 INCHES (12") FROM THE EDGE OF EXCAVATION.

10. LANE CLOSURES SHALL BE RESTRICTED TO 9:00 A.M. TO 3:00 P.M. MONDAY THROUGH FRIDAY. ONE LANE (MINIMUM) SHALL BE RESERVED FOR TRAFFIC (BOTH DIRECTIONS) AT ALL TIMES. WORK IN THE RIGHT OF WAY REQUIRES A RIGHT-OF-WAY PERMIT. NIGHT, WEEKEND, OR WORK HOURS OTHER THAN HOURS MENTIONED ABOVE WILL REQUIRE THE CITY OF FIFE ENGINEER'S APPROVAL. A THREE DAY ADVANCE NOTICE IS REQUIRED. ACCESS TO EXISTING DRIVEWAYS SHALL BE MAINTAINED AT ALL TIMES.

11. IF WORK IS REQUIRED IN THE RIGHT-OF-WAY, THE CONTRACTOR SHALL PROVIDE PROOF OF LIABILITY INSURANCE IN AN AMOUNT NO LESS THAT ONE MILLION DOLLARS PER OCCURRENCE AND A $10,000 (OR 125% OF CONSTRUCTION COSTS) RESTORATION/DEFECT BOND ON CITY OF FIFE FORMS. THE CONTRACTOR SHALL ALSO PROVIDE A TRAFFIC CONTROL PLAN FOR REVIEW AND APPROVAL A MINIMUM OF FIVE(5) DAYS PRIOR TO STARTING THE WORK. ALL TRAFFIC CONTROL DEVICES SHALL BE IN ACCORDANCE WITH THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES".

12. THE CONTRACTOR SHALL CONTACT PIERCE COUNTY TRANSIT AND THE FIFE SCHOOL DISTRICT FOR COORDINATING BUS STOP OPERATIONS DURING CONSTRUCTION, IF NECESSARY.

13. NO CONSTRUCTION, EXCAVATION, HAULING OR REMOVAL OF FILL SHALL BE PERMITTED BETWEEN THE HOURS OF 10:00 P.M. AND 7:00 A.M. WEEKDAYS OR 10:00 P.M. AND 9:00 A.M. ON WEEKENDS.

14. THE CONTRACTOR WILL BE REQUIRED TO WATER THE SITE, AS NECESSARY, TO REDUCE EMISSIONS AS A RESULT OF CONSTRUCTION ACTIVITY. A HYDRANT PERMIT AND WATER METER IS REQUIRED TO OBTAIN WATER FROM THE CITY OF FIFE'S WATER SYSTEM. THE CONTRACTOR SHALL ALSO SWEEP ALL AFFECTED PUBLIC ROADS, AS NECESSARY, OR AS DIRECTED BY THE CITY, TO REMOVE MUD DEPOSITS AS A RESULT OF CONSTRUCTION ACTIVITY.

15. CUT SLOPES SHALL NOT BE STEEPER THAN 2 HORIZONTAL TO 1 VERTICAL AND FILL SLOPES SHALL NOT BE STEEPER THAN 1-1/2 HORIZONTAL TO 1 VERTICAL, OR AS RECOMMENDED BY A SOILS ENGINEER. THE CATCH POINTS OF THE TOP OF CUT SLOPES AND BOTTOM OF FILL SLOPES SHALL BE SET BACK FROM THE SITE BOUNDARY LINES IN ACCORDANCE WITH THE FOLLOWING TABLE, UNLESS A RETAINING WALL IS DESIGNED BY THE ENGINEER AND CONSTRUCTED FOR THIS PROJECT:

CUT/FILL DEPTH	SET BACK DISTANCE
UNDER 5 FEET	2 FEET
5 FEET AND OVER	HEIGHT/2

16. ISSUANCE OF A PERMIT BY THE CITY OF FIFE DOES NOT IMPLY OR SIGNIFY THAT THE PROPOSED WORK COMPLIES WITH THE REQUIREMENTS OF OR IS ALLOWED BY OTHER COUNTY, STATE, OR FEDERAL LAWS, ORDINANCES, OR REGULATIONS. APPLICANT WILL ACCEPT SOLE RESPONSIBILITY AND LIABILITY FOR COMPLIANCE WITH ALL LOCAL, STATE, AND FEDERAL REQUIREMENTS.

17. "AS-BUILT" DRAWINGS CERTIFIED BY A LICENSED LAND SURVEYOR OR PROFESSIONAL ENGINEER ARE REQUIRED FOR RIGHT-OF-WAY IMPROVEMENTS AND ANY SITE CIVIL WORK. THESE DRAWINGS SHALL BE SUBMITTED ON 24" X 36" MYLAR, ON CD IN ELECTRONIC PDF FORMAT AS APPROVED BY THE CITY AND RECEIVE APPROVAL FROM THE CITY BEFORE A CERTIFICATE OF OCCUPANCY IS ISSUED.

18. ALL STORM PIPE SHALL BE INSTALLED WITH RUBBER GASKETED JOINTS. PIPES SHALL NOT ALLOW INTRUSION OF GROUNDWATER INTO STORM SYSTEM. PIPES SHALL BE INSTALLED WATER TIGHT AND AIR TESTED.

19. ALL EXCAVATIONS IN ROADWAYS SHALL BE BACKFILLED FULL-DEPTH WITH CRUSHED ROCK BASE COURSE COMPACTED TO 95% MDD.

20. CURB AND GUTTER SECTIONS IN THE RIGHT-OF-WAY SHALL BE CONSTRUCTED USING FORMS. EXTRUDED APPLICATIONS SHALL NOT BE ACCEPTED, CONCRETE TO BE MINIMUM 4,000 PSI STRENGTH.

21. ALL TYPE II CATCH BASINS NOT DIRECTLY PICKING UP STORM DRAINAGE SHALL HAVE ROUND SOLID LOCKING LIDS. LIDS WILL NOT BE CONSTRUCTED IN THE CURB AND GUTTER LINE OR WHEEL PATH.

22. ALL DRIVEWAYS TO HAVE 6" THICK CONCRETE PAVING FOR ADDITIONAL STRENGTH. MIN. 4,000 PSI STRENGTH.

23. HDPE STORM PIPE TO MEET ASTM F810-93.

24. ALL STRUCTURES LARGER THAN A TYPE 1 CATCH BASIN SHALL REQUIRE A MINIMUM OF 12" THICKNESS OF 4" - 8" QUARRY SPALLS FOR BASE AND MINIMUM OF 12" OUTSIDE OF STRUCTURE, OVER 260# FABRIC PER ASTM D-4632

ENGINEER'S REVIEW

FIFE WASHINGTON

☐ APPROVED
☐ APPROVED AS CORRECTED
☐ REVISE AND RESUBMIT
☐ REJECTED
☐ FOR INFORMATION ONLY

THE CITY'S REVIEW IS NOT A CONFIRMATION OF ANY DIMENSION OR QUANTITIES SHOWN IN THE PLANS AND WILL NOT RELIEVE THE DEVELOPER OR ENGINEER FROM RESPONSIBILITY FOR PLANS ERRORS. NO CHANGES SHALL BE MADE TO THE PLANS EXCEPT WITH THE CONSENT OF THE CITY ENGINEER. IF CONSTRUCTION HAS NOT COMMENCED WITHIN A REASONABLE PERIOD OF THE APPROVAL DATE, PLANS WILL REQUIRE RE-APPROVAL BY THE CITY.

BY DATE

CALL BEFORE YOU DIG:
1-800-424-5555

UTILITY CONFLICT NOTE:

CAUTION:
THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE LOCATION, DIMENSION, AND DEPTH OF ALL EXISTING UTILITIES WHETHER SHOWN ON THESE PLANS OR NOT BY POTHOLING THE UTILITIES AND SURVEYING THE HORIZONTAL AND VERTICAL LOCATION PRIOR TO CONSTRUCTION. THIS SHALL INCLUDE CALLING UTILITY LOCATE @ 1-800-424-5555 AND THEN POTHOLING ALL OF THE EXISTING UTILITIES AT LOCATIONS OF NEW UTILITY CROSSINGS TO PHYSICALLY VERIFY WHETHER OR NOT CONFLICTS EXIST. LOCATIONS OF SAID UTILITIES AS SHOWN ON THESE PLANS ARE BASED UPON THE UNVERIFIED PUBLIC INFORMATION AND ARE SUBJECT TO VARIATION. IF CONFLICTS SHOULD OCCUR, THE CONTRACTOR SHALL CONSULT BARGHAUSEN CONSULTING ENGINEERS, INC. TO RESOLVE ALL PROBLEMS PRIOR TO PROCEEDING WITH CONSTRUCTION.

APPROVED

BY ____________________
CITY OF PUYALLUP
DEVELOPMENT ENGINEERING

DATE ____________________

NOTE: THIS APPROVAL IS VOID AFTER 180 DAYS FROM APPROVAL DATE.
THE CITY WILL NOT BE RESPONSIBLE FOR ERRORS AND/OR OMISSIONS ON THESE PLANS.
FIELD CONDITIONS MAY DICTATE CHANGES TO THESE PLANS AS DETERMINED BY THE DEVELOPMENT ENGINEERING MANAGER.

No.	Date	By	Ckd.	Appr.	Revision
5	12/13/24	DTC	JSM	JSM	SEPA RESUBMITTAL

Title: PRELIMINARY ROAD IMPROVEMENT FREEMAN AND LEVEE INTERSECTION FOR FREEMAN LOGISTICS

For: VECTOR DEVELOPMENT COMPANY
11411 NE 124TH STREET
SUITE 190
KIRKLAND, WA 98034

JASON S. MCAR[illegible] STATE OF WASHINGTON [illegible]4927 REGISTERED PROFESSIONAL ENGINEER
PRELIMINARY
12/13/24

Scale: Horizontal 1"=30' Vertical N/A

Designed JSM
Drawn DTC
Checked JSM
Approved JSM
Date 12/13/24

Barghausen Consulting Engineers, Inc.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222
barghausen.com

Job Number 21585

Sheet C20 of 44

P:\21000s\21585\engineering\SEPA SET\21585-R.dwg 12/13/2024 11:58 AM DCASEY

PRELIMINARY ROAD IMPROVEMENTS STA 50+00 TO 55+00

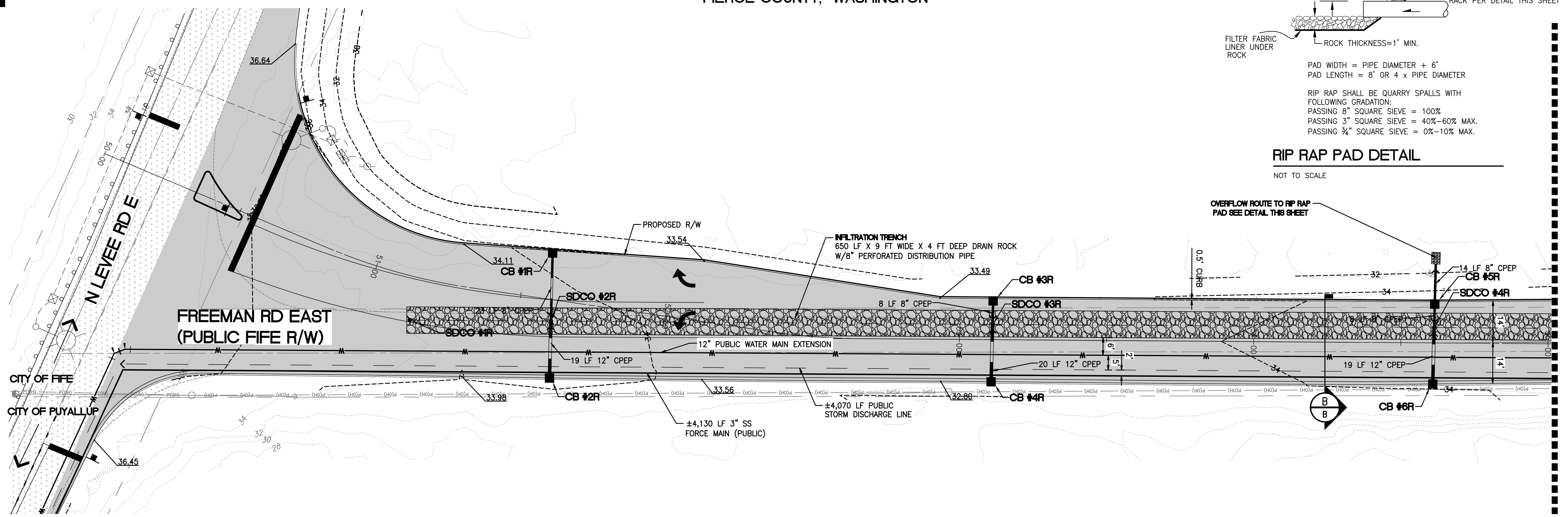
OF

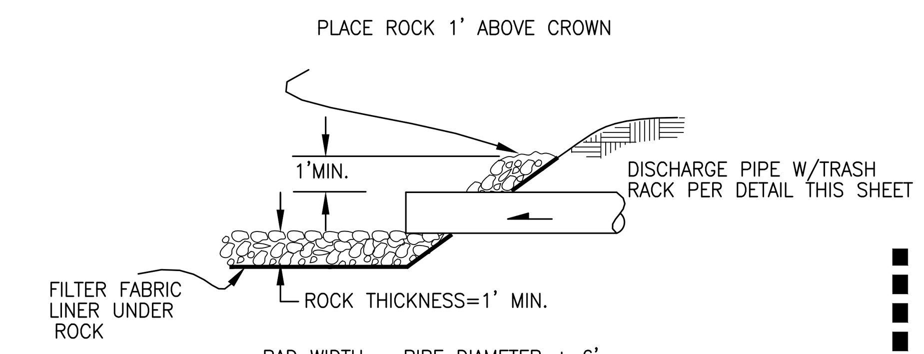
FREEMAN LOGISTICS

PTNS. OF THE SE1/4, OF SEC. 17, TWP. 20 N., RGE 4 EAST, W. M.
AND PTNS. OF THE NE1/4, OF SEC. 20, TWP. 20 N., RGE 4 EAST, W. M.
PIERCE COUNTY, WASHINGTON

N

0 10' 20' 40'
SCALE: 1"=20'



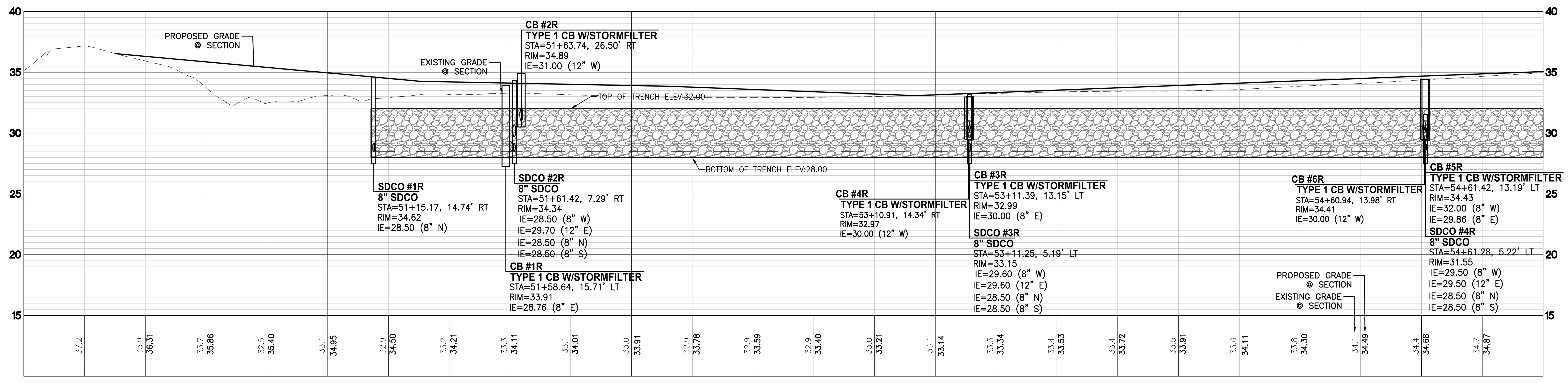


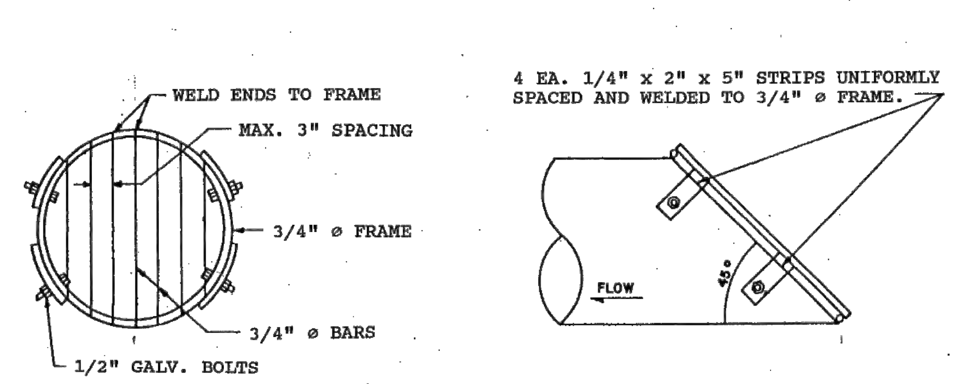
PAD WIDTH = PIPE DIAMETER + 6'
PAD LENGTH = 8' OR 4 x PIPE DIAMETER

RIP RAP SHALL BE QUARRY SPALLS WITH FOLLOWING GRADATION:
PASSING 8" SQUARE SIEVE = 100%
PASSING 3" SQUARE SIEVE = 40%-60% MAX.
PASSING ¾" SQUARE SIEVE = 0%-10% MAX.

RIP RAP PAD DETAIL

NOT TO SCALE





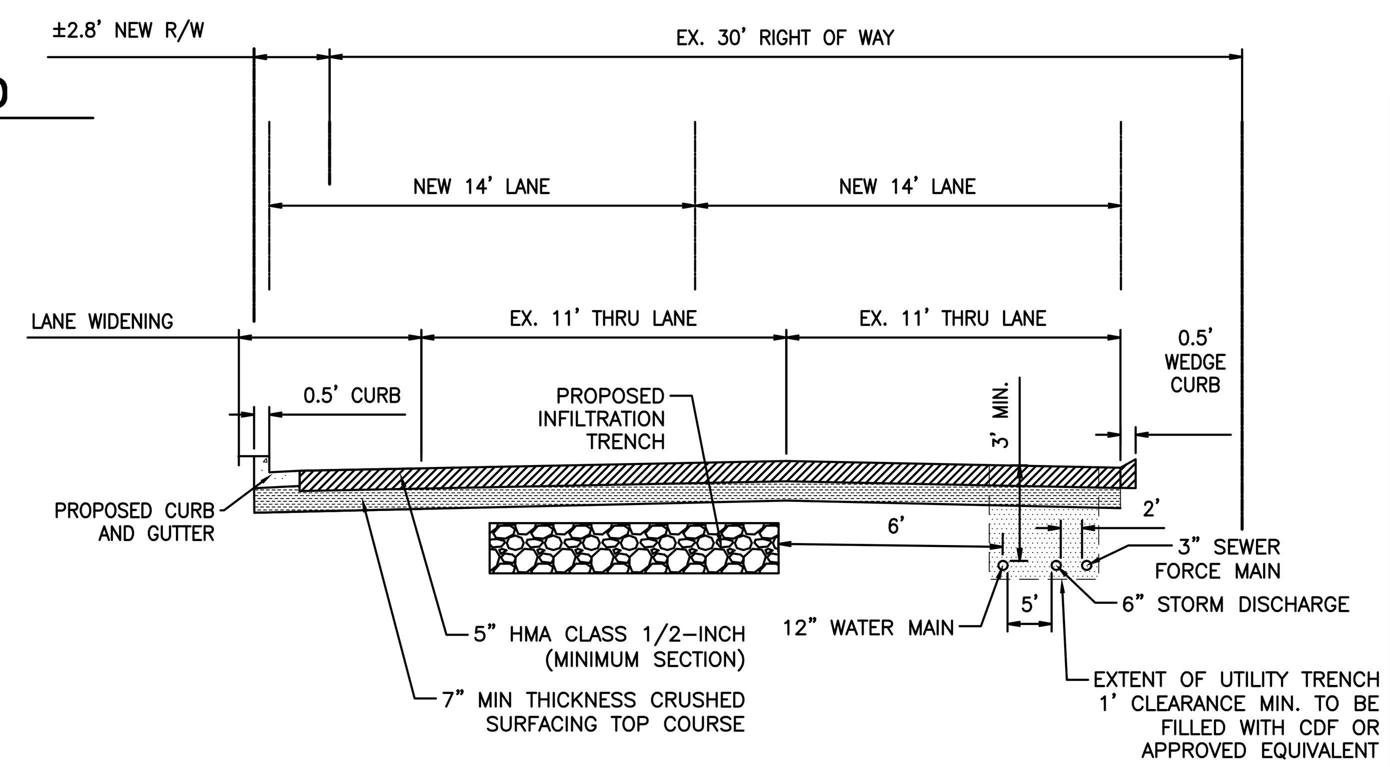
18" AND LARGER PIPE

NOTE: ALL STEEL PARTS TO BE GALVANIZED AND ASPHALT COATED (TREATMENT 1 OR BETTER).

TRASH RACK DETAIL

FREEMAN ROAD EAST
℄ STA: 50+00 TO 55+00

SCALE: HORIZ. 1"=20' VERT. 1"=5'



FREEMAN ROAD EAST SECTION B

NOT TO SCALE

FRONTAGE LEGEND:

(NOTE: NOT ALL SYMBOLS MAY APPEAR ON THE MAP)

TYPE II CATCH BASIN
TYPE I CATCH BASIN
STORM DRAIN FLOW ARROW
STORM DRAINAGE LINE
FIRE HYDRANT
WATER VALVE
CONCRETE BLOCKING
90° BEND
SPOT ELEVATIONS 300.48
CONTOURS —150—
PROPOSED ASPHALT PAVEMENT
EXISTING PAVEMENT

CALL BEFORE YOU DIG:
1-800-424-5555

UTILITY CONFLICT NOTE:

CAUTION:
THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE LOCATION, DIMENSION, AND DEPTH OF ALL EXISTING UTILITIES WHETHER SHOWN ON THESE PLANS OR NOT BY POTHOLING THE UTILITIES AND SURVEYING THE HORIZONTAL AND VERTICAL LOCATION PRIOR TO CONSTRUCTION. THIS SHALL INCLUDE CALLING UTILITY LOCATE @ 1-800-424-5555 AND THEN POTHOLING ALL OF THE EXISTING UTILITIES AT LOCATIONS OF NEW UTILITY CROSSINGS TO PHYSICALLY VERIFY WHETHER OR NOT CONFLICTS EXIST. LOCATIONS OF SAID UTILITIES AS SHOWN ON THESE PLANS ARE BASED UPON THE UNVERIFIED PUBLIC INFORMATION AND ARE SUBJECT TO VARIATION. IF CONFLICTS SHOULD OCCUR, THE CONTRACTOR SHALL CONSULT BARGHAUSEN CONSULTING ENGINEERS, INC. TO RESOLVE ALL PROBLEMS PRIOR TO PROCEEDING WITH CONSTRUCTION.

ENGINEER'S REVIEW
☐ APPROVED
☐ APPROVED AS CORRECTED
☐ REVISE AND RESUBMIT
☐ REJECTED
☐ FOR INFORMATION ONLY

THE CITY'S REVIEW IS NOT A CONFIRMATION OF ANY DIMENSION OR QUANTITIES SHOWN IN THE PLANS AND WILL NOT RELIEVE THE DEVELOPER OR ENGINEER FROM RESPONSIBILITY FOR PLANS ERRORS. NO CHANGES SHALL BE MADE TO THE PLANS EXCEPT WITH THE CONSENT OF THE CITY ENGINEER. IF CONSTRUCTION HAS NOT COMMENCED WITHIN A REASONABLE PERIOD OF THE APPROVAL DATE, PLANS WILL REQUIRE RE-APPROVAL BY THE CITY.

BY DATE

APPROVED

BY
CITY OF PUYALLUP
DEVELOPMENT ENGINEERING

DATE

NOTE: THIS APPROVAL IS VOID AFTER 180 DAYS FROM APPROVAL DATE. THE CITY WILL NOT BE RESPONSIBLE FOR ERRORS AND/OR OMISSIONS ON THESE PLANS. FIELD CONDITIONS MAY DICTATE CHANGES TO THESE PLANS AS DETERMINED BY THE DEVELOPMENT ENGINEERING MANAGER.

No.	Date	By	Ckd.	Appr.	Revision
5	12/13/24	DTC	JSM	JSM	SEPA RESUBMITTAL

Title: PRELIMINARY ROAD IMPROVEMENTS STA 50+00 TO 55+00 FOR FREEMAN LOGISTICS

For: VECTOR DEVELOPMENT COMPANY
11411 NE 124TH STREET
SUITE 190
KIRKLAND, WA 98034

JASON S. MCAR... STATE OF WASHINGTON ...4927 REGISTERED PROFESSIONAL ENGINEER
PRELIMINARY
12/13/24

Scale: Horizontal 1"=20' Vertical 1"=5'

Designed JSM Drawn DTC Checked JSM Approved JSM Date 12/13/24

Barghausen Consulting Engineers, Inc.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222
barghausen.com

Job Number 21585

Sheet C21 of 44

P:\21000s\21585\engineering\SEPA SET\21585-R.dwg 12/13/2024 1:42 PM DCASEY

Appendix B
Study Area Photographs

Appendix B
Study Area Photographs

Photograph 1
Parcels 0420174075 and 0420205016

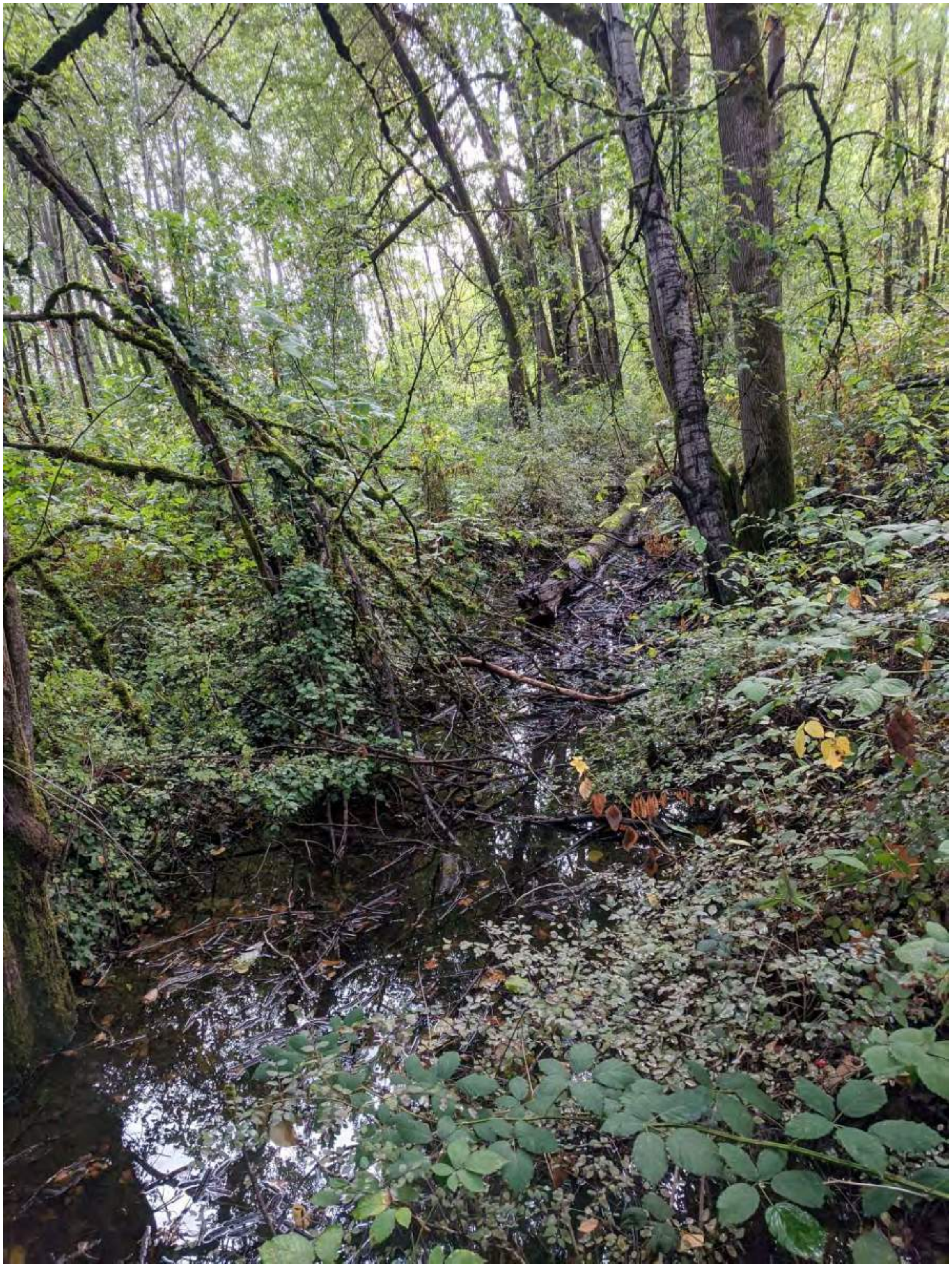
Photograph 2
Agricultural Ditch

Photograph 3
Agricultural Ditch and Adjacent Agricultural Field

Photograph 4
Adjacent Agricultural Fields

Photograph 5
View of DP1

Photograph 6
Agricultural Ditch South

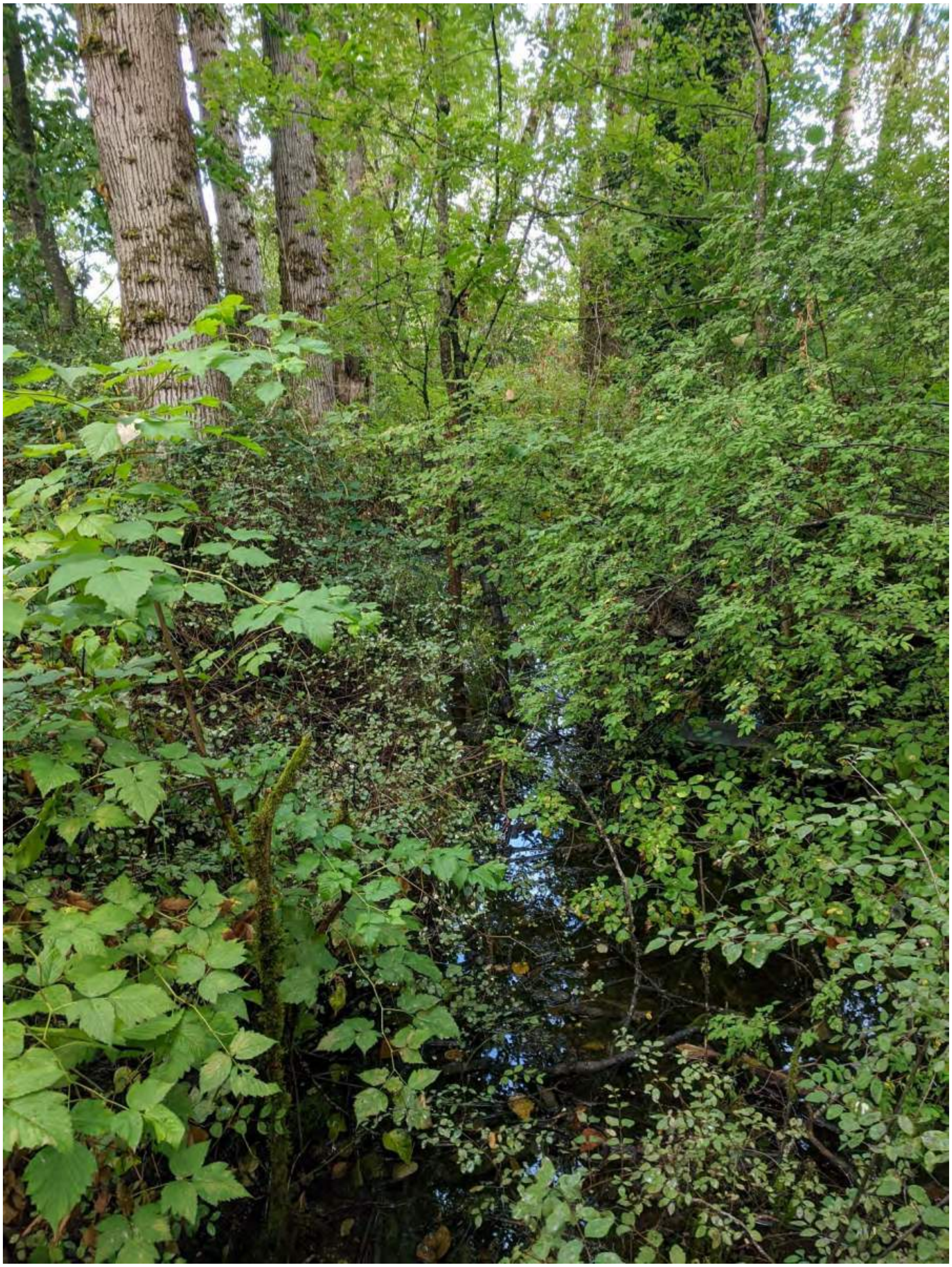


Photograph 7
East Edge of Parcel 0420205016

Photograph 8
Active Grazing in Parcel 0420174075

Photograph 9
Grazing in Parcel 0420174075

Photograph 10
Ditch



Photograph 11
Field Adjacent to Wetland B

Photograph 12
Landscape View near Wetland B

Photograph 13
View near Wetland B

Photograph 14
Field adjacent to Wetland B

Photograph 15
Area Near Wetland B

Photograph 16
Wetlands Mapped South of 52nd Street East

Photograph 17
Wetlands Mapped South of 52nd Street East

Photograph 18
Vegetation in Wetlands Mapped South of 52nd Street East

Photograph 19
Wetland B on Parcel 0420174075 (March 11, 2022)

Photograph 20
Wetland B on Parcel 0420174075 (March 11, 2022)

Photograph 21
Wetland B on Parcel 0420174075 (March 11, 2022)

Photograph 22
Looking down at Wetland A from the adjacent slope (May 17, 2024)

Photograph 23
Wetland A (May 17, 2024)

Appendix C
Wetland Forms and Figures

Appendix C-1

Data Forms

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Freeman Road Logistics City/County: Puyallup/Pierce County Sampling Date: 3/11/2022
Applicant/Owner: Vector Development Company State: WA Sampling Point: DP-1
Investigator(s): C. Douglas, M. Curran Section, Township, Range: S17 & 20 R4E T20N
Landform (hillslope, terrace, etc.): Forested Local relief (concave, convex, none): concave Slope: 1-5
Subregion (LRR): Northwest Forests and Coast (LRR A) Lat: 47.20922528 Long: -122.3177068 Datum: NAD83
Soil Map Unit Name: Pilchuck fine sand NWI Classification: PFO, PSS, POW
Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ____ (If no, explain in Remarks)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" Present? Yes x No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		X
Hydric Soil Present?		X
Wetland Hydrology Present?	X	

Is the Sampled Area within a Wetland? Yes ____ No X

Remarks: Delineated northern and eastern boundary of large wetland system to identify potential buffer impacts for utility line construction

VEGETATION

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status?
1. *Populus balsamifera ssp. Trichocarpa*	80	Yes	FAC
2. *Picea sitchensis*	10	No	FAC
3.			
4.			
5.			
50%= 45 20%= 18 Total Cover:	90		
Sapling/Shrub Stratum (Plot size: ____)			
1. *Cornus sericea*	30	No	FACW
2. *Rubus armeniacus*	20	No	FAC
3. *Symphoricarpos albus*	90	Yes	FACU
4. *Ribes sanguineum*	20	No	FACU
5.			
50%= 80 20%= 32 Total Cover:	160		
Herb Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
50%= 0 20%= 0 Total Cover:	0		
Woody Vine Stratum (Plot size: ____)			
1. *Hedera helix*	20		FACU
2.			
Total Cover:	20		
% Bare Ground in Herb Stratum 100	% Cover of Biotic Crust ____		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **1** (A)
Total Number of Dominant Species Across All Strata: **2** (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: **50%** (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:
OBL species	**0**	x1 = **0**
FACW species	**30**	x2 = **60**
FAC species	**110**	x3 = **330**
FACU species	**110**	x4 = **440**
UPL species	**0**	x5 = **0**
Column Totals:	**250** (A)	**830** (B)

Prevalence Index = B/A = **3.3**

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation
____ 2 - Dominance Test is >50%
____ 3 - Prevalence Index is ≤3.0[1]
____ 4 - Morphological Adaptation[1] (Provide supporting data in Remarks or on a separate sheet)
____ 5 - Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks: 50% FAC vegetation

SOIL

Sampling Point: DP-1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 3/2	100					SiL	w/gravel
8-18	10YR 4/2	100					SL	w/gravel

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Muck Mineral (S1)
- ___ Sandy gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______________

Depth (inches): ______________

Hydric Soil Present? **Yes** ____ **No** X

Remarks: 2 chroma with no redox

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- x Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ____ No ____ Depth (inches): ____

Water table Present? Yes ____ No ____ Depth (inches): ____

Saturation Present? (includes capillary fringe) Yes x No ____ Depth (inches): 10 inches

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (Unnamed Tributary gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Saturation 10 inches deep, no other hydric indicators

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Freeman Road Logistics City/County: Puyallup/Pierce County Sampling Date: 3/11/2022

Applicant/Owner: Vector Development Company State: WA Sampling Point: DP-2

Investigator(s): C. Douglas, M. Curran Section, Township, Range: S17 & 20 R4E T20N

Landform (hillslope, terrace, etc.): Forested Local relief (concave, convex, none): concave Slope: 1-5

Subregion (LRR): Northwest Forests and Coast (LRR A) Lat: 47.2091166 Long: -122.3175633 Datum: NAD83

Soil Map Unit Name: Pilchuck fine sand NWI Classification: PFO, PSS, POW

Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ____ (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" Present? Yes x No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No
Hydric Soil Present?	Yes X	No
Wetland Hydrology Present?	Yes X	No

Is the Sampled Area within a Wetland? **Yes** X **No** ____

Remarks: Delineated northern and eastern boundary of large wetland system to identify potential buffer impacts for utility line construction

VEGETATION

	Absolute % Cover	Dominant Species?	Indicator Status?
Tree Stratum (Plot size: ____)			
1. *Populus balsamifera ssp. Trichocarpa*	70	Yes	FAC
2.			
3.			
4.			
5.			
50%= 35 20%= 14 Total Cover:	70		
Sapling/Shrub Stratum (Plot size: ____)			
1. *Cornus sericea*	85	Yes	FACW
2. *Rubus armeniacus*	20	No	FAC
3. *Symphoricarpos albus*	20	No	FACU
4.			
5.			
50%= 62.5 20%= 25 Total Cover:	125		
Herb Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
50%= 0 20%= 0 Total Cover:	0		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
Total Cover:	0		
% Bare Ground in Herb Stratum 100 % Cover of Biotic Crust ____			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **2** (A)

Total Number of Dominant Species Across All Strata: **2** (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: **100%** (A/B)

Prevalence Index Worksheet:

Total % Cover of:			Multiply by:
OBL species	**0**	x1 =	**0**
FACW species	**85**	x2 =	**170**
FAC species	**90**	x3 =	**270**
FACU species	**20**	x4 =	**80**
UPL species	**0**	x5 =	**0**
Column Totals:	**195** (A)		**520** (B)

Prevalence Index = B/A = **2.7**

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptation[1] (Provide supporting data in Remarks or on a separate sheet)

____ 5 - Wetland Non-Vascular Plants[1]

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks: 100% FAC vegetation

SOIL

Sampling Point: DP-2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/1	100					SiL	
4-9	10YR 3/1	90	10YR 5/4	10	D	M	SL	
9-18	10YR 2/1	95	10YR 4/1	5	D	M	LS	w/gravel

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- x Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Muck Mineral (S1)
- ___ Sandy gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? **Yes** X **No** ___

Remarks: 1 chroma with redox

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum one required; check all that apply)

- x Surface Water (A1)
- x High Water Table (A2)
- x Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- x Inundation Visible on Aerial Imagery (B7)
- x Sparsely Vegetated Concave Surface (B8)
- x Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- x Water-Stained Leaves (B9) (**MLRA 1, 2, 4A and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes x	No ___	Depth (inches): 1 inch
Water table Present?	Yes x	No ___	Depth (inches): at surface
Saturation Present? (includes capillary fringe)	Yes x	No ___	Depth (inches): at surface

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (Unnamed Tributary gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Standing water >1 ft deep 10 ft from DP

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Freeman Road Logistics City/County: Puyallup/Pierce County Sampling Date: 3/11/2022

Applicant/Owner: Vector Development Company State: WA Sampling Point: DP-3

Investigator(s): C. Douglas, M. Curran Section, Township, Range: S17 & 20 R4E T20N

Landform (hillslope, terrace, etc.): Forested Local relief (concave, convex, none): concave Slope: 1-5

Subregion (LRR): Northwest Forests and Coast (LRR A) Lat: 47.20721312 Long: -122.3147837 Datum: NAD83

Soil Map Unit Name: Pilchuck fine sand NWI Classification: PFO, PSS, POW

Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ____ (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" Present? Yes x No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	X	
Hydric Soil Present?		X
Wetland Hydrology Present?		X

Is the Sampled Area within a Wetland? Yes ____ No X

Remarks: Delineated northern and eastern boundary of large wetland system to identify potential buffer impacts for utility line construction

VEGETATION

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status?
1. *Alnus rubra*	10	No	FAC
2. *Populus balsamifera ssp. Trichocarpa*	60	Yes	FAC
3.			
4.			
5.			
50%= 35 20%= 14 Total Cover:	70		
Sapling/Shrub Stratum (Plot size: ____)			
1. *Oemleria cerasiformis*	30	Yes	FACU
2. *Rubus armeniacus*	70	Yes	FAC
3.			
4.			
5.			
50%= 50 20%= 20 Total Cover:	100		
Herb Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
50%= 0 20%= 0 Total Cover:	0		
Woody Vine Stratum (Plot size: ____)			
1. *Hedera helix*	30		FACU
2.			
Total Cover:	30		
% Bare Ground in Herb Stratum 100 % Cover of Biotic Crust ____			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **2** (A)

Total Number of Dominant Species Across All Strata: **3** (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: **67%** (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x1 = 0
FACW species	0	x2 = 0
FAC species	140	x3 = 420
FACU species	30	x4 = 120
UPL species	0	x5 = 0
Column Totals:	170 (A)	540 (B)

Prevalence Index = B/A = **3.2**

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ____ 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptation[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: 67% FAC vegetation

SOIL

Sampling Point: DP-3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 3/3	100					SiL	w/gravel

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Muck Mineral (S1)
___ Sandy gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) (**LRR B**)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):
Type: ______
Depth (inches): ______

Hydric Soil Present? **Yes** ____ **No** X

Remarks: 3 chroma with no redox

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:
Surface Water Present? Yes ____ No ____ Depth (inches): ______
Water table Present? Yes ____ No ____ Depth (inches): ______
Saturation Present? (includes capillary fringe) Yes ____ No ____ Depth (inches): ______

Wetland Hydrology Present? **Yes** ____ **No** X

Describe Recorded Data (Unnamed Tributary gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: No hydric indicators

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Freeman Road Logistics City/County: Puyallup/Pierce County Sampling Date: 3/11/2022
Applicant/Owner: Vector Development Company State: WA Sampling Point: DP-4
Investigator(s): C. Douglas, M. Curran Section, Township, Range: S17 & 20 R4E T20N
Landform (hillslope, terrace, etc.): Forested Local relief (concave, convex, none): concave Slope: 1-5
Subregion (LRR): Northwest Forests and Coast (LRR A) Lat: 47.20725182 Long: -122.3149014 Datum: NAD83
Soil Map Unit Name: Pilchuck fine sand NWI Classification: PFO, PSS, POW
Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ____ (If no, explain in Remarks)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" Present? Yes x No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____
Hydric Soil Present?	Yes X	No ____
Wetland Hydrology Present?	Yes X	No ____

Is the Sampled Area within a Wetland? **Yes** X **No** ____

Remarks: Delineated northern and eastern boundary of large wetland system to identify potential buffer impacts for utility line construction

VEGETATION

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status?
1. *Populus balsamifera ssp. Trichocarpa*	60	Yes	FAC
2.			
3.			
4.			
5.			
50%= 30 20%= 12 Total Cover:	**60**		
Sapling/Shrub Stratum (Plot size: ____)			
1. *Cornus sericea*	80	Yes	FACW
2. *Rubus armeniacus*	20	No	FAC
3. *Rubus spectabilis*	30	Yes	FAC
4.			
5.			
50%= 65 20%= 26 Total Cover:	**130**		
Herb Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
50%= 0 20%= 0 Total Cover:	**0**		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
Total Cover:	**0**		

% Bare Ground in Herb Stratum **100** % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **3** (A)
Total Number of Dominant Species Across All Strata: **3** (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: **100%** (A/B)

Prevalence Index Worksheet:

Total % Cover of:			Multiply by:
OBL species	**0**	x1 =	**0**
FACW species	**80**	x2 =	**160**
FAC species	**110**	x3 =	**330**
FACU species	**0**	x4 =	**0**
UPL species	**0**	x5 =	**0**
Column Totals:	**190** (A)		**490** (B)

Prevalence Index = B/A = **2.6**

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
X 3 - Prevalence Index is ≤3.0[1]
____ 4 - Morphological Adaptation[1] (Provide supporting data in Remarks or on a separate sheet)
____ 5 - Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks: 100% FAC vegetation

SOIL

Sampling Point: DP-4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 3/1	100					SiL	
5-18	10YR 4/1	85	10YR 5/4	15	D	M	SiL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- _x_ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Muck Mineral (S1)
- ___ Sandy gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? **Yes** _X_ **No** ___

Remarks: 1 chroma with redox

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum one required; check all that apply)

- ___ Surface Water (A1)
- _x_ High Water Table (A2)
- _x_ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- _x_ Inundation Visible on Aerial Imagery (B7)
- _x_ Sparsely Vegetated Concave Surface (B8)
- _x_ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- _x_ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _x_ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes ___	No _x_	Depth (inches): ___
Water table Present?	Yes _x_	No ___	Depth (inches): at surface
Saturation Present? (includes capillary fringe)	Yes _x_	No ___	Depth (inches): at surface

Wetland Hydrology Present? **Yes** _X_ **No** ___

Describe Recorded Data (Unnamed Tributary gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Standing water >1 ft deep 3 ft from DP

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site:	Freeman Road Logistics	City/County:	Puyallup/Pierce County	Sampling Date:	3/11/2022
Applicant/Owner:	Vector Development Company	State:	WA	Sampling Point:	DP-5
Investigator(s):	C. Douglas, M. Curran	Section, Township, Range:	S17 & 20 R4E T20N		
Landform (hillslope, terrace, etc.):	Forested	Local relief (concave, convex, none):	concave	Slope:	1-5
Subregion (LRR):	Northwest Forests and Coast (LRR A)	Lat: 47.20693991	Long: -122.3150232	Datum:	NAD83
Soil Map Unit Name:	Pilchuck fine sand	NWI Classification:	PFO, PSS, POW		

Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ____ (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" Present? Yes x No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		X
Hydric Soil Present?		X
Wetland Hydrology Present?		X

Is the Sampled Area within a Wetland? **Yes** ____ **No** X

Remarks: Delineated northern and eastern boundary of large wetland system to identify potential buffer impacts for utility line construction

VEGETATION

	Absolute % Cover	Dominant Species?	Indicator Status?
Tree Stratum (Plot size: ____)			
1. *Alnus rubra*	60	Yes	FAC
2. *Populus balsamifera ssp. Trichocarpa*	80	Yes	FAC
3.			
4.			
5.			
50%= 70 20%= 28 Total Cover:	**140**		
Sapling/Shrub Stratum (Plot size: ____)			
1. *Oemleria cerasiformis*	50	Yes	FACU
2. *Rubus armeniacus*	10	No	FAC
3. *Rubus spectabilis*	20	No	FAC
4. *Symphoricarpos albus*	70	Yes	FACU
5.			
50%= 75 20%= 30 Total Cover:	**150**		
Herb Stratum (Plot size: ____)			
1. *Polystichum munitum*	20	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
50%= 10 20%= 4 Total Cover:	**20**		
Woody Vine Stratum (Plot size: ____)			
1. *Hedera helix*	20		FACU
2.			
Total Cover:	**20**		
% Bare Ground in Herb Stratum **80** % Cover of Biotic Crust ____			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	**2**	(A)
Total Number of Dominant Species Across All Strata:	**5**	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	**40%**	(A/B)

Prevalence Index Worksheet:

Total % Cover of:			Multiply by:
OBL species	**0**	x1 =	**0**
FACW species	**0**	x2 =	**0**
FAC species	**170**	x3 =	**510**
FACU species	**140**	x4 =	**560**
UPL species	**0**	x5 =	**0**
Column Totals:	**310** (A)		**1070** (B)

Prevalence Index = B/A = **3.5**

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation
____ 2 - Dominance Test is >50%
____ 3 - Prevalence Index is ≤3.0[1]
____ 4 - Morphological Adaptation[1] (Provide supporting data in Remarks or on a separate sheet)
____ 5 - Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ____ **No** X

Remarks: 40% FAC vegetation

SOIL

Sampling Point: DP-5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 3/3	100					L	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Muck Mineral (S1)
___ Sandy gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) (**LRR B**)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? **Yes** ____ **No** X

Remarks: 3 chroma with no redox

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ____ No ____ Depth (inches): ____
Water table Present? Yes ____ No ____ Depth (inches): ____
Saturation Present? (includes capillary fringe) Yes ____ No ____ Depth (inches): ____

Wetland Hydrology Present? **Yes** ____ **No** X

Describe Recorded Data (Unnamed Tributary gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: No hydric indicators

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Freeman Road Logistics	City/County: Puyallup/Pierce County	Sampling Date: 3/11/2022
Applicant/Owner: Vector Development Company	State: WA	Sampling Point: DP-6
Investigator(s): C. Douglas, M. Curran	Section, Township, Range: S17 & 20 R4E T20N	
Landform (hillslope, terrace, etc.): Forested	Local relief (concave, convex, none): concave	Slope: 1-5
Subregion (LRR): Northwest Forests and Coast (LRR A)	Lat: 47.20715552	Long: -122.3151651	Datum: NAD83
Soil Map Unit Name: Pilchuck fine sand	NWI Classification: PFO, PSS, POW	

Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ____ (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" Present? Yes x No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____
Hydric Soil Present?	Yes X	No ____
Wetland Hydrology Present?	Yes X	No ____

Is the Sampled Area within a Wetland? **Yes** X **No** ____

Remarks: Delineated northern and eastern boundary of large wetland system to identify potential buffer impacts for utility line construction

VEGETATION

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status?
1. *Alnus rubra*	70	Yes	FAC
2. *Populus balsamifera ssp. Trichocarpa*	20	Yes	FAC
3.			
4.			
5.			
50%= 45 20%= 18 Total Cover:	90		
Sapling/Shrub Stratum (Plot size: ____)			
1. *Cornus sericea*	70	Yes	FACW
2. *Rubus armeniacus*	20	No	FAC
3. *Rubus spectabilis*	20	No	FAC
4. *Ribes sanguineum*	5	No	FACU
5. *Symphoricarpos albus*	5	No	FACU
50%= 60 20%= 24 Total Cover:	120		
Herb Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
50%= 0 20%= 0 Total Cover:	0		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
Total Cover:	0		
% Bare Ground in Herb Stratum 100 % Cover of Biotic Crust ____			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	**3**	(A)
Total Number of Dominant Species Across All Strata:	**3**	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	**100%**	(A/B)

Prevalence Index Worksheet:

Total % Cover of:			Multiply by:
OBL species	**0**	x1 =	**0**
FACW species	**70**	x2 =	**140**
FAC species	**130**	x3 =	**390**
FACU species	**10**	x4 =	**40**
UPL species	**0**	x5 =	**0**
Column Totals:	**210** (A)		**570** (B)

Prevalence Index = B/A = **2.7**

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- **X** 2 - Dominance Test is >50%
- **X** 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptation[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks: 100% FAC vegetation

SOIL

Sampling Point: DP-6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/1	100					SiL	
4-18	10YR 4/1	80	10YR 5/4	20	D	M	SiL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
x Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Muck Mineral (S1)
___ Sandy gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) (**LRR B**)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):
Type: ______
Depth (inches): ______

Hydric Soil Present? **Yes** X **No** ___

Remarks: 1 chroma with redox

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum one required; check all that apply)

x Surface Water (A1)
x High Water Table (A2)
x Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
x Inundation Visible on Aerial Imagery (B7)
x Sparsely Vegetated Concave Surface (B8)
x Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
x Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

x Water-Stained Leaves (B9) (**MLRA 1, 2, 4A and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes x	No ___	Depth (inches):	1 inch
Water table Present?	Yes x	No ___	Depth (inches):	at surface
Saturation Present? (includes capillary fringe)	Yes x	No ___	Depth (inches):	at surface

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (Unnamed Tributary gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Standing water >1 ft deep 2 ft from DP

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Western Mountains, Valleys, and Coast Region
See ERDC/EL TR-10-3; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp: 11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Vector Freeman/5203 Freeman Rd E City/County: Puyallup/Pierce Sampling Date: 5/17
Applicant/Owner: Vector/Puyallup Tribe State: WA Sampling Point: DP-7
Investigator(s): Hannah Fotherby Section, Township, Range: S20, T20N, R4E
Landform (hillside, terrace, etc.): floodplain/historic river meander Local relief (concave, convex, none): none Slope (%): 5
Subregion (LRR): LRR A, MLRA 2 Lat: 47.20858637 Long: -122.3197029 Datum: WGS84
Soil Map Unit Name: Pilchuck fine sand NWI classification: PFO1C
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ___
Hydric Soil Present?	Yes ___	No X
Wetland Hydrology Present?	Yes ___	No X

Is the Sampled Area within a Wetland? **Yes** ___ **No** X

Remarks:
Plot located in a flat area below the line of Symphoricarpos albus, where the Populus balsamifera community transitions to a Cornus alba community.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Populus balsamifera*	60	Yes	FAC
2. *Prunus emarginata*	10	No	FACU
3.			
4.			
	70	=Total Cover	
Sapling/Shrub Stratum (Plot size: 15)			
1. *Cornus alba*	20	Yes	FACW
2. *Symphoricarpos albus*	15	Yes	FACU
3.			
4.			
5.			
	35	=Total Cover	
Herb Stratum (Plot size: 5)			
1. *Urtica dioica*	2	No	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	2	=Total Cover	
Woody Vine Stratum (Plot size: 15)			
1.			
2.			
		=Total Cover	
% Bare Ground in Herb Stratum 98			

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across All Strata: 3 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 66.7% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	20	x 2 =	40
FAC species	62	x 3 =	186
FACU species	25	x 4 =	100
UPL species	0	x 5 =	0
Column Totals:	107 (A)		326 (B)

Prevalence Index = B/A = 3.05

Hydrophytic Vegetation Indicators:
___ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ 5 - Wetland Non-Vascular Plants[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks:

SOIL

Sampling Point: DP-7

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 2/1	100					Sandy	sandy loam
6-18	10YR 3/1	100					Sandy	loamy sand (mostly sand)

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ 1 cm Muck (A9) **(LRR D, G)**
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ 2.5 cm Mucky Peat or Peat (S2) **(LRR G)**
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) **(LRR A, E)**
___ Iron-Manganese Masses (F12) **(LRR D)**
___ Red Parent Material (F21)
___ Very Shallow Dark Surface (F22)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):
Type: ___
Depth (inches): ___

Hydric Soil Present? Yes ___ No X

Remarks:
No redox or hydrogen sulfide smell observed. Sand composition increases with depth.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres on Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
X Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___
Water Table Present? Yes ___ No X Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Soil plug was moist but not saturated. Geomorphic position is a flat area adjacent to a ponded depression.

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Western Mountains, Valleys, and Coast Region
See ERDC/EL TR-10-3; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp: 11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Vector Freeman/5203 Freeman Rd E City/County: Puyallup/Pierce Sampling Date: 5/17/24

Applicant/Owner: Vector/Puyallup Tribe State: WA Sampling Point: DP-8

Investigator(s): Hannah Fotherby Section, Township, Range: S20, T20N. R4E

Landform (hillside, terrace, etc.): floodplain/historic river meander Local relief (concave, convex, none): none Slope (%): 1

Subregion (LRR): LRR A, MLRA 2 Lat: 47.20861737 Long: -122.3197029 Datum: WGS84

Soil Map Unit Name: Pilchuck fine sand NWI classification: PFO1C

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ___
Hydric Soil Present?	Yes X	No ___
Wetland Hydrology Present?	Yes X	No ___

Is the Sampled Area within a Wetland? **Yes** X **No** ___

Remarks:
Plot is approximately 1 foot lower in elevation than DP-7, and approximately 15 feet away.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30)			
1. *Fraxinus latifolia*	30	Yes	FACW
2.			
3.			
4.			
	30	=Total Cover	
Sapling/Shrub Stratum (Plot size: 15)			
1. *Cornus alba*	95	Yes	FACW
2.			
3.			
4.			
5.			
	95	=Total Cover	
Herb Stratum (Plot size: 5)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
		=Total Cover	
Woody Vine Stratum (Plot size: 15)			
1.			
2.			
		=Total Cover	
% Bare Ground in Herb Stratum 100			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	125	x 2 =	250
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	125 (A)		250 (B)

Prevalence Index = B/A = 2.00

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
X 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ 5 - Wetland Non-Vascular Plants[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks:

SOIL

Sampling Point: DP-8

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 2/1	100					Mucky Sand	contains silt
8-18	10YR 2/1	100					Sandy	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- X Hydrogen Sulfide (A4)
- ___ 1 cm Muck (A9) **(LRR D, G)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- X Sandy Mucky Mineral (S1)
- ___ 2.5 cm Mucky Peat or Peat (S2) **(LRR G)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR A, E)**
- ___ Iron-Manganese Masses (F12) **(LRR D)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? **Yes** X **No** ___

Remarks:
Sand composition increases with depth. Hydrogen sulfide odor.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- X Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2 4A, and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___
Water Table Present?	Yes X	No ___	Depth (inches): 4
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Surface water was approximately 15 feet away from plot. Geomorphic position is a flat area within a depression.

U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Western Mountains, Valleys, and Coast Region** See ERDC/EL TR-10-3; the proponent agency is CECW-CO-R	*OMB Control #: 0710-0024, Exp: 11/30/2024* *Requirement Control Symbol EXEMPT:* *(Authority: AR 335-15, paragraph 5-2a)*

Project/Site: Vector Freeman/5203 Freeman Rd E City/County: Puyallup/Pierce Sampling Date: 5/17/24

Applicant/Owner: Vector/Puyallup Tribe State: WA Sampling Point: DP-9

Investigator(s): Hannah Fotherby Section, Township, Range: S20, T20N, R4E

Landform (hillside, terrace, etc.): floodplain/historic river meander Local relief (concave, convex, none): convex Slope (%): 8

Subregion (LRR): LRR A, MLRA 2 Lat: 47.20862474 Long: -122.3201188 Datum: WGS84

Soil Map Unit Name: Pilchuck fine sand NWI classification: PFO1C

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ___	**Is the Sampled Area within a Wetland?** **Yes** ___ **No** X
Hydric Soil Present?	Yes ___	No X	
Wetland Hydrology Present?	Yes ___	No X	

Remarks:
Plot located on a slope, at the base of a large black cottonwood. Plot is approximately 8 feet higher on the slope than DP-10.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Populus balsamifera*	75	Yes	FAC
2. *Prunus emarginata*	15	No	FACU
3. *Fraxinus latifolia*	10	No	FACW
4.			
	100	=Total Cover	
Sapling/Shrub Stratum (Plot size: 15)			
1. *Symphoricarpos albus*	70	Yes	FACU
2. *Physocarpus capitatus*	30	Yes	FACW
3.			
4.			
5.			
	100	=Total Cover	
Herb Stratum (Plot size: 5)			
1. *Urtica dioica*	5	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	5	=Total Cover	
Woody Vine Stratum (Plot size: 15)			
1.			
2.			
		=Total Cover	
% Bare Ground in Herb Stratum 95			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 75.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	40	x 2 =	80
FAC species	80	x 3 =	240
FACU species	85	x 4 =	340
UPL species	0	x 5 =	0
Column Totals:	205 (A)		660 (B)

Prevalence Index = B/A = 3.22

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ 5 - Wetland Non-Vascular Plants[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks:

SOIL

Sampling Point: DP-9

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-10	10YR 3/2	100					Sandy	sandy loam
10-18	10YR 3/2	100					Sandy	loamy sand

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ 1 cm Muck (A9) **(LRR D, G)**
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ 2.5 cm Mucky Peat or Peat (S2) **(LRR G)**
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) **(LRR A, E)**
___ Iron-Manganese Masses (F12) **(LRR D)**
___ Red Parent Material (F21)
___ Very Shallow Dark Surface (F22)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):
Type: ______
Depth (inches): ______

Hydric Soil Present? Yes ___ No X

Remarks:
Sand composition increases with depth. No redox observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres on Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2 4A, and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:
Surface Water Present? Yes ___ No X Depth (inches): ___
Water Table Present? Yes ___ No X Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Soil plug was very lightly moist but not saturated.

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Western Mountains, Valleys, and Coast Region
See ERDC/EL TR-10-3; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp: 11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Vector Freeman/5203 Freeman Rd E City/County: Puyallup/Pierce Sampling Date: 5/17/24

Applicant/Owner: Vector/Puyallup Tribe State: WA Sampling Point: DP-10

Investigator(s): Hannah Fotherby Section, Township, Range: S20, T20N, R4E

Landform (hillside, terrace, etc.): floodplain/historic river meander Local relief (concave, convex, none): concave Slope (%): 10

Subregion (LRR): LRR A, MLRA 2 Lat: 47.20869074 Long: -122.3200738 Datum: WGS84

Soil Map Unit Name: Pilchuck fine sand NWI classification: PFO1C

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ___
Hydric Soil Present?	Yes X	No ___
Wetland Hydrology Present?	Yes X	No ___

Is the Sampled Area within a Wetland? **Yes** X **No** ___

Remarks:
Plot located at the edge of the ponded area within Wetland A. At the toe of slope and within a depression.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Populus balsamifera*	60	Yes	FAC
2.			
3.			
4.			
	60	=Total Cover	
Sapling/Shrub Stratum (Plot size: 15)			
1. *Cornus sericea*	80	Yes	FACW
2.			
3.			
4.			
5.			
	80	=Total Cover	
Herb Stratum (Plot size: 5)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
		=Total Cover	
Woody Vine Stratum (Plot size: 15)			
1.			
2.			
		=Total Cover	
% Bare Ground in Herb Stratum 100			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	80	x 2 =	160
FAC species	60	x 3 =	180
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	140 (A)		340 (B)

Prevalence Index = B/A = 2.43

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
X 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ 5 - Wetland Non-Vascular Plants[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks:

SOIL

Sampling Point: DP-10

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 2/1	100					Mucky Sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- X Hydrogen Sulfide (A4)
- ___ 1 cm Muck (A9) **(LRR D, G)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- X Sandy Mucky Mineral (S1)
- ___ 2.5 cm Mucky Peat or Peat (S2) **(LRR G)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR A, E)**
- ___ Iron-Manganese Masses (F12) **(LRR D)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes X No ___

Remarks:
Could not dig deeper than 5 inches due to roots. Faint hydrogen sulfide odor.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- X Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2 4A, and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

	Yes	No	Depth (inches):
Surface Water Present?		X	
Water Table Present?	X		2
Saturation Present? (includes capillary fringe)	X		0

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Permanent ponding is approximately 5 feet from this plot location. Geomorphic position is at the toe of slope and within a depression.

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Western Mountains, Valleys, and Coast Region
See ERDC/EL TR-10-3; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp: 11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Vector Freeman/5203 Freeman Rd E City/County: Puyallup/Pierce Sampling Date: 5/17/24
Applicant/Owner: Vector/Puyallup Tribe State: WA Sampling Point: DP-11
Investigator(s): Hannah Fotherby Section, Township, Range: S20, T20N, R4E
Landform (hillside, terrace, etc.): historic floodplain Local relief (concave, convex, none): concave Slope (%): 10
Subregion (LRR): LRR A, MLRA 2 Lat: 47.208145 Long: -122.319899 Datum: WGS84
Soil Map Unit Name: Pilchuck fine sand NWI classification: none
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___	No X
Hydric Soil Present?	Yes ___	No X
Wetland Hydrology Present?	Yes ___	No X

Is the Sampled Area within a Wetland? Yes ___ No X

Remarks:
Plot located in a low area between Wetland A and the intersection of Levee Rd and Freeman Rd E.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Populus balsamifera*	50	Yes	FAC
2. *Acer macrophyllum*	30	Yes	FACU
3. *Prunus emarginata*	10	No	FACU
4.			
	90	=Total Cover	
Sapling/Shrub Stratum (Plot size: 15)			
1. *Symphoricarpos albus*	65	Yes	FACU
2. *Oemleria cerasiformis*	30	Yes	FACU
3. *Rubus armeniacus*	2	No	FAC
4.			
5.			
	97	=Total Cover	
Herb Stratum (Plot size: 5)			
1. *Urtica dioica*	20	Yes	FAC
2. *Polystichum munitum*	5	No	FACU
3. *Galium aparine*	2	No	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	27	=Total Cover	
Woody Vine Stratum (Plot size: ___)			
1.			
2.			
		=Total Cover	

% Bare Ground in Herb Stratum 73

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across All Strata: 5 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 40.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	72	x 3 =	216
FACU species	142	x 4 =	568
UPL species	0	x 5 =	0
Column Totals:	214 (A)		784 (B)

Prevalence Index = B/A = 3.66

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ 5 - Wetland Non-Vascular Plants[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ___ No X

Remarks:

SOIL

Sampling Point: DP-11

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 3/2	100					Loamy/Clayey	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ 1 cm Muck (A9) **(LRR D, G)**
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ 2.5 cm Mucky Peat or Peat (S2) **(LRR G)**
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) **(LRR A, E)**
___ Iron-Manganese Masses (F12) **(LRR D)**
___ Red Parent Material (F21)
___ Very Shallow Dark Surface (F22)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):
Type: ___
Depth (inches): ___

Hydric Soil Present? **Yes** ___ **No** X

Remarks:
No redox features observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres on Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2 4A, and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___
Water Table Present?	Yes ___	No X	Depth (inches): ___
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches): ___

Wetland Hydrology Present? **Yes** ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Soil plug was dry.

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Western Mountains, Valleys, and Coast Region
See ERDC/EL TR-10-3; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp: 11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Freeman Road - Parcel 0420201104 City/County: Fife/Pierce Sampling Date: 5/20/23

Applicant/Owner: Vector Development State: WA Sampling Point: DP-12

Investigator(s): Hannah Fotherby and Jakob Rowny Section, Township, Range: S20, T20N, R04E

Landform (hillside, terrace, etc.): Ditch/trench bottom Local relief (concave, convex, none): concave Slope (%): 0

Subregion (LRR): LRR A, MLRA 2 Lat: 47.2085448 Long: -122.32171 Datum: WGS84

Soil Map Unit Name: Pilchuck fine sand NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___ , Soil ___ , or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___ , Soil ___ , or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ___
Hydric Soil Present?	Yes ___	No X
Wetland Hydrology Present?	Yes ___	No X

Is the Sampled Area within a Wetland? **Yes** ___ **No** X

Remarks:
Data point located in a low area in the northeast portion of the parcel, within a small trench/ditch about 3 feet deep.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Populus balsamifera*	75	Yes	FAC
2. *Acer macrophyllum*	15	No	FACU
3.			
4.			
	90	=Total Cover	
Sapling/Shrub Stratum (Plot size: 15)			
1. *Symphoricarpos albus*	40	Yes	FACU
2. *Corylus cornuta*	30	Yes	FACU
3. *Fraxinus latifolia*	30	Yes	FACW
4. *Rubus armeniacus*	15	No	FAC
5.			
	115	=Total Cover	
Herb Stratum (Plot size: 5)			
1. *Ranunculus repens*	10	Yes	FAC
2. *Rubus ursinus*	5	Yes	FACU
3. Unknown grass sp.	5	Yes	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	20	=Total Cover	
Woody Vine Stratum (Plot size: 15)			
1.			
2.			
		=Total Cover	
% Bare Ground in Herb Stratum 80			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 57.1% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	30	x 2 =	60
FAC species	105	x 3 =	315
FACU species	90	x 4 =	360
UPL species	0	x 5 =	0
Column Totals:	225 (A)		735 (B)

Prevalence Index = B/A = 3.27

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ 5 - Wetland Non-Vascular Plants[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks:

SOIL

Sampling Point: DP-12

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 3/3	100					Sandy	sandy loam

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ 1 cm Muck (A9) **(LRR D, G)**
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ 2.5 cm Mucky Peat or Peat (S2) **(LRR G)**
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) **(LRR A, E)**
___ Iron-Manganese Masses (F12) **(LRR D)**
___ Red Parent Material (F21)
___ Very Shallow Dark Surface (F22)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: none
Depth (inches): ______

Hydric Soil Present? **Yes** ___ **No** X

Remarks:
No redoximorphic features present.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres on Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2 4A, and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___
Water Table Present?	Yes ___	No X	Depth (inches): ___
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches): ___

Wetland Hydrology Present? **Yes** ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Soil lightly moist at around 10 inches deep but no saturation or other hydrology indicators present.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Freeman Road Logistics City/County: Puyallup/Pierce County Sampling Date: 3/11/2022

Applicant/Owner: Vector Development Company State: WA Sampling Point: DP-13

Investigator(s): C. Douglas, M. Curran Section, Township, Range: S17 R4E T20N

Landform (hillslope, terrace, etc.): Forested Local relief (concave, convex, none): concave Slope: 1-5

Subregion (LRR): Northwest Forests and Coast (LRR A) Lat: 47.21406277 Long: -122.318663 Datum: NAD83

Soil Map Unit Name: Pilchuck fine sand NWI Classification: PFO, PSS, POW

Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ____ (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" Present? Yes x No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	X	
Hydric Soil Present?		X
Wetland Hydrology Present?	X	

Is the Sampled Area within a Wetland? **Yes** ____ **No** X

Remarks: Depression area within grass pasture, ground is cleared of vegetation, grass vegetation surrounds standing water

VEGETATION

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status?
1.			
2.			
3.			
4.			
5.			
50%= 0 20%= 0 Total Cover:	0		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
50%= 0 20%= 0 Total Cover:	0		
Herb Stratum (Plot size: ____)			
1. *Agrostis capillaris*	30	Yes	FAC
2. *Festuca rubra*	70	Yes	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
50%= 50 20%= 20 Total Cover:	100		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
Total Cover:	0		

% Bare Ground in Herb Stratum 0 % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **2** (A)

Total Number of Dominant Species Across All Strata: **2** (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: **100%** (A/B)

Prevalence Index Worksheet:

Total % Cover of:			Multiply by:
OBL species	0	x1 =	0
FACW species	0	x2 =	0
FAC species	100	x3 =	300
FACU species	0	x4 =	0
UPL species	0	x5 =	0
Column Totals:	100 (A)		300 (B)

Prevalence Index = B/A = **3.0**

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptation[1] (Provide supporting data in Remarks or on a separate sheet)

____ 5 - Wetland Non-Vascular Plants[1]

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks: 100% FAC vegetation, mowed grass pasture

SOIL

Sampling Point: DP-13

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 4/3	99	10YR 5/4	1	D	M	SiL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Muck Mineral (S1)
- ___ Sandy gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? **Yes** ___ **No** X

Remarks: 3 chroma with redox

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- x Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No x Depth (inches): ___

Water table Present? Yes ___ No x Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes x No ___ Depth (inches): 14 inches

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (Unnamed Tributary gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Saturation at 14 inches

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Freeman Road Logistics City/County: Puyallup/Pierce County Sampling Date: 3/11/2022

Applicant/Owner: Vector Development Company State: WA Sampling Point: DP-14

Investigator(s): C. Douglas, M. Curran Section, Township, Range: S17 R4E T20N

Landform (hillslope, terrace, etc.): Forested Local relief (concave, convex, none): concave Slope: 1-5

Subregion (LRR): Northwest Forests and Coast (LRR A) Lat: 47.21400951 Long: -122.3185192 Datum: NAD83

Soil Map Unit Name: Pilchuck fine sand NWI Classification: PFO, PSS, POW

Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ____ (If no, explain in Remarks)

Are Vegetation x , Soil x , or Hydrology ____ significantly disturbed? Are "Normal Circumstances" Present? Yes x No ____

Are Vegetation ____ , Soil ____ , or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** **Yes** X **No** ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks: Depression area within grass pasture, ground is cleared of vegetation, grass vegetation surrounds standing water.

VEGETATION

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status?
1.			
2.			
3.			
4.			
5.			
50%= 0 20%= 0 Total Cover:	0		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
50%= 0 20%= 0 Total Cover:	0		
Herb Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
50%= 0 20%= 0 Total Cover:	0		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
Total Cover:	0		
% Bare Ground in Herb Stratum 100 % Cover of Biotic Crust ____			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **0** (A)

Total Number of Dominant Species Across All Strata: **0** (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: **0%** (A/B)

Prevalence Index Worksheet:

Total % Cover of:			Multiply by:
OBL species	**0**	x1 =	**0**
FACW species	**0**	x2 =	**0**
FAC species	**0**	x3 =	**0**
FACU species	**0**	x4 =	**0**
UPL species	**0**	x5 =	**0**
Column Totals:	**0**	(A)	**0** (B)

Prevalence Index = B/A = **0.0**

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation
____ 2 - Dominance Test is >50%
____ 3 - Prevalence Index is ≤3.0[1]
____ 4 - Morphological Adaptation[1] (Provide supporting data in Remarks or on a separate sheet)
____ 5 - Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks: No vegetation in standing water depression within grass pasture

SOIL

Sampling Point: DP-14

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 5/2	90	10YR 5/4	10	D	M	SiL	
8-18	10YR 5/1	70	7.5YR 4/4	30	D	M	SiL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Muck Mineral (S1)
___ Sandy gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
___ Loamy Gleyed Matrix (F2)
X Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) (**LRR B**)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):
Type: ___
Depth (inches): ___

Hydric Soil Present? **Yes** X **No** ___

Remarks: 1 and 2 chroma with redox

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum one required; check all that apply)

x Surface Water (A1)
___ High Water Table (A2)
x Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes x No ___ Depth (inches): 3 inches
Water table Present? Yes ___ No x Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes x No ___ Depth (inches): at surface

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (Unnamed Tributary gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Standing water a few inches deep in depression. No water table, surface water flowed into data plot hole.

Appendix C-2
Wetland A Rating

Wetland name or number A

RATING SUMMARY – Western Washington

Name of wetland (or ID #): Offsite Wetland A Date of site visit: 3/11/22 and 5/30/23

Rated by C. Douglas, H. Fotherby, J. Rowny Trained by Ecology? X Yes ___No Date of training '07, '22, '16

HGM Class used for rating Depressional Wetland has multiple HGM classes?___Y X N

NOTE: **Form is not complete without the required figures** (figures can be combined).
Source of base aerial photo/map ESRI

OVERALL WETLAND CATEGORY II (based on functions X or special characteristics__)

1. Category of wetland based on FUNCTIONS

_______**Category I** – Total score = 23 - 27
X **Category II** – Total score = 20 - 22
_______**Category III** – Total score = 16 - 19
_______**Category IV** – Total score = 9 - 15

FUNCTION	**Improving Water Quality**			**Hydrologic**			**Habitat**			
								Circle the appropriate ratings		
Site Potential	H	M	L	H	M	L	H	M	L	
Landscape Potential	H	M	L	H	M	L	H	M	L	
Value	H	M	L	H	M	L	H	M	L	**TOTAL**
Score Based on Ratings	7			9			6			22

Score for each function based on three ratings
(order of ratings is not important)

9 = H, H, H
8 = H, H, M
7 = H, H, L
7 = H, M, M
6 = H, M, L
6 = M, M, M
5 = H, L, L
5 = M, M, L
4 = M, L, L
3 = L, L, L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	**CATEGORY**
Estuarine	**I II**
Wetland of High Conservation Value	**I**
Bog	**I**
Mature Forest	**I**
Old Growth Forest	**I**
Coastal Lagoon	**I II**
Interdunal	**I II III IV**
None of the above	X

Wetland name or number A

Maps and figures required to answer questions correctly for Western Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	D 1.3, H 1.1, H 1.4	
Hydroperiods	D 1.4, H 1.2	
Location of outlet (*can be added to map of hydroperiods)*	D 1.1, D 4.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	
Map of the contributing basin	D 4.3, D 5.3	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and total habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	D 3.3	

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Ponded depressions	R 1.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	R 2.4	
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	
Width of unit vs. width of stream *(can be added to another figure)*	R 4.1	
Map of the contributing basin	R 2.2, R 2.3, R 5.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and total habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	R 3.2, R 3.3	

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	L 1.1, L 4.1, H 1.1, H 1.4	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and total habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants (*can be added to figure above)*	S 4.1	
Boundary of 150 ft buffer (can be added to another figure)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and total habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	S 3.3	

Wetland name or number A

HGM Classification of Wetlands in Western Washington

For questions 1-7, the criteria described must apply to the entire unit being rated.

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-7 apply, and go to Question 8.

1. Are the water levels in the entire unit usually controlled by tides except during floods?

NO – go to 2 **YES** – the wetland class is **Tidal Fringe** – go to 1.1

1.1 Is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)?

NO – Saltwater Tidal Fringe (Estuarine) **YES – Freshwater Tidal Fringe**

If your wetland can be classified as a Freshwater Tidal Fringe use the forms for **Riverine** wetlands. If it is Saltwater Tidal Fringe, it is an **Estuarine** wetland and is not scored. This method **cannot** be used to score functions for estuarine wetlands.

2. The entire wetland unit is flat, and precipitation is the only source (>90%) of water to it. Groundwater and surface water runoff are NOT sources of water to the unit.

NO – go to 3 **YES** – The wetland class is **Flats**

If your wetland can be classified as a Flats wetland, use the form for **Depressional** wetlands.

3. Does the entire wetland unit **meet all** of the following criteria?

___The vegetated part of the wetland is on the shores of a body of permanent open water (without any plants on the surface at any time of the year) at least 20 ac (8 ha) in size,

___At least 30% of the open water area is deeper than 6.6 ft (2 m).

NO – go to 4 **YES –** The wetland class is **Lake Fringe** (Lacustrine Fringe)

4. Does the entire wetland unit **meet all** of the following criteria?

____The wetland is on a slope (slope can be very gradual),

____The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheet flow, or in a swale without distinct banks,

____The water leaves the wetland **without being impounded**.

NO – go to 5 **YES –** The wetland class is **Slope**

NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 ft deep).

5. Does the entire wetland unit **meet all** of the following criteria?
   ____The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river,
   ____The overbank flooding occurs at least once every 2 years.

   NO – go to 6 **YES** – The wetland class is **Riverine**
   NOTE: The Riverine unit can contain depressions that are filled with water when the river is not flooding

6. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year? This means that any outlet, if present, is higher than the interior of the wetland.

   NO – go to 7 **YES** – The wetland class is **Depressional**

7. Is the entire wetland unit located in a very flat area with no obvious depression and no overbank flooding? The unit does not pond surface water more than a few inches. The unit seems to be maintained by high groundwater in the area. The wetland may be ditched but has no obvious natural outlet.

   NO – go to 8 **YES** – The wetland class is **Depressional**

8. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-7 APPLY TO DIFFERENT AREAS IN THE UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

   NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine along stream within boundary of depression	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine
Salt Water Tidal Fringe and any other class of freshwater wetland	Treat as ESTUARINE

If you are still unable to determine which of the above criteria apply to your wetland, or if you have **more than 2 HGM classes** within a wetland boundary, classify the wetland as Depressional for the rating.

Wetland name or number A

DEPRESSIONAL AND FLATS WETLANDS

Water Quality Functions - Indicators that the site functions to improve water quality

D 1.0. Does the site have the potential to improve water quality?	
D 1.1. Characteristics of surface water outflows from the wetland: Wetland is a depression or flat depression (QUESTION 7 on key) with no surface water leaving it (no outlet). points = 3 Wetland has an intermittently flowing stream or ditch, OR highly constricted permanently flowing outlet. points = 2 Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing points = 1 Wetland is a flat depression (QUESTION 7 on key), whose outlet is a permanently flowing ditch. points = 1	3
D 1.2. The soil 2 in. below the surface (or duff layer) is true clay or true organic *(use NRCS definitions).* Yes = 4 No = 0	0
D 1.3. Characteristics and distribution of persistent plants (Emergent, Scrub-shrub, and/or Forested Cowardin classes): Wetland has persistent, ungrazed plants > 95% of area points = 5 Wetland has persistent, ungrazed plants > ½ of area points = 3 Wetland has persistent, ungrazed plants ≥ $^{1}/_{10}$ of area points = 1 Wetland has persistent, ungrazed plants < $^{1}/_{10}$ of area points = 0	3
D 1.4. Characteristics of seasonal ponding or inundation: *This is the area that is ponded for at least 2 months. See description in manual.* Area seasonally ponded is > ½ total area of wetland points = 4 Area seasonally ponded is ≥ ¼ total area of wetland points = 2 Area seasonally ponded is < ¼ total area of wetland points = 0	2
Total for D 1 Add the points in the boxes above	8

Rating of Site Potential If score is: __**12-16 = H** X **6-11 = M** ___**0-5 = L** *Record the rating on the first page*

D 2.0. Does the landscape have the potential to support the water quality function of the site?	
D 2.1. Does the wetland unit receive stormwater discharges? Yes = 1 No = 0	1
D 2.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate pollutants? Yes = 1 No = 0	1
D 2.3. Are there septic systems within 250 ft of the wetland? Yes = 1 No = 0	0
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1-D 2.3? Source________________ Yes = 1 No = 0	0
Total for D 2 Add the points in the boxes above	2

Rating of Landscape Potential If score is: __**3 or 4 = H** X **1 or 2 = M** ___**0 = L** *Record the rating on the first page*

D 3.0. Is the water quality improvement provided by the site valuable to society?	
D 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, lake, or marine water that is on the 303(d) list? Yes = 1 No = 0	0
D 3.2. Is the wetland in a basin or sub-basin where an aquatic resource is on the 303(d) list? Yes = 1 No = 0	1
D 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality? (Answer YES if there is a TMDL in development or in effect for the basin in which the unit is found.) Yes = 2 No = 0	2
Total for D 3 Add the points in the boxes above	3

Rating of Value If score is: X **2-4 = H** ___**1 = M** ___**0 = L** *Record the rating on the first page*

Wetland name or number A

DEPRESSIONAL AND FLATS WETLANDS **Hydrologic Functions** - Indicators that the site functions to reduce flooding and stream degradation	
D 4.0. Does the site have the potential to reduce flooding and erosion?	
D 4.1. Characteristics of surface water outflows from the wetland: Wetland is a depression or flat depression with no surface water leaving it (no outlet) points = 4 Wetland has an intermittently flowing stream/ditch, OR highly constricted permanently flowing outlet points = 2 Wetland is a flat depression (question 7 on key), whose outlet is a permanently flowing ditch points = 1 Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing points = 0	4
D 4.2. Depth of storage during wet periods: Estimate the height of ponding above the bottom of the outlet. For wetlands with no outlet, measure from the surface of permanent water or if dry, the deepest part. Marks of ponding are 3 ft or more above the surface or bottom of outlet points = 7 Marks of ponding between 2 ft to < 3 ft from surface or bottom of outlet points = 5 Marks are at least 0.5 ft to < 2 ft from surface or bottom of outlet points = 3 The wetland is a "headwater" wetland points = 3 Wetland is flat but has small depressions on the surface that trap water points = 1 Marks of ponding less than 0.5 ft (6 in) points = 0	7
D 4.3. Contribution of the wetland to storage in the watershed: Estimate the ratio of the area of upstream basin contributing surface water to the area of the wetland unit itself. The area of the basin is less than 10 times the area of the unit points = 5 The area of the basin is 10 to 100 times the area of the unit points = 3 The area of the basin is more than 100 times the area of the unit points = 0 Entire wetland is in the Flats class points = 5	5
Total for D 4 Add the points in the boxes above	16

Rating of Site Potential If score is: X **12-16 = H** ___**6-11 = M** ___**0-5 = L** *Record the rating on the first page*

D 5.0. Does the landscape have the potential to support hydrologic functions of the site?	
D 5.1. Does the wetland receive stormwater discharges? Yes = 1 No = 0	1
D 5.2. Is >10% of the area within 150 ft of the wetland in land uses that generate excess runoff? Yes = 1 No = 0	1
D 5.3. Is more than 25% of the contributing basin of the wetland covered with intensive human land uses (residential at >1 residence/ac, urban, commercial, agriculture, etc.)? Yes = 1 No = 0	1
Total for D 5 Add the points in the boxes above	3

Rating of Landscape Potential If score is: X **3 = H** ___**1 or 2 = M** ___**0 = L** *Record the rating on the first page*

D 6.0. Are the hydrologic functions provided by the site valuable to society?	
D 6.1. Is the unit in a landscape that has flooding problems? Choose the description that best matches conditions around the wetland unit being rated. Do not add points. Choose the highest score if more than one condition is met. The wetland captures surface water that would otherwise flow downgradient into areas where flooding has damaged human or natural resources (e.g., houses or salmon redds): • Flooding occurs in a sub-basin that is immediately downgradient of unit. points = 2 • Surface flooding problems are in a sub-basin farther downgradient. points = 1 • Flooding from groundwater is an issue in the sub-basin. points = 1 • The existing or potential outflow from the wetland is so constrained by human or natural conditions that the water stored by the wetland cannot reach areas that flood. *Explain why* ______________ points = 0 • There are no problems with flooding downstream of the wetland. points = 0	2
D 6.2. Has the site been identified as important for flood storage or flood conveyance in a regional flood control plan? Yes = 2 No = 0	2
Total for D 6 Add the points in the boxes above	4

Rating of Value If score is: X **2-4 = H** ___**1 = M** ___**0 = L** *Record the rating on the first page*

These questions apply to wetlands of all HGM classes.

HABITAT FUNCTIONS - Indicators that site functions to provide important habitat

H 1.0. Does the site have the potential to provide habitat?

H 1.1. Structure of plant community: Indicators are Cowardin classes and strata within the Forested class. Check the Cowardin plant classes in the wetland. Up to 10 patches may be combined for each class to meet the threshold of ¼ ac if the unit is at least 2.5 ac, or more than 10% of the unit if it is smaller than 2.5 ac.

2

- ____Aquatic bed — 4 structures or more: points = 4
- X Emergent — 3 structures: points = 2
- X Scrub-shrub (areas where shrubs have > 30% cover) — 2 structures: points = 1
- X Forested (areas where trees have > 30% cover) — 1 structure: points = 0

If the unit has a Forested class, check if:

____The Forested class has 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/groundcover) that each cover 20% within the Forested polygon

H 1.2. Hydroperiods

2

Check the types of water regimes (hydroperiods) present within the wetland. The water regime has to cover more than 10% of the wetland if the unit is < 2.5 ac, or ¼ ac if the unit is at least 2.5 ac to count (see text for descriptions of hydroperiods).

- X Permanently flooded or inundated — 4 or more types present: points = 3
- X Seasonally flooded or inundated — 3 types present: points = 2
- ____Occasionally flooded or inundated — 2 types present: points = 1
- X Saturated only — 1 type present: points = 0
- ____Permanently flowing stream or river in, or adjacent to, the wetland
- ____Intermittently or seasonally flowing stream in, or adjacent to, the wetland
- ____**Lake Fringe wetland** — **2 points**
- ____**Freshwater tidal wetland** — **2 points**

H 1.3. Richness of plant species

1

Count the number of plant species in the wetland that cover at least 10 ft^2.

Different patches of the same species can be combined to meet the size threshold and you do not have to name the species. **Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Canada thistle**

If you counted: > 19 species — points = 2

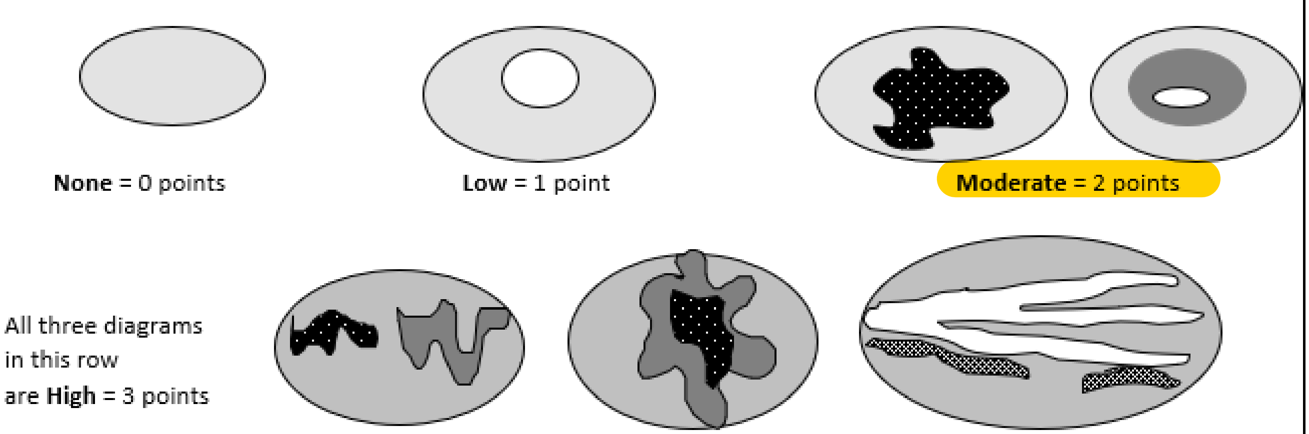
5 - 19 species — points = 1

< 5 species — points = 0

H 1.4. Interspersion of habitats

2

Decide from the diagrams below whether interspersion among Cowardin plants classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, moderate, low, or none. If you have four or more plant classes or three classes and open water, the rating is always high.



H 1.5. Special habitat features: Check the habitat features that are present in the wetland. The number of checks is the number of points. X Large, downed, woody debris within the wetland (> 4 in. diameter and 6 ft long). X Standing snags (dbh > 4 in.) within the wetland ____Undercut banks are present for at least 6.6 ft (2 m) **and/or** overhanging plants extend at least 3.3 ft (1 m) over open water or a stream (or ditch) in, or contiguous with the wetland, for at least 33 ft (10 m) X Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 30 degree slope) OR signs of recent beaver activity are present (cut shrubs or trees that have not yet weathered where wood is exposed) X At least ¼ ac of thin-stemmed persistent plants or woody branches are present in areas that are permanently or seasonally inundated (structures for egg-laying by amphibians) ____Invasive plants cover less than 25% of the wetland area in every stratum of plants (see H 1.1 above for the list of strata and H 1.5 in the manual for the list of aggressive plant species)	4
Total for H 1 — Add the points in the boxes above	11

Rating of Site Potential If score is: __**15-18 = H** X **7-14 = M** ___**0-6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support the habitat functions of the site?	
H 2.1. Accessible habitat (include only habitat polygons accessible from the wetland. *Calculate:* % relatively undisturbed habitat 5 + [(% moderate and low intensity land uses)/2] 0 = 5 % Total accessible habitat is: > $^{1}/_{3}$ (33.3%) of 1 km Polygon — points = 3 20-33% of 1 km Polygon — points = 2 10-19% of 1 km Polygon — points = 1 < 10% of 1 km Polygon — points = 0	0
H 2.2. Total habitat in 1 km Polygon around the wetland. *Calculate:* % relatively undisturbed habitat 10 + [(% moderate and low intensity land uses)/2] 10 = 20 % Total habitat > 50% of Polygon — points = 3 Total habitat 10-50% and in 1-3 patches — points = 2 Total habitat 10-50% and > 3 patches — points = 1 Total habitat < 10% of 1 km Polygon — points = 0	1
H 2.3. Land use intensity in 1 km Polygon: > 50% of 1 km Polygon is high intensity land use — points = (- 2) ≤ 50% of 1 km Polygon is high intensity — points = 0	-2
Total for H 2 — Add the points in the boxes above	-1

Rating of Landscape Potential If score is: __**4-6 = H** ___**1-3 = M** X **< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose only the highest score that applies to the wetland being rated.* Site meets ANY of the following criteria: — points = 2 — It has 3 or more Priority Habitats within 100 m (see next page) — It provides habitat for Threatened or Endangered species (any plant or animal on the state or federal lists) — It is mapped as a location for an individual WDFW Priority Species — It is a Wetland of High Conservation Value as determined by the Department of Natural Resources data — It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan Site has 1 or 2 Priority Habitats (listed on next page) within 100 m — points = 1 Site does not meet any of the criteria above — points = 0	2

Rating of Value If score is: __**2 = H** ___**1 = M** ___**0 = L** *Record the rating on the first page*

WDFW Priority Habitats

See complete descriptions of Priority Habitats listed by WDFW, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008 (current year, as revised). Priority Habitat and Species List.[133] This list was updated for consistency with guidance from WDFW.

This question is independent of the land use between the wetland unit and the Priority Habitat. All vegetated wetlands are by definition a Priority Habitat but are not included in this list because they are addressed by this rating system.

Count how many of the following Priority Habitats are within 330 ft (100 m) of the wetland unit:

— **Aspen Stands:** Pure or mixed stands of aspen greater than 1 ac (0.4 ha).

— **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife. This habitat automatically counts if mapped on the PHS online map within 100m of the wetland. If not mapped, a determination can be made in the field.

— **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

— **Cliffs:** Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.

— **Fresh Deepwater:** Lands permanently flooded with freshwater, including environments where surface water is permanent and often deep, so that water, rather than air, is the principal medium within which the dominant organisms live. Substrate does not support emergent vegetation. Do not select if Instream habitat is also present, or if the entire Deepwater feature is included in the wetland unit being rated (such as a pond with a vegetated fringe).

— **Herbaceous Balds:** Variable size patches of grass and forbs on shallow soils over bedrock.

X **Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources. Do not select if Fresh Deepwater habitat is also present.

— **Nearshore:** Relatively undisturbed nearshore habitats. These include Coastal Nearshore, Open Coast Nearshore, and Puget Sound Nearshore.

— **Old-growth/Mature forests:** Old-growth west of Cascade crest – Stands of at least 2 tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) > 32 in. (81 cm) diameter at breast height (dbh) or > 200 years of age. Mature forests – Stands with average diameters exceeding 21 in. (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west of the Cascade crest.

[133] http://wdfw.wa.gov/publications/00165/wdfw00165.pdf

— **Oregon White Oak:** Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important. For single oaks or oak stands <0.4 ha in urban areas, WDFW's Management Recommendations for Oregon White Oak[134] provides more detail for determining if they are Priority Habitats

X **Riparian:** The area adjacent to freshwater aquatic systems with flowing or standing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

X **Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 20 in. (51 cm) in western Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in. (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

— **Talus:** Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

— **Westside Prairies:** Herbaceous, non-forested plant communities that can either take the form of a dry prairie or a wet prairie.

[134] https://wdfw.wa.gov/publications/00030/wdfw00030.pdf

Wetland name or number A

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

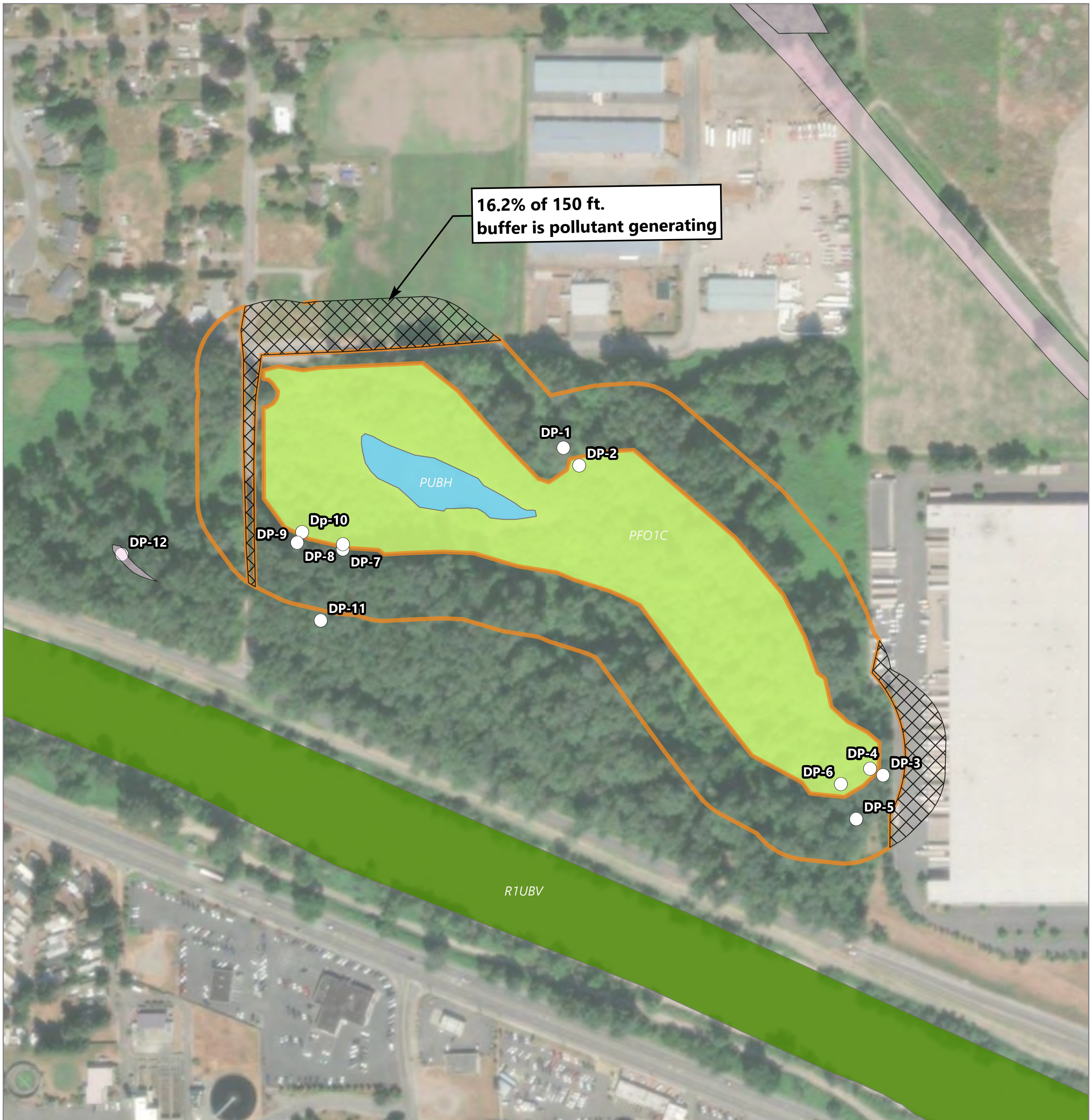
Wetland Type *Check off any criteria that apply to the wetland. Circle the category when the appropriate criteria are met.*	**Category**
SC 1.0. Estuarine wetlands Does the wetland meet the following criteria for Estuarine wetlands? — The dominant water regime is tidal, — Vegetated, and — With a salinity greater than 0.5 ppt Yes **–** Go to **SC 1.1** No= **Not an estuarine wetland**	
SC 1.1. Is the wetland within a National Wildlife Refuge, National Park, National Estuary Reserve, Natural Area Preserve, State Park or Educational, Environmental, or Scientific Reserve designated under WAC 332-30-151? Yes = **Category I** No – Go to **SC 1.2**	**Cat. I**
SC 1.2. Is the wetland unit at least 1 ac in size and meets at least two of the following three conditions? — The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing), and has less than 10% cover of non-native plant species. If non-native species are *Spartina*, see chapter 4.8 in the manual. — At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland. — The wetland has at least two of the following features: tidal channels, depressions with open water, or contiguous freshwater wetlands. Yes = **Category I** No = **Category II**	**Cat. I** **Cat. II**
SC 2.0. Wetlands of High Conservation Value (WHCV) SC 2.1. Does the wetland overlap with any known or historical rare plant or rare & high-quality ecosystem polygons on the WNHP Data Explorer?[135] Yes **= Category I** No – Go to **SC 2.2** SC 2.2. Does the wetland have a rare plant species, rare ecosystem (e.g., plant community), or high-quality common ecosystem that may qualify the site as a WHCV? Contact WNHP for resources to help determine the presence of these elements. Yes – Submit data to WA Natural Heritage Program for determination,[136] Go to **SC 2.3** No **= Not a WHCV** SC 2.3. Did WNHP review the site within 30 days and determine that it has a rare plant or ecosystem that meets their criteria? Yes **= Category I** No **= Not a WHCV**	**Cat. I**
SC 3.0. Bogs Does the wetland (or any part of the unit) meet both the criteria for soils and vegetation in bogs? *Use the key below.* ***If you answer YES, you will still need to rate the wetland based on its functions.*** SC 3.1. Does an area within the wetland unit have organic soil horizons, either peats or mucks, that compose 16 in. or more of the first 32 in. of the soil profile? Yes – Go to **SC 3.3** No – Go to **SC 3.2** SC 3.2. Does an area within the wetland unit have organic soils, either peats or mucks, that are less than 16 in. deep over bedrock, or an impermeable hardpan such as clay or volcanic ash, or that are floating on top of a lake or pond? Yes – Go to **SC 3.3** No = **Not a bog** SC 3.3. Does an area with peats or mucks have more than 70% cover of mosses at ground level, AND at least a 30% cover of plant species listed in Table 4? Yes = **Category I bog** No – Go to **SC 3.4** **NOTE:** If you are uncertain about the extent of mosses in the understory, you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16 in. deep. If the pH is less than 5.0 and the plant species in Table 4 are present, the wetland is a bog. SC 3.4. Is an area with peats or mucks forested (> 30% cover) with Sitka spruce, subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Engelmann spruce, or western white pine, AND any of the species (or combination of species) listed in Table 4 provide more than 30% of the cover under the canopy? Yes = **Category I bog** No **= Not a bog**	**Cat. I**

[135] https://www.dnr.wa.gov/NHPdata
[136] https://www.dnr.wa.gov/Publications/amp_nh_sighting_form.pdf

Wetland name or number A

SC 4.0. Forested Wetlands Does the wetland have at least 1 contiguous acre of forest that meets one of these criteria for the WA Department of Fish and Wildlife's forests as Priority Habitats? ***If you answer YES, you will still need to rate the wetland based on its functions.*** — **Old-growth forests** (west of Cascade crest): Stands of at least two tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) that are at least 200 years of age OR have a diameter at breast height (dbh) of 32 in. (81 cm) or more. — **Mature forests** (west of the Cascade Crest): Stands where the largest trees are 80- 200 years old OR the species that make up the canopy have an average diameter (dbh) exceeding 21 in. (53 cm). Yes = **Category I** No = **Not a forested wetland for this section**	**Cat. I**
SC 5.0. Wetlands in Coastal Lagoons Does the wetland meet all of the following criteria of a wetland in a coastal lagoon? — The wetland lies in a depression adjacent to marine waters that is wholly or partially separated from marine waters by sandbanks, gravel banks, shingle, or, less frequently, rocks — The lagoon in which the wetland is located contains ponded water that is saline or brackish (> 0.5 ppt) during most of the year in at least a portion of the lagoon *(needs to be measured near the bottom)* — The lagoon retains some of its surface water at low tide during spring tides Yes – Go to **SC 5.1** No = **Not a wetland in a coastal lagoon** SC 5.1. Does the wetland meet all of the following three conditions? — The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing), and has less than 20% cover of aggressive, opportunistic plant species (see list of species in H 1.5 in the manual). — At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland. — The wetland is larger than $^{1}/_{10}$ ac (4350 ft^{2}) Yes = **Category I** No = **Category II**	**Cat. I** **Cat. II**
SC 6.0. Interdunal Wetlands Is the wetland west of the 1889 line (also called the Western Boundary of Upland Ownership or WBUO)? ***If you answer YES, you will still need to rate the wetland based on its habitat functions.*** In practical terms that means the following geographic areas: — Long Beach Peninsula: Lands west of SR 103 — Grayland-Westport: Lands west of SR 105 — Ocean Shores-Copalis: Lands west of SR 115 and SR 109 and Ocean Shores Blvd SW, including lands west of E. Oceans Shores Blvd SW. Yes – Go to **SC 6.1** No = **Not an interdunal wetland for rating** SC 6.1. Is the wetland 1 ac or larger and scores an 8 or 9 for the habitat functions on the form (rates H,H,H or H,H,M for the three aspects of function)? Yes = **Category I** No – Go to **SC 6.2** SC 6.2. Is the wetland 1 ac or larger, or is it in a mosaic of wetlands that is 1 ac or larger? Yes = **Category II** No – Go to **SC 6.3** SC 6.3. Is the unit between 0.1 and 1 ac, or is it in a mosaic of wetlands that is between 0.1 and 1 ac? Yes = **Category III** No = **Category IV**	**Cat I** **Cat. II** **Cat. III** **Cat. IV**
Category of wetland based on Special Characteristics If you answered No for all types, enter "Not Applicable" on Summary Form	NA

Appendix C-3
Wetland A Figures



LEGEND:

NWI Wetland

Freshwater Forested/ Shrub Wetland

Freshwater Pond

Riverine

City of Puyallup Wetlands Inventory

Unverified

150 Foot Buffer of Wetland A

Pollutant Generating Area

Wetland Test Plot Location

0 350

Feet

Sources:
1. Aerial imagery: Esri (2022)
2. NWI: USFWS (2023)

Notes:
1. USDA: United States Department of Agriculture
2. NWI: National Wetland Inventory
3. USFWS: United States Fish and Wildlife Service
4. May 2023 field observations indicate upland conditions at DP-13 and unverified wetland area.

Publish Date: 2024/05/23, 2:02 PM | User: tweldy
Filepath: \\GSTFile01\GIS\Jobs\Vector_Development_Company_2141\Freeman_Road\Maps\CAR\FreemanRoad_CAR.aprx

ANCHOR QEA

Figure 1

Wetland A - Cowardin Vegetation Classes and 150-foot Wetland Offset

Wetland Rating Form - Wetland A

Freeman Road Logistics

LEGEND:

Hydroperiod

Permanently Flooded

Saturated

NOTE:
1. Aerial image provided by Esri Online Services.

0 350
Feet

Publish Date: 2023/07/06, 2:18 PM | User: jlarson
Filepath: \\orcas\GIS\Jobs\Vector_Development_Company_2141\Freeman_Road\Maps\CAR\FreemanRoad_CAR.aprx

ANCHOR QEA

Figure 2
Wetland A - Hydroperiods
Wetland Rating Form - Wetland A
Freeman Road Logistics

LEGEND:

Wetland A

Contributing Basin

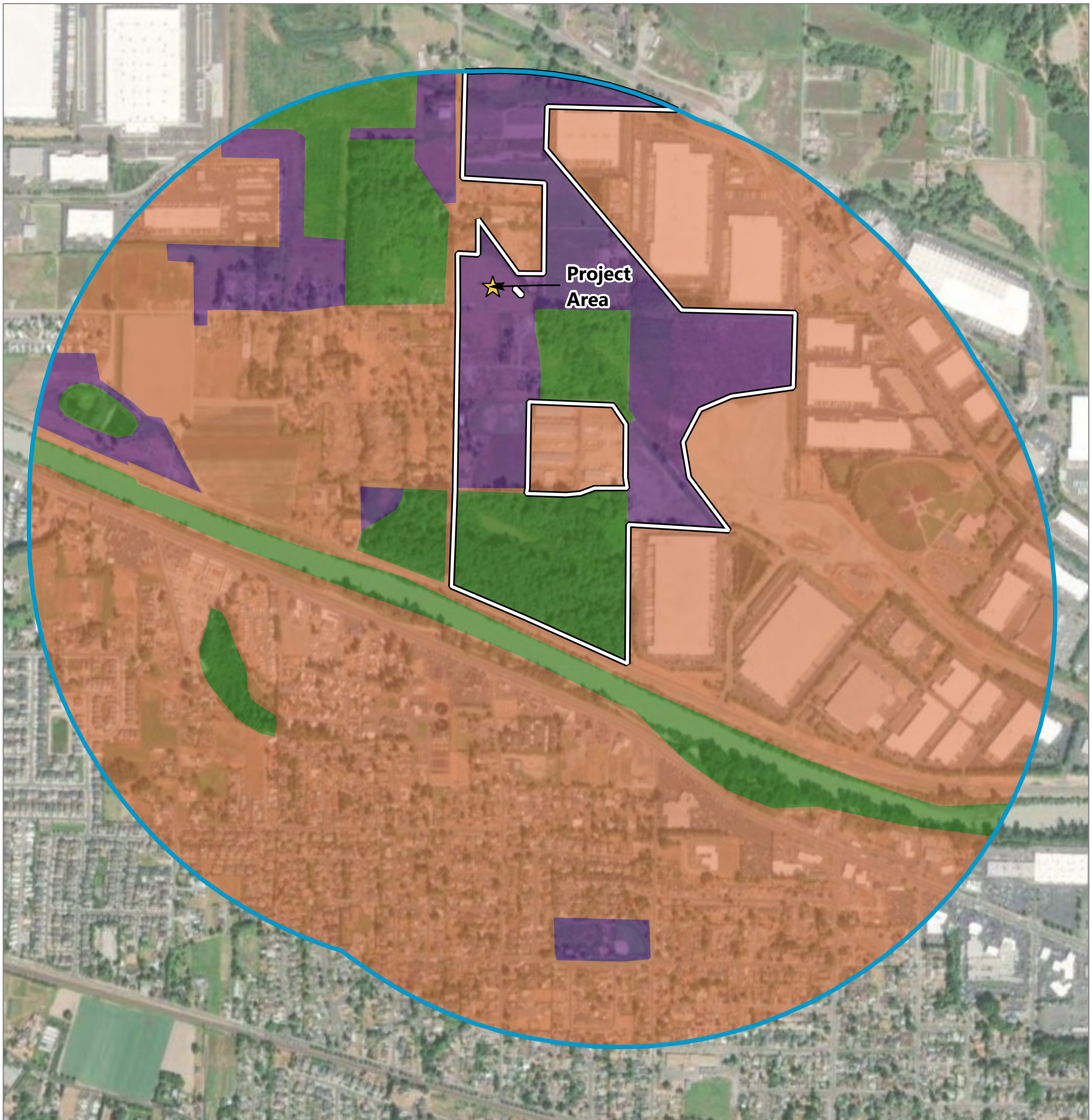
NOTE:
1. Aerial image provided by Esri Online Services.

0 600
Feet

Publish Date: 2023/07/06, 2:27 PM | User: jlarson
Filepath: \\orcas\GIS\Jobs\Vector_Development_Company_2141\Freeman_Road\Maps\CAR\FreemanRoad_CAR.aprx

ANCHOR QEA

Figure 3
Wetland A - Map of the Contributing Basin
Wetland Rating Form - Wetland A
Freeman Road Logistics



LEGEND:

- Project Area
- 1-km Radius of Wetland A
- Acessible Habitat

Land Use Type

- High Intensity
- Low/Moderate Intensity
- Relatively Undisturbed

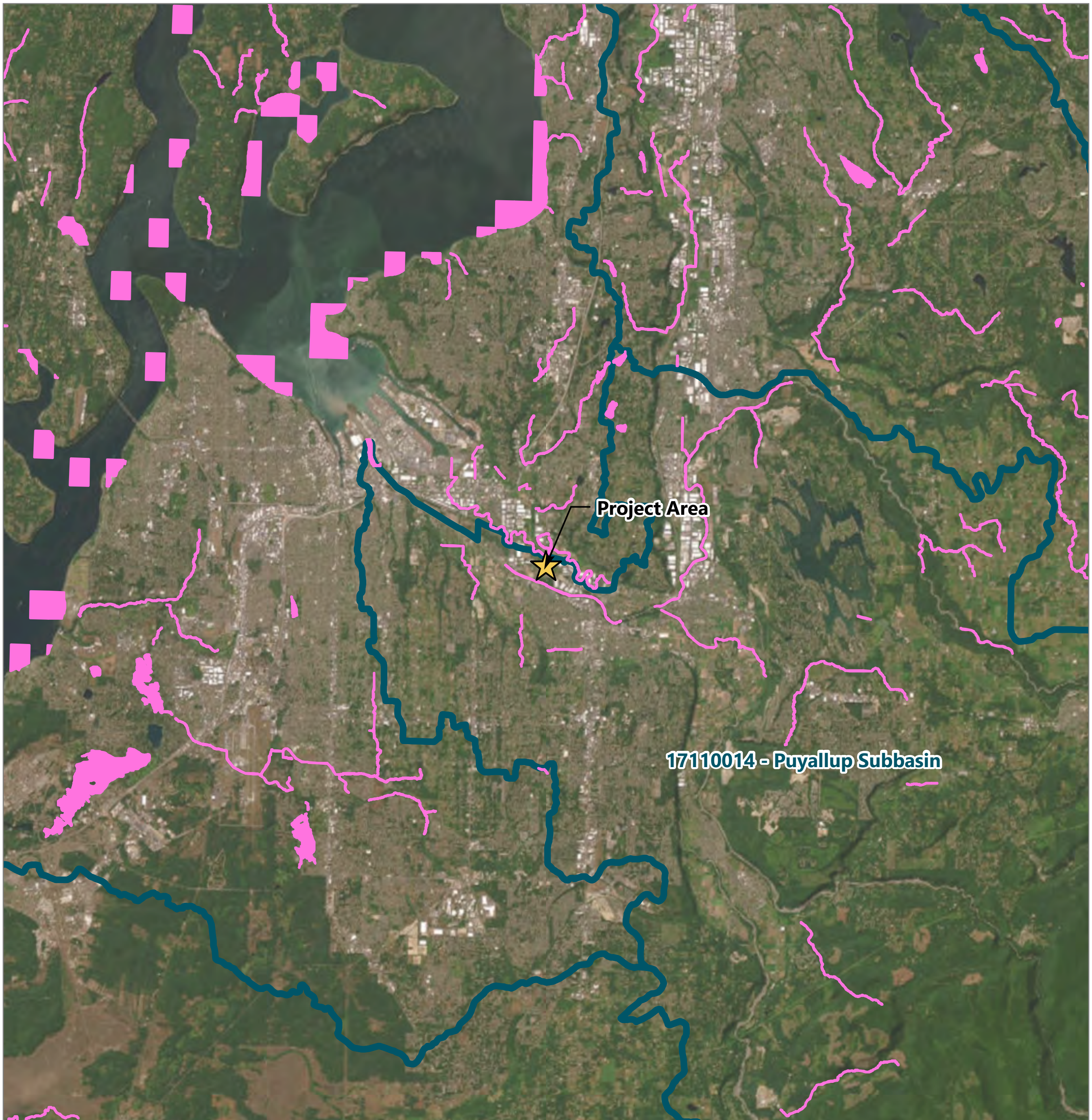
NOTE:
1. Aerial image provided by Esri Online Services.

0 1,200
Feet

Publish Date: 2023/07/06, 4:52 PM | User: jlarson
Filepath: \\orcas\GIS\Jobs\Vector_Development_Company_2141\Freeman_Road\Maps\CAR\FreemanRoad_CAR.aprx

ANCHOR QEA

Figure 4
Land Use Intensity Within 1-km of the Wetland
Wetland Rating Form - Wetland A
Freeman Road Logistics



LEGEND:

Project Area

303(d) Listed Water

HUC8 Watershed

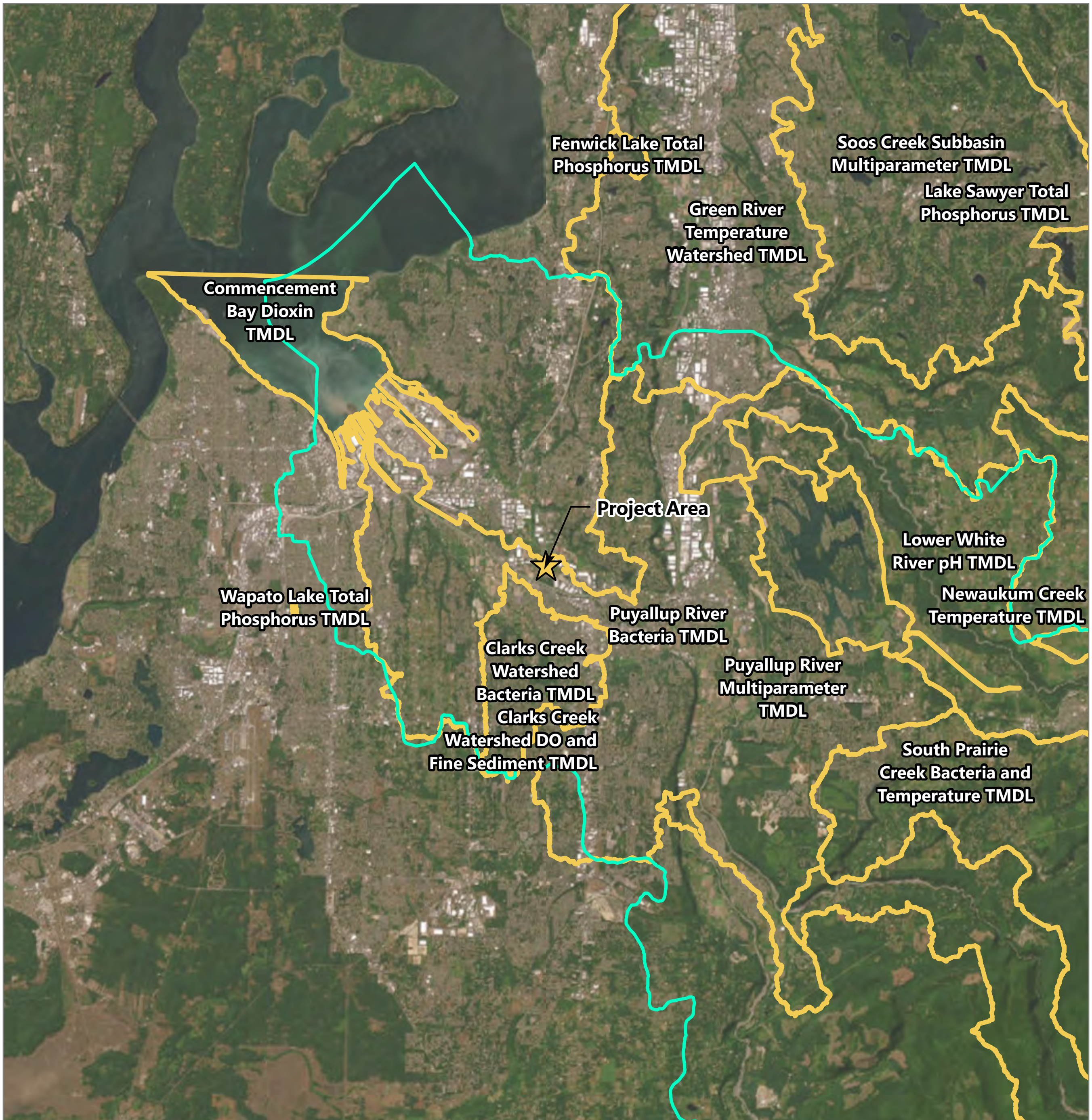
NOTES:
1. Aerial image provided by Esri Online Services.
2. 303(d) lised waters and HUC8 Watershed boundary from Washington State Ecology.

0 4
Miles

Publish Date: 2023/05/25, 10:52 AM | User: alesueur
Filepath: \\orcas\gis\Jobs\Vector_Development_Company_2141\Freeman_Road\Maps\Wetlands\Ratings_WetlandB\WetlandB_Ratings.aprx

ANCHOR QEA

Figure 5
303(d) Listed Waters
Wetland Rating Form - Wetland A
Freeman Road Logistics



LEGEND:

Project Area

WRIA 10 - Puyallup - White

TMDL

NOTES:

1. Aerial image provided by Esri Online Services.
2. WRIA 10 and TMDL boundaries are from Washington State Ecology.

0 4

Miles

Publish Date: 2023/05/25, 10:51 AM | User: alesueur

Filepath: \\orcas\gis\Jobs\Vector_Development_Company_2141\Freeman_Road\Maps\Wetlands\Ratings_WetlandB\WetlandB_Ratings.aprx

ANCHOR QEA

Figure 6

List of TMDLs for WRIA 10 - Puyallup - White

Wetland Rating Form - Wetland A

Freeman Road Logistics

Appendix C-4
Wetland B Rating

Wetland name or number B

RATING SUMMARY – Western Washington

Name of wetland (or ID #): On-site Wetland B Date of site visit: 5/20/23

Rated by Hannah Fotherby, Jakob Rowny Trained by Ecology? X Yes ___No Date of training 12/8/22

HGM Class used for rating Depressional Wetland has multiple HGM classes? ___Y X N

NOTE: Form is not complete without the figures requested *(figures can be combined)*.
Source of base aerial photo/map ESRI

OVERALL WETLAND CATEGORY III (based on functions X or special characteristics___)

1. Category of wetland based on FUNCTIONS

_______**Category I** – Total score = 23 - 27

_______**Category II** – Total score = 20 - 22

X **Category III** – Total score = 16 - 19

_______**Category IV** – Total score = 9 - 15

FUNCTION	Improving Water Quality			Hydrologic			Habitat			
							Circle the appropriate ratings			
Site Potential	H	M	L	H	M	L	H	M	L	
Landscape Potential	H	M	L	H	M	L	H	M	L	
Value	H	M	L	H	M	L	H	M	L	**TOTAL**
Score Based on Ratings	7			7			5			19

Score for each function based on three ratings
(order of ratings is not important)

9 = H,H,H
8 = H,H,M
7 = H,H,L
7 = H,M,M
6 = H,M,L
6 = M,M,M
5 = H,L,L
5 = M,M,L
4 = M,L,L
3 = L,L,L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	CATEGORY
Estuarine	I II
Wetland of High Conservation Value	I
Bog	I
Mature Forest	I
Old Growth Forest	I
Coastal Lagoon	I II
Interdunal	I II III IV
None of the above	X

Maps and figures required to answer questions correctly for Western Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	D 1.3, H 1.1, H 1.4	Figure 1
Hydroperiods	D 1.4, H 1.2	Figure 2
Location of outlet (*can be added to map of hydroperiods)*	D 1.1, D 4.1	Figure 2
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	Figure 1
Map of the contributing basin	D 4.3, D 5.3	Figure 3
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	Figure 4
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	Figure 5
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	D 3.3	Figure 6

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Ponded depressions	R 1.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	R 2.4	
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	
Width of unit vs. width of stream *(can be added to another figure)*	R 4.1	
Map of the contributing basin	R 2.2, R 2.3, R 5.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	R 3.2, R 3.3	

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	L 1.1, L 4.1, H 1.1, H 1.4	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants (*can be added to figure above)*	S 4.1	
Boundary of 150 ft buffer (can be added to another figure)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	S 3.3	

Wetland name or number B

HGM Classification of Wetlands in Western Washington

For questions 1-7, the criteria described must apply to the entire unit being rated.

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-7 apply, and go to Question 8.

1. Are the water levels in the entire unit usually controlled by tides except during floods?

NO – go to 2 **YES** – the wetland class is **Tidal Fringe** – go to 1.1

1.1 Is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)?

NO – Saltwater Tidal Fringe (Estuarine) **YES – Freshwater Tidal Fringe**
*If your wetland can be classified as a Freshwater Tidal Fringe use the forms for **Riverine** wetlands. If it is Saltwater Tidal Fringe it is an **Estuarine** wetland and is not scored. This method **cannot** be used to score functions for estuarine wetlands.*

2. The entire wetland unit is flat and precipitation is the only source (>90%) of water to it. Groundwater and surface water runoff are NOT sources of water to the unit.

NO – go to 3 **YES** – The wetland class is **Flats**
*If your wetland can be classified as a Flats wetland, use the form for **Depressional** wetlands.*

3. Does the entire wetland unit **meet all** of the following criteria?
__The vegetated part of the wetland is on the shores of a body of permanent open water (without any plants on the surface at any time of the year) at least 20 ac (8 ha) in size;
__At least 30% of the open water area is deeper than 6.6 ft (2 m).

NO – go to 4 **YES** – The wetland class is **Lake Fringe** (Lacustrine Fringe)

4. Does the entire wetland unit **meet all** of the following criteria?
___The wetland is on a slope (*slope can be very gradual*),
___The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks,
___The water leaves the wetland **without being impounded**.

NO – go to 5 **YES** – The wetland class is **Slope**

NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 ft deep).

5. Does the entire wetland unit **meet all** of the following criteria?
___The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river,
___The overbank flooding occurs at least once every 2 years.

Wetland name or number B

NO – go to 6 **YES** – The wetland class is **Riverine**

NOTE: The Riverine unit can contain depressions that are filled with water when the river is not flooding

6. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year? *This means that any outlet, if present, is higher than the interior of the wetland.*

NO – go to 7 **YES** – The wetland class is **Depressional**

7. Is the entire wetland unit located in a very flat area with no obvious depression and no overbank flooding? The unit does not pond surface water more than a few inches. The unit seems to be maintained by high groundwater in the area. The wetland may be ditched, but has no obvious natural outlet.

NO – go to 8 **YES** – The wetland class is **Depressional**

8. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-7 APPLY TO DIFFERENT AREAS IN THE UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine along stream within boundary of depression	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine
Salt Water Tidal Fringe and any other class of freshwater wetland	Treat as ESTUARINE

If you are still unable to determine which of the above criteria apply to your wetland, or if you have ***more than 2 HGM classes*** *within a wetland boundary, classify the wetland as Depressional for the rating.*

Wetland name or number B

DEPRESSIONAL AND FLATS WETLANDS **Water Quality Functions** - Indicators that the site functions to improve water quality	
D 1.0. Does the site have the potential to improve water quality?	
D 1.1. Characteristics of surface water outflows from the wetland: Wetland is a depression or flat depression (QUESTION 7 on key) with no surface water leaving it (no outlet). points = 3 Wetland has an intermittently flowing stream or ditch, OR highly constricted permanently flowing outlet. points = 2 Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing points = 1 Wetland is a flat depression (QUESTION 7 on key), whose outlet is a permanently flowing ditch. points = 1	3
D 1.2. The soil 2 in below the surface (or duff layer) is true clay or true organic *(use NRCS definitions)*. Yes = 4 No = 0	0
D 1.3. Characteristics and distribution of persistent plants (Emergent, Scrub-shrub, and/or Forested Cowardin classes): Wetland has persistent, ungrazed, plants > 95% of area points = 5 Wetland has persistent, ungrazed, plants > ½ of area points = 3 Wetland has persistent, ungrazed plants > $^1/_{10}$ of area points = 1 Wetland has persistent, ungrazed plants < $^1/_{10}$ of area points = 0	5
D 1.4. Characteristics of seasonal ponding or inundation: *This is the area that is ponded for at least 2 months. See description in manual.* Area seasonally ponded is > ½ total area of wetland points = 4 Area seasonally ponded is > ¼ total area of wetland points = 2 Area seasonally ponded is < ¼ total area of wetland points = 0	2
Total for D 1 Add the points in the boxes above	10

Rating of Site Potential If score is: ___**12-16 = H** _X_ **6-11 = M** ___**0-5 = L** *Record the rating on the first page*

D 2.0. Does the landscape have the potential to support the water quality function of the site?	
D 2.1. Does the wetland unit receive stormwater discharges? Yes = 1 No = 0	0
D 2.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate pollutants? Yes = 1 No = 0	1
D 2.3. Are there septic systems within 250 ft of the wetland? houses are gone but septic may still be leaching Yes = 1 No = 0	1
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1-D 2.3? Source________________ Yes = 1 No = 0	0
Total for D 2 Add the points in the boxes above	2

Rating of Landscape Potential If score is: ___**3 or 4 = H** _X_ **1 or 2 = M** ___**0 = L** *Record the rating on the first page*

D 3.0. Is the water quality improvement provided by the site valuable to society?	
D 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, lake, or marine water that is on the 303(d) list? Yes = 1 No = 0	0
D 3.2. Is the wetland in a basin or sub-basin where an aquatic resource is on the 303(d) list? Yes = 1 No = 0	1
D 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality (*answer YES if there is a TMDL for the basin in which the unit is found*)? Yes = 2 No = 0	2
Total for D 3 Add the points in the boxes above	3

Rating of Value If score is: _X_ **2-4 = H** ___**1 = M** ___**0 = L** *Record the rating on the first page*

Wetland name or number B

DEPRESSIONAL AND FLATS WETLANDS **Hydrologic Functions** - Indicators that the site functions to reduce flooding and stream degradation	
D 4.0. Does the site have the potential to reduce flooding and erosion?	
D 4.1. Characteristics of surface water outflows from the wetland: Wetland is a depression or flat depression with no surface water leaving it (no outlet) points = 4 Wetland has an intermittently flowing stream or ditch, OR highly constricted permanently flowing outletpoints = 2 Wetland is a flat depression (QUESTION 7 on key), whose outlet is a permanently flowing ditch points = 1 Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing points = 0	4
D 4.2. Depth of storage during wet periods: *Estimate the height of ponding above the bottom of the outlet. For wetlands with no outlet, measure from the surface of permanent water or if dry, the deepest part.* Marks of ponding are 3 ft or more above the surface or bottom of outlet points = 7 Marks of ponding between 2 ft to < 3 ft from surface or bottom of outlet points = 5 Marks are at least 0.5 ft to < 2 ft from surface or bottom of outlet points = 3 The wetland is a "headwater" wetland points = 3 Wetland is flat but has small depressions on the surface that trap water points = 1 Marks of ponding less than 0.5 ft (6 in) points = 0	0
D 4.3. Contribution of the wetland to storage in the watershed: *Estimate the ratio of the area of upstream basin contributing surface water to the wetland to the area of the wetland unit itself.* The area of the basin is less than 10 times the area of the unit points = 5 The area of the basin is 10 to 100 times the area of the unit points = 3 The area of the basin is more than 100 times the area of the unit points = 0 Entire wetland is in the Flats class points = 5	5
Total for D 4 Add the points in the boxes above	9

Rating of Site Potential If score is:___**12-16 = H** _X_**6-11 = M** ___**0-5 = L** *Record the rating on the first page*

D 5.0. Does the landscape have the potential to support hydrologic functions of the site?	
D 5.1. Does the wetland receive stormwater discharges? Yes = 1 No = 0	0
D 5.2. Is >10% of the area within 150 ft of the wetland in land uses that generate excess runoff? Yes = 1 No = 0	1
D 5.3. Is more than 25% of the contributing basin of the wetland covered with intensive human land uses (residential at >1 residence/ac, urban, commercial, agriculture, etc.)? Yes = 1 No = 0	0
Total for D 5 Add the points in the boxes above	1

Rating of Landscape Potential If score is:___**3 = H** _X_**1 or 2 = M** ___**0 = L** *Record the rating on the first page*

D 6.0. Are the hydrologic functions provided by the site valuable to society?	
D 6.1. The unit is in a landscape that has flooding problems. *Choose the description that best matches conditions around the wetland unit being rated. Do not add points. Choose the highest score if more than one condition is met.* The wetland captures surface water that would otherwise flow down-gradient into areas where flooding has damaged human or natural resources (e.g., houses or salmon redds): • Flooding occurs in a sub-basin that is immediately down-gradient of unit. points = 2 • Surface flooding problems are in a sub-basin farther down-gradient. points = 1 Flooding from groundwater is an issue in the sub-basin. points = 1 The existing or potential outflow from the wetland is so constrained by human or natural conditions that the water stored by the wetland cannot reach areas that flood. *Explain why* ______________ points = 0 There are no problems with flooding downstream of the wetland. points = 0	2
D 6.2. Has the site been identified as important for flood storage or flood conveyance in a regional flood control plan? Yes = 2 No = 0	0
Total for D 6 Add the points in the boxes above	2

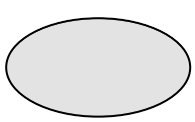
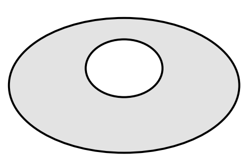
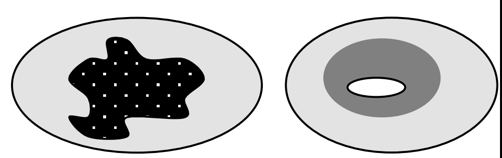
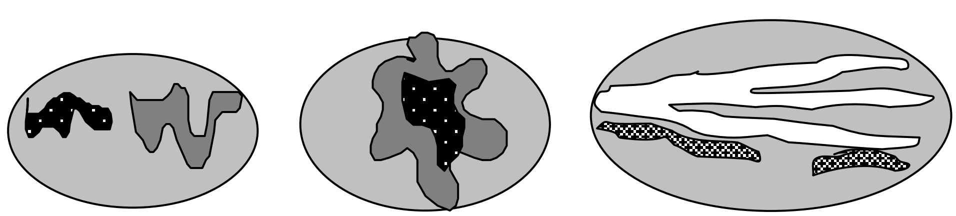
Rating of Value If score is:_X_**2-4 = H** ___**1 = M** ___**0 = L** *Record the rating on the first page*

Wetland name or number B

These questions apply to wetlands of all HGM classes.

HABITAT FUNCTIONS - Indicators that site functions to provide important habitat

H 1.0. Does the site have the potential to provide habitat?

H 1.1. Structure of plant community: *Indicators are Cowardin classes and strata within the Forested class.* Check the Cowardin plant classes in the wetland. *Up to 10 patches may be combined for each class to meet the threshold of ¼ ac or more than 10% of the unit if it is smaller than 2.5 ac. Add the number of structures checked.* ____Aquatic bed — 4 structures or more: points = 4 _X__Emergent — 3 structures: points = 2 ____Scrub-shrub (areas where shrubs have > 30% cover) — 2 structures: points = 1 ____Forested (areas where trees have > 30% cover) — 1 structure: points = 0 *If the unit has a Forested class, check if:* ____The Forested class has 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/ground-cover) that each cover 20% within the Forested polygon	0
H 1.2. Hydroperiods Check the types of water regimes (hydroperiods) present within the wetland. The water regime has to cover more than 10% of the wetland or ¼ ac to count (*see text for descriptions of hydroperiods*). ____Permanently flooded or inundated — 4 or more types present: points = 3 _X__Seasonally flooded or inundated — 3 types present: points = 2 ____Occasionally flooded or inundated — 2 types present: points = 1 _X__Saturated only — 1 type present: points = 0 ____Permanently flowing stream or river in, or adjacent to, the wetland ____Seasonally flowing stream in, or adjacent to, the wetland ____**Lake Fringe wetland** — **2 points** ____**Freshwater tidal wetland** — **2 points**	1
H 1.3. Richness of plant species Count the number of plant species in the wetland that cover at least 10 ft^2. *Different patches of the same species can be combined to meet the size threshold and you do not have to name the species.* ***Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Canadian thistle*** If you counted: > 19 species — points = 2 5 - 19 species — points = 1 < 5 species — points = 0 *Alopecurus pratensis, Ranunculus repens, Trifolium repens, Juncus effusus*	0
H 1.4. Interspersion of habitats Decide from the diagrams below whether interspersion among Cowardin plants classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, moderate, low, or none. *If you have four or more plant classes or three classes and open water, the rating is always high.*  **None** = 0 points  **Low** = 1 point  **Moderate** = 2 points  All three diagrams in this row are **HIGH** = 3points	0

H 1.5. Special habitat features: Check the habitat features that are present in the wetland. *The number of checks is the number of points.* ____Large, downed, woody debris within the wetland (> 4 in diameter and 6 ft long). ____Standing snags (dbh > 4 in) within the wetland ____Undercut banks are present for at least 6.6 ft (2 m) **and/or** overhanging plants extends at least 3.3 ft (1 m) over a stream (or ditch) in, or contiguous with the wetland, for at least 33 ft (10 m) ____Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 30 degree slope) OR signs of recent beaver activity are present *(cut shrubs or trees that have not yet weathered where wood is exposed)* ____At least ¼ ac of thin-stemmed persistent plants or woody branches are present in areas that are permanently or seasonally inundated *(structures for egg-laying by amphibians)* _X__Invasive plants cover less than 25% of the wetland area in every stratum of plants (*see H 1.1 for list of strata*)	*1*
Total for H 1 Add the points in the boxes above	*2*

Rating of Site Potential If score is:___**15-18 = H** ___**7-14 = M** _X_**0-6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support the habitat functions of the site?	
H 2.1. Accessible habitat (include *only habitat that directly abuts wetland unit*). *Calculate:* % undisturbed habitat_6_ **+** [(% moderate and low intensity land uses)/2]_6_ **=** _12_% If total accessible habitat is: > $^{1}/_{3}$ (33.3%) of 1 km Polygon points = 3 20-33% of 1 km Polygon points = 2 10-19% of 1 km Polygon points = 1 < 10% of 1 km Polygon points = 0	1
H 2.2. Undisturbed habitat in 1 km Polygon around the wetland. *Calculate:* % undisturbed habitat_18_ **+** [(% moderate and low intensity land uses)/2]_12_ **=** _30_% Undisturbed habitat > 50% of Polygon points = 3 Undisturbed habitat 10-50% and in 1-3 patches points = 2 Undisturbed habitat 10-50% and > 3 patches points = 1 Undisturbed habitat < 10% of 1 km Polygon points = 0	1
H 2.3. Land use intensity in 1 km Polygon: If > 50% of 1 km Polygon is high intensity land use points = (- 2) ≤ 50% of 1 km Polygon is high intensity points = 0	-2
Total for H 2 Add the points in the boxes above	0

Rating of Landscape Potential If score is:___**4-6 = H** ___**1-3 = M** _X_**< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose only the highest score that applies to the wetland being rated.* Site meets ANY of the following criteria: points = 2 _X_ It has 3 or more priority habitats within 100 m (see next page) — It provides habitat for Threatened or Endangered species (any plant or animal on the state or federal lists) — It is mapped as a location for an individual WDFW priority species — It is a Wetland of High Conservation Value as determined by the Department of Natural Resources — It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan Site has 1 or 2 priority habitats (listed on next page) within 100 m points = 1 Site does not meet any of the criteria above points = 0	*2*

Rating of Value If score is:_X_**2 = H** ___**1 = M** ___**0 = L** *Record the rating on the first page*

WDFW Priority Habitats

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp. http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here: http://wdfw.wa.gov/conservation/phs/list/)

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland unit: ***NOTE:*** *This question is independent of the land use between the wetland unit and the priority habitat.*

— **Aspen Stands:** Pure or mixed stands of aspen greater than 1 ac (0.4 ha).

— **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).

— **Herbaceous Balds:** Variable size patches of grass and forbs on shallow soils over bedrock.

— **Old-growth/Mature forests:** Old-growth west of Cascade crest – Stands of at least 2 tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) > 32 in (81 cm) dbh or > 200 years of age. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west of the Cascade crest.

— **Oregon White Oak:** Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).

X **Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

— **Westside Prairies:** Herbaceous, non-forested plant communities that can either take the form of a dry prairie or a wet prairie (*full descriptions in WDFW PHS report p. 161 – see web link above*).

X **Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.

— **Nearshore**: Relatively undisturbed nearshore habitats. These include Coastal Nearshore, Open Coast Nearshore, and Puget Sound Nearshore. (*full descriptions of habitats and the definition of relatively undisturbed are in WDFW report – see web link on previous page).*

— **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

— **Cliffs:** Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.

— **Talus:** Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

X **Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 20 in (51 cm) in western Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

Note: All vegetated wetlands are by definition a priority habitat but are not included in this list because they are addressed elsewhere.

Wetland name or number B

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Wetland Type *Check off any criteria that apply to the wetland. Circle the category when the appropriate criteria are met.*	**Category**
SC 1.0. Estuarine wetlands Does the wetland meet the following criteria for Estuarine wetlands? — The dominant water regime is tidal, — Vegetated, and — With a salinity greater than 0.5 ppt Yes –Go to **SC 1.1** No= **Not an estuarine wetland**	
SC 1.1. Is the wetland within a National Wildlife Refuge, National Park, National Estuary Reserve, Natural Area Preserve, State Park or Educational, Environmental, or Scientific Reserve designated under WAC 332-30-151? Yes = **Category I** No - Go to **SC 1.2**	**Cat. I**
SC 1.2. Is the wetland unit at least 1 ac in size and meets at least two of the following three conditions? — The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing, and has less than 10% cover of non-native plant species. (If non-native species are *Spartina*, see page 25) — At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland. — The wetland has at least two of the following features: tidal channels, depressions with open water, or contiguous freshwater wetlands. Yes = **Category I** No = **Category II**	**Cat. I** **Cat. II**
SC 2.0. Wetlands of High Conservation Value (WHCV) SC 2.1. Has the WA Department of Natural Resources updated their website to include the list of Wetlands of High Conservation Value? **Yes – Go to SC 2.2** No **–** Go to **SC 2.3** SC 2.2. Is the wetland listed on the WDNR database as a Wetland of High Conservation Value? Yes **= Category I** **No = Not a WHCV** SC 2.3. Is the wetland in a Section/Township/Range that contains a Natural Heritage wetland? http://www1.dnr.wa.gov/nhp/refdesk/datasearch/wnhpwetlands.pdf Yes **– Contact WNHP/WDNR and go to SC 2.4** No **= Not a WHCV** SC 2.4. Has WDNR identified the wetland within the S/T/R as a Wetland of High Conservation Value and listed it on their website? Yes **= Category I** No **= Not a WHCV**	**Cat. I**
SC 3.0. Bogs Does the wetland (or any part of the unit) meet both the criteria for soils and vegetation in bogs? *Use the key below.* ***If you answer YES you will still need to rate the wetland based on its functions.*** SC 3.1. Does an area within the wetland unit have organic soil horizons, either peats or mucks, that compose 16 in or more of the first 32 in of the soil profile? Yes – Go to **SC 3.3** No – Go to **SC 3.2** SC 3.2. Does an area within the wetland unit have organic soils, either peats or mucks, that are less than 16 in deep over bedrock, or an impermeable hardpan such as clay or volcanic ash, or that are floating on top of a lake or pond? Yes – Go to **SC 3.3** No = **Is not a bog** SC 3.3. Does an area with peats or mucks have more than 70% cover of mosses at ground level, AND at least a 30% cover of plant species listed in Table 4? Yes = **Is a Category I bog** No – Go to **SC 3.4** **NOTE:** If you are uncertain about the extent of mosses in the understory, you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16 in deep. If the pH is less than 5.0 and the plant species in Table 4 are present, the wetland is a bog. SC 3.4. Is an area with peats or mucks forested (> 30% cover) with Sitka spruce, subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Engelmann spruce, or western white pine, AND any of the species (or combination of species) listed in Table 4 provide more than 30% of the cover under the canopy? Yes = **Is a Category I bog** No **= Is not a bog**	**Cat. I**

<table>
<tr><td>

SC 4.0. Forested Wetlands

Does the wetland have at least 1 contiguous acre of forest that meets one of these criteria for the WA Department of Fish and Wildlife's forests as priority habitats? ***If you answer YES you will still need to rate the wetland based on its functions.***

— **Old-growth forests** (west of Cascade crest): Stands of at least two tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) that are at least 200 years of age OR have a diameter at breast height (dbh) of 32 in (81 cm) or more.

— **Mature forests** (west of the Cascade Crest): Stands where the largest trees are 80- 200 years old OR the species that make up the canopy have an average diameter (dbh) exceeding 21 in (53 cm).

Yes = **Category I** No = **Not a forested wetland for this section**

</td><td>

Cat. I

</td></tr>
<tr><td>

SC 5.0. Wetlands in Coastal Lagoons

Does the wetland meet all of the following criteria of a wetland in a coastal lagoon?

— The wetland lies in a depression adjacent to marine waters that is wholly or partially separated from marine waters by sandbanks, gravel banks, shingle, or, less frequently, rocks

— The lagoon in which the wetland is located contains ponded water that is saline or brackish (> 0.5 ppt) during most of the year in at least a portion of the lagoon *(needs to be measured near the bottom)*

Yes – Go to **SC 5.1** No = **Not a wetland in a coastal lagoon**

SC 5.1. Does the wetland meet all of the following three conditions?

— The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing), and has less than 20% cover of aggressive, opportunistic plant species (see list of species on p. 100).

— At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland.

— The wetland is larger than $^{1}/_{10}$ ac (4350 ft^{2})

Yes = **Category I** No = **Category II**

</td><td>

Cat. I

Cat. II

</td></tr>
<tr><td>

SC 6.0. Interdunal Wetlands

Is the wetland west of the 1889 line (also called the Western Boundary of Upland Ownership or WBUO)? ***If you answer yes you will still need to rate the wetland based on its habitat functions.***

In practical terms that means the following geographic areas:

— Long Beach Peninsula: Lands west of SR 103

— Grayland-Westport: Lands west of SR 105

— Ocean Shores-Copalis: Lands west of SR 115 and SR 109

Yes – Go to **SC 6.1** No = **not an interdunal wetland for rating**

SC 6.1. Is the wetland 1 ac or larger and scores an 8 or 9 for the habitat functions on the form (rates H,H,H or H,H,M for the three aspects of function)? Yes = **Category I** No – Go to **SC 6.2**

SC 6.2. Is the wetland 1 ac or larger, or is it in a mosaic of wetlands that is 1 ac or larger?
Yes = **Category II** No – Go to **SC 6.3**

SC 6.3. Is the unit between 0.1 and 1 ac, or is it in a mosaic of wetlands that is between 0.1 and 1 ac?
Yes = **Category III** No = **Category IV**

</td><td>

Cat I

Cat. II

Cat. III

Cat. IV

</td></tr>
<tr><td>

Category of wetland based on Special Characteristics
If you answered No for all types, enter "Not Applicable" on Summary Form

</td><td>

N/A

</td></tr>
</table>

This page left blank intentionally

Appendix C-5
Wetland B Figures

LEGEND:

150-foot Buffer of Wetland B

Pollutant Generating Area

Cowardin Class

Palustrine Emergent

NOTES:
1. Aerial image provided by Esri Online Services.

0 100
Feet

Publish Date: 2023/05/25, 2:36 PM | User: alesueur
Filepath: \\orcas\gis\Jobs\Vector_Development_Company_2141\Freeman_Road\Maps\Wetlands\Ratings_WetlandB\WetlandB_Ratings.aprx

ANCHOR QEA

Figure 1
Cowardin Plant Classes and Area Within 150-feet of the Wetland
Wetland Rating Form - Wetland B
Freeman Road Logistics

LEGEND:

Wetland B

Hydroperiods

Saturated

Seasonally Flooded

NOTES:
1. Aerial image provided by Esri Online Services.

0 40
Feet

Publish Date: 2023/05/25, 10:47 AM | User: alesueur
Filepath: \\orcas\gis\Jobs\Vector_Development_Company_2141\Freeman_Road\Maps\Wetlands\Ratings_WetlandB\WetlandB_Ratings.aprx

Figure 2
Hydroperiods
Wetland Rating Form - Wetland B
Freeman Road Logistics

LEGEND:

Wetland B

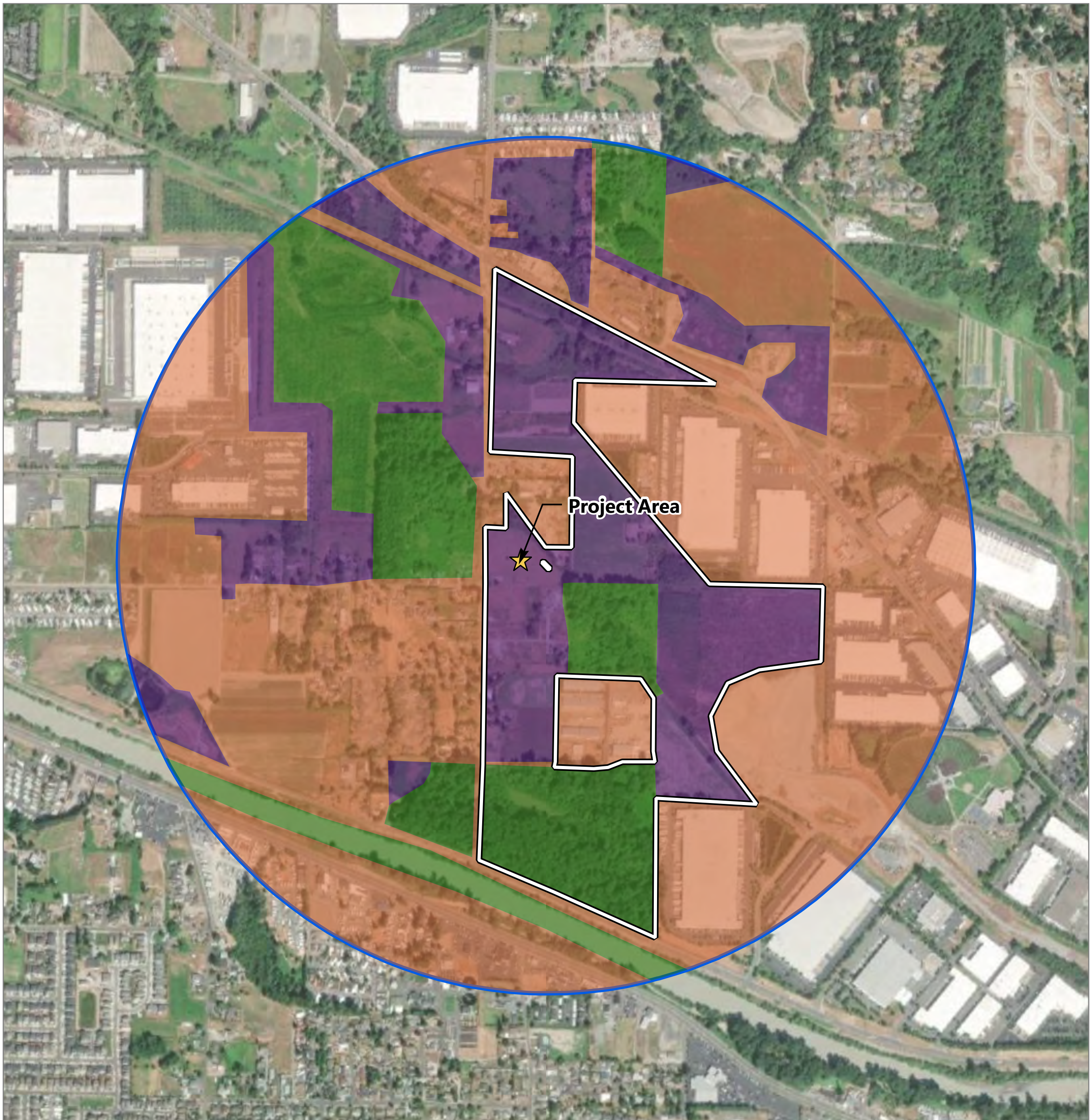
Contributing Basin

NOTES:
1. Aerial image provided by Esri Online Services.
2. Hillshade background from Washington Department of Natural Resources, Pierce County Lidar, 2020.

0 200
Feet

Publish Date: 2023/05/25, 2:23 PM | User: alesueur
Filepath: \\orcas\gis\Jobs\Vector_Development_Company_2141\Freeman_Road\Maps\Wetlands\Ratings_WetlandB\WetlandB_Ratings.aprx

Figure 3
Contributing Basin
Wetland Rating Form - Wetland B
Freeman Road Logistics



LEGEND:

- Project Area
- 1-km Radius of Wetland B
- Accessible Habitat

Land Use Type

- High Intensity
- Low/Moderate Intensity
- Relatively Undisturbed

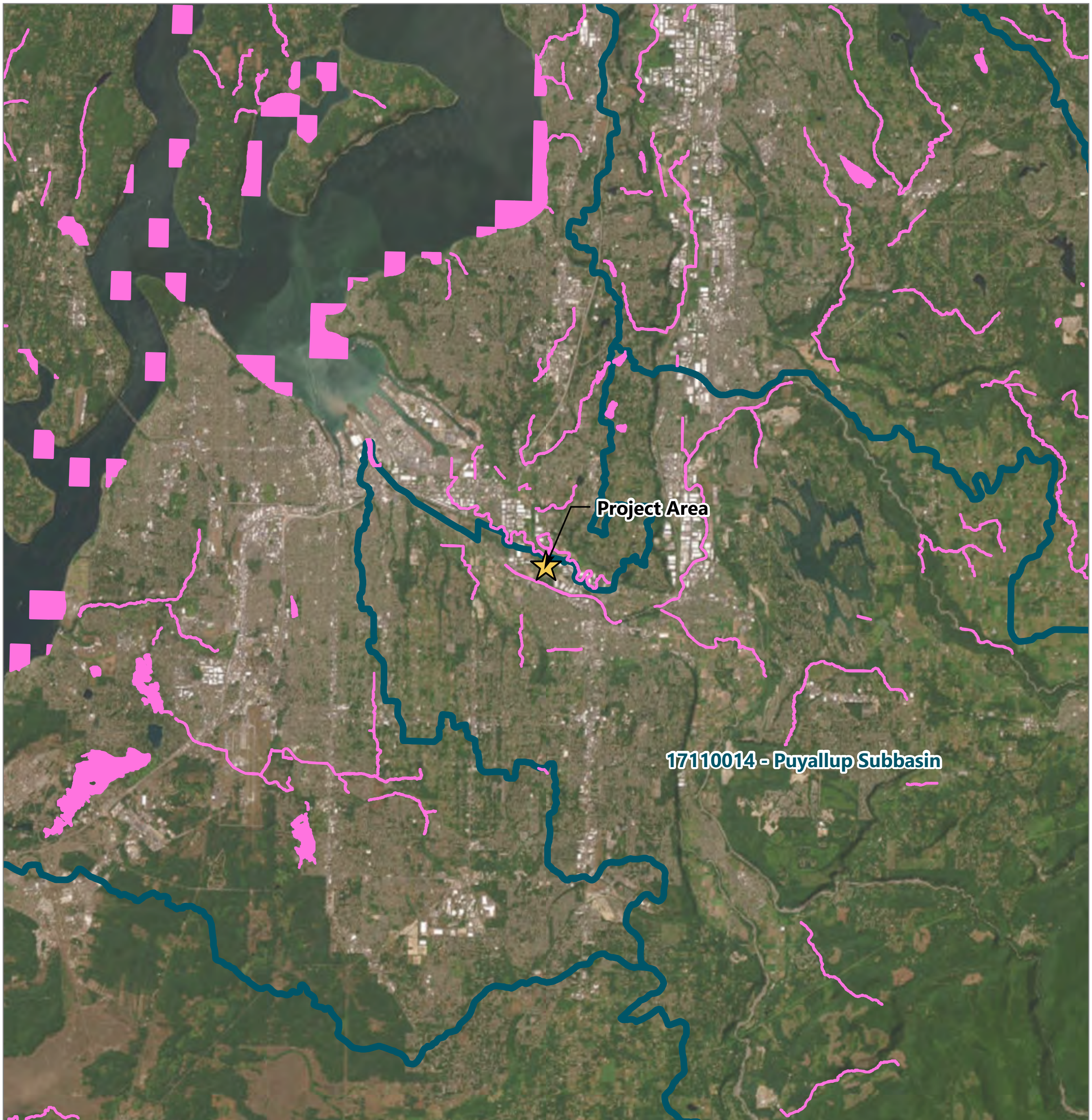
NOTES:
1. Aerial image provided by Esri Online Services.

0 1,200
Feet

Publish Date: 2023/05/25, 2:48 PM | User: alesueur
Filepath: \\orcas\gis\Jobs\Vector_Development_Company_2141\Freeman_Road\Maps\Wetlands\Ratings_WetlandB\WetlandB_Ratings.aprx

ANCHOR QEA

Figure 4
Land Use Intensity within 1-km of the Wetland
Wetland Rating Form - Wetland B
Freeman Road Logistics



LEGEND:

Project Area

303(d) Listed Water

HUC8 Watershed

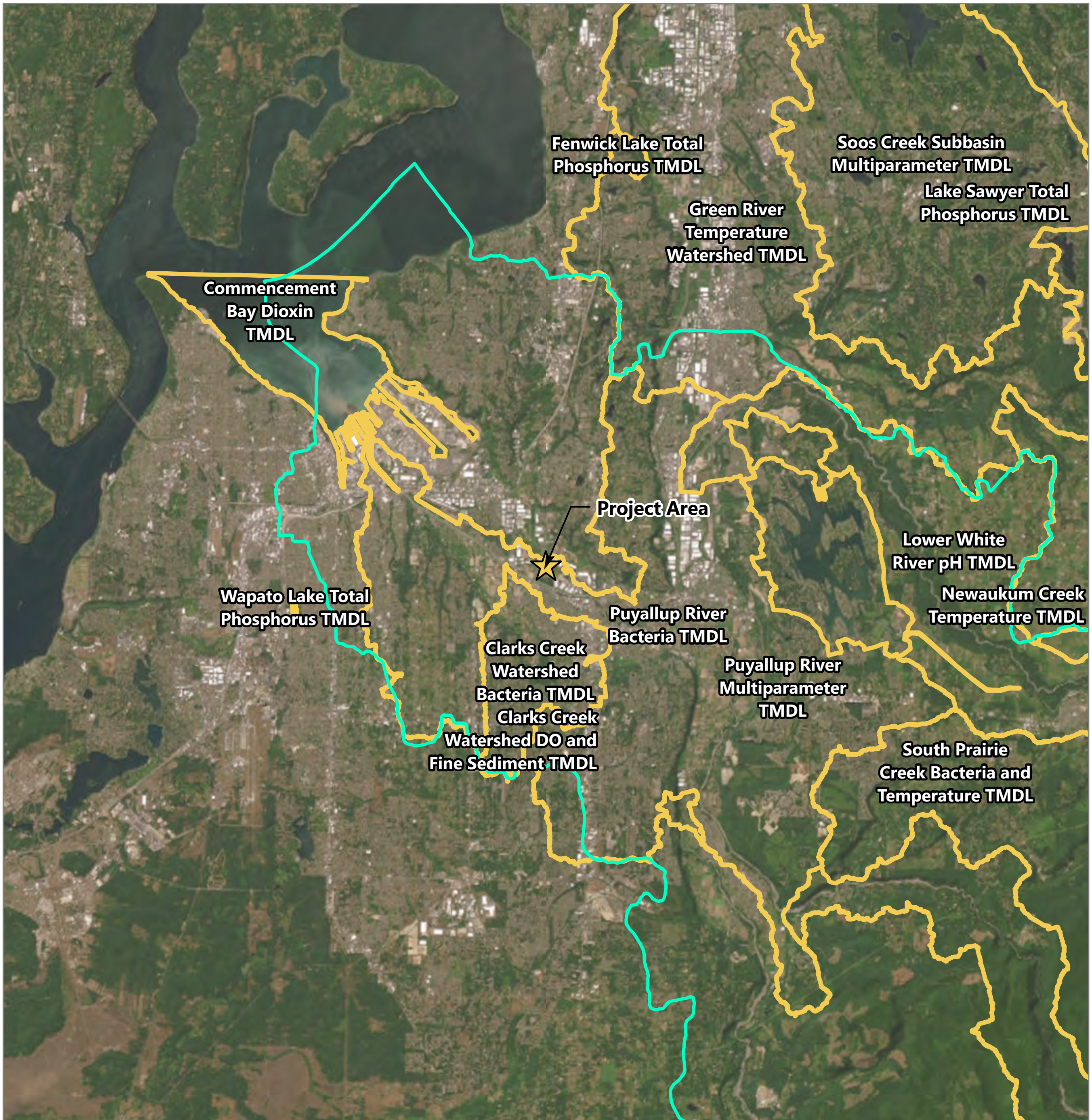
NOTES:
1. Aerial image provided by Esri Online Services.
2. 303(d) lised waters and HUC8 Watershed boundary from Washington State Ecology.

0 4
Miles

Publish Date: 2023/05/25, 10:52 AM | User: alesueur
Filepath: \\orcas\gis\Jobs\Vector_Development_Company_2141\Freeman_Road\Maps\Wetlands\Ratings_WetlandB\WetlandB_Ratings.aprx

ANCHOR QEA

Figure 5
303(d) Listed Waters
Wetland Rating Form - Wetland B
Freeman Road Logistics



LEGEND:

Project Area

WRIA 10 - Puyallup - White

TMDL

NOTES:

1. Aerial image provided by Esri Online Services.
2. WRIA 10 and TMDL boundaries are from Washington State Ecology.

0 4
Miles

Publish Date: 2023/05/25, 10:51 AM | User: alesueur
Filepath: \\orcas\gis\Jobs\Vector_Development_Company_2141\Freeman_Road\Maps\Wetlands\Ratings_WetlandB\WetlandB_Ratings.aprx

ANCHOR QEA

Figure 6
List of TMDLs for WRIA 10 - Puyallup - White
Wetland Rating Form - Wetland B
Freeman Road Logistics

Appendix C-6
WSDOT Ratings

Wetland name or number: Wetland 87

RATING SUMMARY – Western Washington

Name of wetland (or ID #): SR 167 Completion Project – Wetland 87 Date of site visit: 4/8/2021

Rated by R. Baker Trained by Ecology? ☒ Yes ☐ No Date of Training Sep. 2008

HGM Class used for rating Depressional Wetland has multiple HGM classes? ☐ Yes ☒ No

Additional HGM Classes (*if multiple*): n/a

Source of base aerial photo/map ESRI Aerial, 2020

OVERALL WETLAND CATEGORY III (based on functions ☒ or special characteristics ☐)

1. Category of wetland based on FUNCTIONS

Category III – Total score = 16 – 19

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
Enter the appropriate ratings				
Site Potential	M	M	M	
Landscape Potential	M	M	L	
Value	H	M	H	**TOTAL**
Score Based on Ratings	7			

Score for each function based on three ratings
(*order of ratings is not important*)

9 = H,H,H
8 = H,H,M
7 = H,H,L
7 = H,M,M
6 = H,M,L
6 = M,M,M
5 = H,L,L
5 = M,M,L
4 = M,L,L
3 = L,L,L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	CATEGORY
Estuarine	
Wetland of High Conservation Value	
Bog	
Mature Forest	
Old Growth Forest	
Coastal Lagoon	
Interdunal	
None of the above	X

Maps and figures required to answer questions correctly for Western Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	D 1.3, H 1.1, H 1.4	D-23
Hydroperiods and location of outlets	D 1.4, H 1.2, D 1.1, D 4.1	D-24
Flow directions and associated features	n/a	D-24a
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	D-24
Map of the contributing basin	D 4.3, D 5.3	D-25
1 km Polygon: Area that extends 1 km from entire wetland edge—including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	D-26
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	D-5
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	D 3.3	D-6

Wetland name or number: Wetland 87

DEPRESSIONAL AND FLATS WETLANDS **Water Quality Functions** – Indicators that the site functions to improve water quality	
D 1.0. Does the site have the potential to improve water quality?	
D 1.1. Characteristics of surface water outflows from the wetland: Wetland is a depression or flat depression (QUESTION 7 on key) with no surface water leaving it (no outlet) | points = 3	3
D 1.2. The soil 2 in below the surface (or duff layer) is true clay or true organic *(use NRCS definitions).* No = 0	0
D 1.3. Characteristics and distribution of persistent plants (Emergent, Scrub-shrub, and/or Forested Cowardin classes): Wetland has persistent, ungrazed plants > 95% of area | points = 5	5
D 1.4. Characteristics of seasonal ponding or inundation: *This is the area that is ponded for at least 2 months. See description in manual.* Area seasonally ponded is < 1/4 total area of wetland | points = 0	0
Total for D 1 Add the points in the boxes above (F9 key)	8

Rating of Site Potential If score is: 6–11 = M *Record the rating on the first page*

D 2.0. Does the landscape have the potential to support the water quality function of the site?	
D 2.1. Does the wetland unit receive stormwater discharges? No = 0	0
D 2.2. Is >10% of the area within 150 ft of the wetland in land uses that generate pollutants? Yes = 1	1
D 2.3. Are there septic systems within 250 ft of the wetland? No = 0	0
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1–D 2.3? Source: Homeless encampment/trash Yes = 1	1
Total for D 2 Add the points in the boxes above	2

Rating of Landscape Potential If score is: 1 or 2 = M *Record the rating on the first page*

D 3.0. Is the water quality improvement provided by the site valuable to society?	
D 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, lake, or marine water that is on the 303(d) list? No = 0	0
D 3.2. Is the wetland in a basin or subbasin where an aquatic resource is on the 303(d) list? Yes = 1	1
D 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality (*answer YES if there is a TMDL for the basin in which the unit is found*)? Yes = 2	2
Total for D 3 Add the points in the boxes above	3

Rating of Value If score is: 2–4 = H *Record the rating on the first page*

COMMENTS: Area to the North of wetland (across Stream 14) is active conventional agriculture. TMDLs in place for the Puyallup.

Hydrologic Functions – Indicators that the site functions to reduce flooding and stream degradation	
D 4.0. Does the site have the potential to reduce flooding and erosion?	
D 4.1. Characteristics of surface water outflows from the wetland: Wetland is a depression or flat depression with no surface water leaving it (no outlet) | points = 4	4
D 4.2. Depth of storage during wet periods: *Estimate the height of ponding above the bottom of the outlet. For wetlands with no outlet, measure from the surface of permanent water or if dry, the deepest part.* Marks of ponding less than 0.5 ft (6 in) | points = 0	0
D 4.3. Contribution of the wetland to storage in the watershed: *Estimate the ratio of the area of upstream basin contributing surface water to the wetland to the area of the wetland unit itself.* The area of the basin is 10 to 100 times the area of the unit | points = 3	3
Total for D 4 Add the points in the boxes above	7

Rating of Site Potential If score is: 6–11 = M *Record the rating on the first page*

D 5.0. Does the landscape have the potential to support hydrologic functions of the site?	
D 5.1. Does the wetland receive stormwater discharges? No = 0	0
D 5.2. Is >10% of the area within 150 ft of the wetland in land uses that generate excess runoff? Yes = 1	1
D 5.3. Is more than 25% of the contributing basin of the wetland covered with intensive human land uses (residential at >1 residence/ac, urban, commercial, agriculture, etc.)? No = 0	0
Total for D 5 Add the points in the boxes above	1

Rating of Landscape Potential If score is: 1 or 2 = M *Record the rating on the first page*

Wetland name or number: Wetland 87

D 6.0. Are the hydrologic functions provided by the site valuable to society?	
D 6.1. The unit is in a landscape that has flooding problems. *Choose the description that best matches conditions around the wetland unit being rated. Do not add points. Choose the highest score if more than one condition is met.* The wetland captures surface water that would otherwise flow down-gradient into areas where flooding has damaged human or natural resources (e.g., houses or salmon redds): Surface flooding problems are in a subbasin farther down-gradient | points = 1 **If not applicable chosen above:** Choose an item. **Explanation for 0 points (if required above):**	1
D 6.2. Has the site been identified as important for flood storage or flood conveyance in a regional flood control plan? No = 0	0
Total for D 6 — Add the points in the boxes above	1

Rating of Value If score is: 1 = M *Record the rating on the first page*

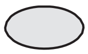
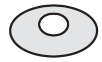
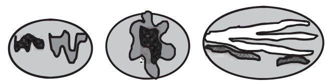
COMMENTS: Wetland is adjacent to conventional ag fields and streams, but not connected to streams via surface flow.

These questions apply to wetlands of all HGM classes.

HABITAT FUNCTIONS – Indicators that site functions to provide important habitat

H 1.0. Does the site have the potential to provide habitat?		
H 1.1. Structure of plant community: *Indicators are Cowardin classes and strata within the Forested class.* Check the Cowardin plant classes in the wetland. *Up to 10 patches may be combined for each class to meet the threshold of 1/4 ac or more than 10% of the unit if it is smaller than 2.5 ac. Add the number of structures checked.* ☐ Aquatic bed ☐ Emergent ☒ Scrub-shrub (areas where shrubs have >30% cover) ☒ Forested (areas where trees have >30% cover) *If the unit has a Forested class, check if:* ☐ The Forested class has 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/ground-cover) that each cover 20% within the Forested polygon	2 structures | points = 1	1
H 1.2. Hydroperiods Check the types of water regimes (hydroperiods) present within the wetland. The water regime has to cover more than 10% of the wetland or 1/4 ac to count (*see text for descriptions of hydroperiods*). ☐ Permanently flooded or inundated ☒ Seasonally flooded or inundated ☐ Occasionally flooded or inundated ☒ Saturated only ☐ Permanently flowing stream or river in, or adjacent to, the wetland ☐ Seasonally flowing stream in, or adjacent to, the wetland ☐ **Lake Fringe wetland** ☐ **Freshwater tidal wetland**	2 types present | points = 1 **2 points** **2 points**	1
H 1.3. Richness of plant species Count the number of plant species in the wetland that cover at least 10 ft^2. *Different patches of the same species can be combined to meet the size threshold and you do not have to name the species.* ***Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Canadian thistle.*** If you counted: 5–19 species | points = 1		1

Wetland name or number: Wetland 87

H 1.4. Interspersion of habitats Decide from the diagrams below whether interspersion among Cowardin plants classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, moderate, low, or none. *If you have four or more plant classes or three classes and open water, the rating is always high.* Choose an item. **None** = 0 points  **Low** = 1 point  **Moderate** = 2 points  All three diagrams in this row are **HIGH** = 3 points 	1
H 1.5. Special habitat features: Check the habitat features that are present in the wetland. *The number of checks is the number of points*. ☒ Large, downed, woody debris within the wetland (>4 in diameter and 6 ft long). ☒ Standing snags (dbh >4 in) within the wetland ☐ Undercut banks are present for at least 6.6 ft (2 m) **and/or** overhanging plants extends at least 3.3 ft (1 m) over a stream (or ditch) in, or contiguous with the wetland, for at least 33 ft (10 m) ☐ Stable steep banks of fine material that might be used by beaver or muskrat for denning (>30 degree slope) OR signs of recent beaver activity are present (*cut shrubs or trees that have not yet weathered where wood is exposed*) ☐ At least 1/4 ac of thin-stemmed persistent plants or woody branches are present in areas that are permanently or seasonally inundated (*structures for egg-laying by amphibians*) ☒ Invasive plants cover less than 25% of the wetland area in every stratum of plants (*see H 1.1 for list of strata*)	3
Total for H 1 — Add the points in the boxes above	7

Rating of Site Potential If score is: 7–14 = M *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support the habitat functions of the site?	
H 2.1. Accessible habitat (include *only habitat that directly abuts wetland unit*). *Calculate*: % undisturbed habitat 1.3**+** [(% moderate and low intensity land uses)2.7/2] 1.4 **= 2.7**% If total accessible habitat is: <10% of 1 km Polygon | points = 0	0
H 2.2. Undisturbed habitat in 1 km Polygon around the wetland. *Calculate*: % undisturbed habitat 14.1**+** [(% moderate and low intensity land uses)16.5/2] 8.3 **= 22.4**% Undisturbed habitat 10–50% and >3 patches | points = 1	1
H 2.3. Land use intensity in 1 km Polygon: 69.3**%** >50% of 1 km Polygon is high intensity land use | points = (-2)	-2
Total for H 2 — Add the points in the boxes above	-1

Rating of Landscape Potential If score is: < 1 = L *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose only the highest score that applies to the wetland being rated.* WDFW Priority Habitats within 100 m: ☐ Aspen Stands ☐ Biodiversity Areas and Corridors ☐ Herbaceous Balds ☐ Old Growth/Mature Forests ☐ Oregon White Oak ☒ Riparian ☐ Westside Prairies ☒ Instream ☐ Nearshore ☐ Caves ☐ Cliffs ☐ Talus ☒ Snags and Logs (*Priority habitats listed by WDFW: For complete descriptions of WDFW priority habitats, and the counties in which they can be found, see: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington,* <http://wdfw.wa.gov/publications/00165/wdfw00165.pdf>, *or access the list from here:* <https://wdfw.wa.gov/species-habitats/at-risk/phs/list>.) Site meets ANY of the following criteria: points = 2 ☒ It has 3 or more priority habitats within 100 m (checked above) ☐ It provides habitat for Threatened or Endangered species (any plant or animal on the state or federal lists) ☐ It is mapped as a location for an individual WDFW priority species ☐ It is a Wetland of High Conservation Value as determined by the Department of Natural Resources ☐ It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan Site has 1 or 2 priority habitats within 100 m (checked above) points = 1 Site does not meet any of the criteria above points = 0	2

Rating of Value If score is: 2 = H *Record the rating on the first page*

Legend

Stream

Delineated wetland boundary

Cowardin class

PFO - Palustrine forested

PSS - Palustrine scrub-shrub

Figure D-23.
Cowardin Classes for Wetland 87.

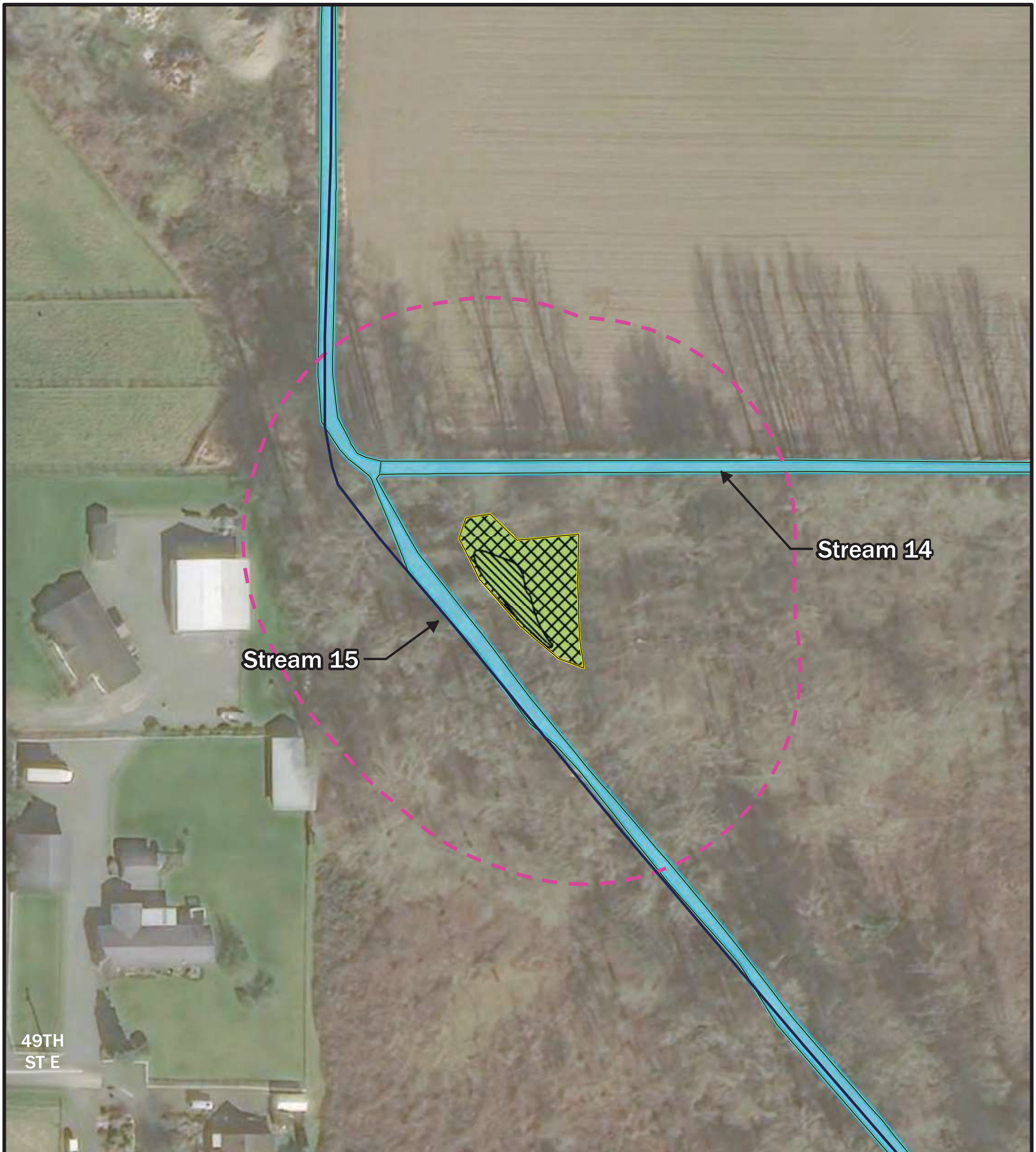
N

0 25 50 100 Feet

HERRERA

ESRI, Aerial (2020)

K:\Projects\Y2016\16-06277-000\Project\GISWorking\Wetland_Delineation2021\Ratings_Figures\FigX_CowardinClass_WLX_letter.mxd



Legend

Streams (Pierce County 2021)
Delineated wetland boundary
Delineated OHWM
Wetland
Stream
150ft boundary
Hydroperiod
Saturated only
Seasonally flooded

Figure D-24.
Hydroperiod, 150-Foot Boundary, and Location of Outlets for Wetland 87.

N

0 45 90 180 Feet

HERRERA

ESRI, Aerial (2021)

K:\Projects\Y2016\16-06277-000\Project\GISWorking\Wetland_Delineation2021\Ratings_Figures\FigX_Hydroperiods_WLX_letter.mxd

Legend

Flow Direction

Streams (Pierce County 2021)

Wetland

Stream

Delineated OHWM

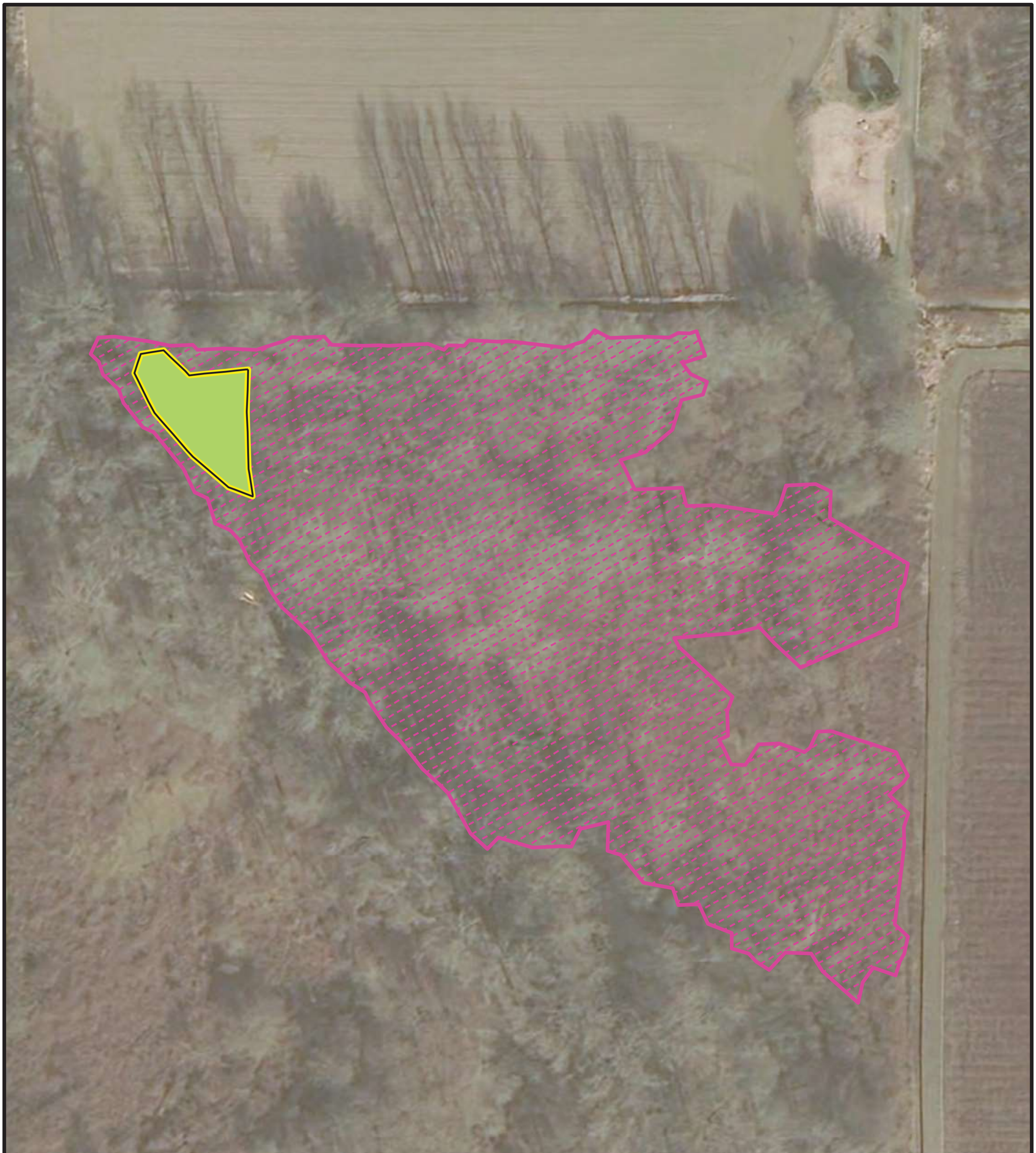
Figure D-24a.
Flow Directions and Features Associated with Wetland 87.

0 45 90 180 Feet

HERRERA

ESRI, Aerial (2020)

K:\Projects\Y2016\16-06277-000\Project\GISWorking\Wetland_Delineation2021\Ratings_Figures\FigX_FlowDirection_WLX_letter.mxd



Legend

Contributing basin

Wetland

Delineated wetland boundary

**Figure D-25.
Map of Contributing Basin for
Wetland 87.**

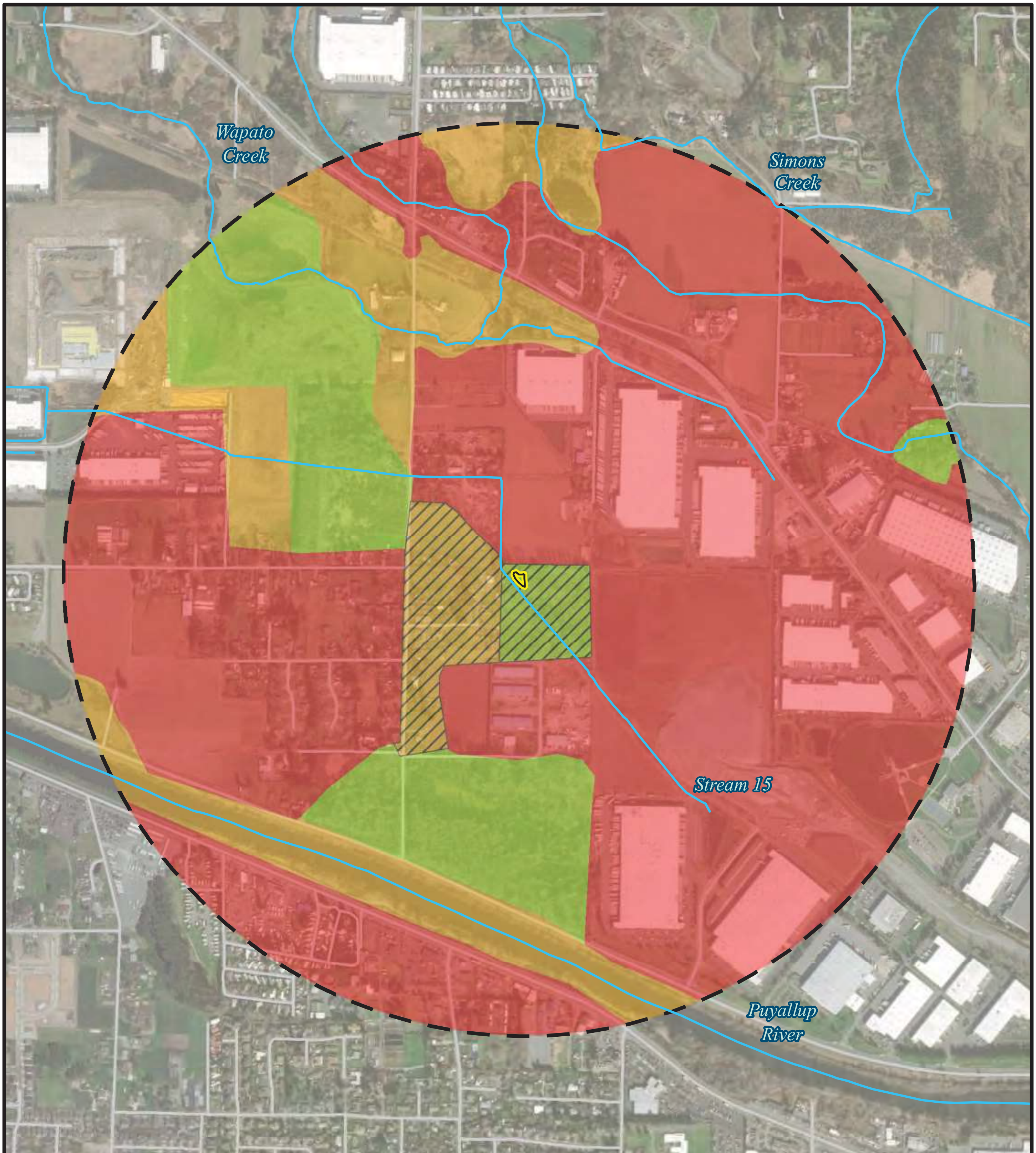
N

0 50 100 200 Feet

HERRERA

Esri, Aerial (2021)

K:\Projects\Y2016\16-06277-000\Project\GISWorking\Wetland_Delineation2021\Ratings_Figures\FigX_ContributingBasin_WLX_letter.mxd



Legend

Delineated wetland boundary
1-km boundary
Wetland
Stream (Pierce County)

Habitat type
High intensity
Low/Moderate Intensity and accessible
Low/Moderate Intensity
Relatively undisturbed
Relatively undisturbed and accessible

Figure D-26.
Habitat Within a 1-km Boundary of Wetland 87.

N

0 500 1,000 2,000 Feet

HERRERA

Esri, Aerial (2021)

K:\Projects\Y2016\16-06277-000\Project\GISWorking\Wetland_Delineation2021\Ratings_Figures\FigX_Habitat1KM_WLX_letter.mxd

Wetland name or number: Wetland 89

RATING SUMMARY – Western Washington

Name of wetland (or ID #): SR 167 Completion Project – Wetland 89 Date of site visit: 4/8/2021

Rated by R. Baker Trained by Ecology? ☒ Yes ☐ No Date of Training Sep. 2008

HGM Class used for rating Depressional Wetland has multiple HGM classes? ☐ Yes ☒ No

Additional HGM Classes (*if multiple*): n/a

Source of base aerial photo/map ESRI Aerial, 2020

OVERALL WETLAND CATEGORY II (based on functions ☒ or special characteristics ☐)

1. Category of wetland based on FUNCTIONS

Category II – Total score = 20 – 22

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
Enter the appropriate ratings				
Site Potential	M	M	L	
Landscape Potential	H	H	L	
Value	H	M	H	**TOTAL**
Score Based on Ratings	8	7		2

Score for each function based on three ratings
(*order of ratings is not important*)
9 = H,H,H
8 = H,H,M
7 = H,H,L
7 = H,M,M
6 = H,M,L
6 = M,M,M
5 = H,L,L
5 = M,M,L
4 = M,L,L
3 = L,L,L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	CATEGORY
Estuarine	
Wetland of High Conservation Value	
Bog	
Mature Forest	
Old Growth Forest	
Coastal Lagoon	
Interdunal	
None of the above	X

Maps and figures required to answer questions correctly for Western Washington

<u>Depressional Wetlands</u>

Map of:	To answer questions:	Figure #
Cowardin plant classes	D 1.3, H 1.1, H 1.4	D-31
Hydroperiods and location of outlets	D 1.4, H 1.2, D 1.1, D 4.1	D-32
Flow directions and associated features	n/a	D-32a
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	D-32
Map of the contributing basin	D 4.3, D 5.3	D-33
1 km Polygon: Area that extends 1 km from entire wetland edge—including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	D-34
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	D-5
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	D 3.3	D-6

Wetland name or number: Wetland 89

DEPRESSIONAL AND FLATS WETLANDS **Water Quality Functions** – Indicators that the site functions to improve water quality	
D 1.0. Does the site have the potential to improve water quality?	
D 1.1. Characteristics of surface water outflows from the wetland: Wetland is a depression or flat depression (QUESTION 7 on key) with no surface water leaving it (no outlet) | points = 3	3
D 1.2. The soil 2 in below the surface (or duff layer) is true clay or true organic *(use NRCS definitions).* No = 0	0
D 1.3. Characteristics and distribution of persistent plants (Emergent, Scrub-shrub, and/or Forested Cowardin classes): Wetland has persistent, ungrazed plants > 1/2 of area | points = 3	3
D 1.4. Characteristics of seasonal ponding or inundation: *This is the area that is ponded for at least 2 months. See description in manual.* Area seasonally ponded is < 1/4 total area of wetland | points = 0	0
Total for D 1 Add the points in the boxes above (F9 key)	6
Rating of Site Potential If score is: 6–11 = M *Record the rating on the first page*	
D 2.0. Does the landscape have the potential to support the water quality function of the site?	
D 2.1. Does the wetland unit receive stormwater discharges? Yes = 1	1
D 2.2. Is >10% of the area within 150 ft of the wetland in land uses that generate pollutants? Yes = 1	1
D 2.3. Are there septic systems within 250 ft of the wetland? No = 0	0
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1–D 2.3? Source: Trash/Homeless encampments Yes = 1	1
Total for D 2 Add the points in the boxes above	3
Rating of Landscape Potential If score is: 3 or 4 = H *Record the rating on the first page*	
D 3.0. Is the water quality improvement provided by the site valuable to society?	
D 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, lake, or marine water that is on the 303(d) list? No = 0	0
D 3.2. Is the wetland in a basin or subbasin where an aquatic resource is on the 303(d) list? Yes = 1	1
D 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality (*answer YES if there is a TMDL for the basin in which the unit is found*)? Yes = 2	2
Total for D 3 Add the points in the boxes above	3
Rating of Value If score is: 2–4 = H *Record the rating on the first page*	
COMMENTS: Wetland is upstream of the Puyallup River, which has set TMDLs	

Hydrologic Functions – Indicators that the site functions to reduce flooding and stream degradation	
D 4.0. Does the site have the potential to reduce flooding and erosion?	
D 4.1. Characteristics of surface water outflows from the wetland: Wetland is a depression or flat depression with no surface water leaving it (no outlet) | points = 4	4
D 4.2. Depth of storage during wet periods: *Estimate the height of ponding above the bottom of the outlet. For wetlands with no outlet, measure from the surface of permanent water or if dry, the deepest part.* Marks of ponding less than 0.5 ft (6 in) | points = 0	0
D 4.3. Contribution of the wetland to storage in the watershed: *Estimate the ratio of the area of upstream basin contributing surface water to the wetland to the area of the wetland unit itself.* The area of the basin is less than 10 times the area of the unit | points = 5	5
Total for D 4 Add the points in the boxes above	9
Rating of Site Potential If score is: 6–11 = M *Record the rating on the first page*	
D 5.0. Does the landscape have the potential to support hydrologic functions of the site?	
D 5.1. Does the wetland receive stormwater discharges? Yes = 1	1
D 5.2. Is >10% of the area within 150 ft of the wetland in land uses that generate excess runoff? Yes = 1	1
D 5.3. Is more than 25% of the contributing basin of the wetland covered with intensive human land uses (residential at >1 residence/ac, urban, commercial, agriculture, etc.)? Yes = 1	1
Total for D 5 Add the points in the boxes above	3
Rating of Landscape Potential If score is: 3 = H *Record the rating on the first page*	

D 6.0. Are the hydrologic functions provided by the site valuable to society?	
D 6.1. <u>The unit is in a landscape that has flooding problems</u>. *Choose the description that best matches conditions around the wetland unit being rated. Do not add points. <u>Choose the highest score if more than one condition is met</u>.* The wetland captures surface water that would otherwise flow down-gradient into areas where flooding has damaged human or natural resources (e.g., houses or salmon redds): Surface flooding problems are in a subbasin farther down-gradient | points = 1 **If not applicable chosen above:** Choose an item. **Explanation for 0 points (if required above):**	1
D 6.2. Has the site been identified as important for flood storage or flood conveyance in a regional flood control plan? No = 0	0
Total for D 6 — Add the points in the boxes above	1

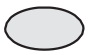
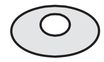
Rating of Value If score is: 1 = M *Record the rating on the first page*

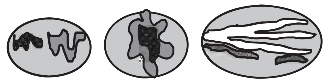
COMMENTS:

These questions apply to wetlands of all HGM classes. **HABITAT FUNCTIONS** – Indicators that site functions to provide important habitat		
H 1.0. Does the site have the potential to provide habitat?		
H 1.1. Structure of plant community: *Indicators are Cowardin classes and strata within the Forested class.* Check the Cowardin plant classes in the wetland. *Up to 10 patches may be combined for each class to meet the threshold of 1/4 ac or more than 10% of the unit if it is smaller than 2.5 ac. Add the number of structures checked.* ☐ Aquatic bed ☐ Emergent ☒ Scrub-shrub (areas where shrubs have >30% cover) ☐ Forested (areas where trees have >30% cover) *If the unit has a Forested class, check if:* ☐ The Forested class has 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/ground-cover) that each cover 20% within the Forested polygon	1 structure | points = 0	0
H 1.2. Hydroperiods Check the types of water regimes (hydroperiods) present within the wetland. The water regime has to cover more than 10% of the wetland or 1/4 ac to count (*see text for descriptions of hydroperiods*). ☐ Permanently flooded or inundated ☐ Seasonally flooded or inundated ☐ Occasionally flooded or inundated ☒ Saturated only ☐ Permanently flowing stream or river in, or adjacent to, the wetland ☐ Seasonally flowing stream in, or adjacent to, the wetland ☐ **Lake Fringe wetland** ☐ **Freshwater tidal wetland**	1 type present | points = 0 **2 points** **2 points**	0
H 1.3. Richness of plant species Count the number of plant species in the wetland that cover at least 10 ft^2. *Different patches of the same species can be combined to meet the size threshold and you do not have to name the species.* ***Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Canadian thistle.*** If you counted: <5 species | points = 0		0

H 1.4. Interspersion of habitats — **0**

Decide from the diagrams below whether interspersion among Cowardin plants classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, moderate, low, or none. *If you have four or more plant classes or three classes and open water, the rating is always high.* None | points = 0

None = 0 points  **Low** = 1 point  **Moderate** = 2 points 

All three diagrams in this row are **HIGH** = 3 points 

H 1.5. Special habitat features: — **0**

Check the habitat features that are present in the wetland. *The number of checks is the number of points*.

- ☐ Large, downed, woody debris within the wetland (>4 in diameter and 6 ft long).
- ☐ Standing snags (dbh >4 in) within the wetland
- ☐ Undercut banks are present for at least 6.6 ft (2 m) **and/or** overhanging plants extends at least 3.3 ft (1 m) over a stream (or ditch) in, or contiguous with the wetland, for at least 33 ft (10 m)
- ☐ Stable steep banks of fine material that might be used by beaver or muskrat for denning (>30 degree slope) OR signs of recent beaver activity are present (*cut shrubs or trees that have not yet weathered where wood is exposed*)
- ☐ At least 1/4 ac of thin-stemmed persistent plants or woody branches are present in areas that are permanently or seasonally inundated (*structures for egg-laying by amphibians*)
- ☐ Invasive plants cover less than 25% of the wetland area in every stratum of plants (*see H 1.1 for list of strata*)

Total for H 1	Add the points in the boxes above	0

Rating of Site Potential If score is: 0–6 = L *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support the habitat functions of the site?

H 2.1. Accessible habitat (include *only habitat that directly abuts wetland unit*). — **0**

Calculate: % undisturbed habitat 1.3**+** [(% moderate and low intensity land uses)2.7/2] 1.4 **= 2.7**%

If total accessible habitat is: <10% of 1 km Polygon | points = 0

H 2.2. Undisturbed habitat in 1 km Polygon around the wetland. — **1**

Calculate: % undisturbed habitat 11.9**+** [(% moderate and low intensity land uses)14.1/2] 7.1 **= 19.0**%

Undisturbed habitat 10–50% and >3 patches | points = 1

H 2.3. Land use intensity in 1 km Polygon: 73.9% — **-2**

>50% of 1 km Polygon is high intensity land use | points = (-2)

Total for H 2	Add the points in the boxes above	-1

Rating of Landscape Potential If score is: < 1 = L *Record the rating on the first page*

Wetland name or number: Wetland 89

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose only the highest score that applies to the wetland being rated.* WDFW Priority Habitats within 100 m: ☐ Aspen Stands ☐ Biodiversity Areas and Corridors ☐ Herbaceous Balds ☐ Old Growth/Mature Forests ☐ Oregon White Oak ☒ Riparian ☐ Westside Prairies ☒ Instream ☐ Nearshore ☐ Caves ☐ Cliffs ☐ Talus ☒ Snags and Logs (*Priority habitats listed by WDFW: For complete descriptions of WDFW priority habitats, and the counties in which they can be found, see: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington,* <http://wdfw.wa.gov/publications/00165/wdfw00165.pdf>, *or access the list from here:* <https://wdfw.wa.gov/species-habitats/at-risk/phs/list>.) Site meets ANY of the following criteria: points = 2 ☒ It has 3 or more priority habitats within 100 m (checked above) ☐ It provides habitat for Threatened or Endangered species (any plant or animal on the state or federal lists) ☐ It is mapped as a location for an individual WDFW priority species ☐ It is a Wetland of High Conservation Value as determined by the Department of Natural Resources ☐ It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan Site has 1 or 2 priority habitats within 100 m (checked above) points = 1 Site does not meet any of the criteria above points = 0	2

Rating of Value If score is: 2 = H *Record the rating on the first page*

Legend

Stream

Delineated wetland boundary

Cowardin class

PSS - Palustrine scrub-shrub

Figure D-31.
Cowardin Classes for Wetland 89.

0 25 50 100 Feet

HERRERA

ESRI, Aerial (2020)

K:\Projects\Y2016\16-06277-000\Project\GISWorking\Wetland_Delineation2021\Ratings_Figures\FigX_CowardinClass_WLX_letter.mxd

Legend

Streams (Pierce County 2021)

Delineated wetland boundary

Delineated OHWM

Wetland

Stream

150ft boundary

Hydroperiod

Saturated only

Figure D-32.
Hydroperiod, 150-Foot Boundary, and Location of Outlets for Wetland 89.

N

0 45 90 180 Feet

HERRERA

ESRI, Aerial (2021)

K:\Projects\Y2016\16-06277-000\Project\GISWorking\Wetland_Delineation2021\Ratings_Figures\FigX_Hydroperiods_WLX_letter.mxd

Legend

Flow Direction
Streams (Pierce County 2021)
Surveyed ditches
Culverts
Wetland
Stream
Delineated OHWM

Figure D-32a.
Flow Directions and Features Associated with Wetland 89.

N
0 45 90 180 Feet

HERRERA

ESRI, Aerial (2020)

K:\Projects\Y2016\16-06277-000\Project\GISWorking\Wetland_Delineation2021\Ratings_Figures\FigX_FlowDirection_WLX_letter.mxd

Legend

Contributing basin

Wetland

Delineated wetland boundary

Figure D-33.
Map of Contributing Basin for Wetland 89.

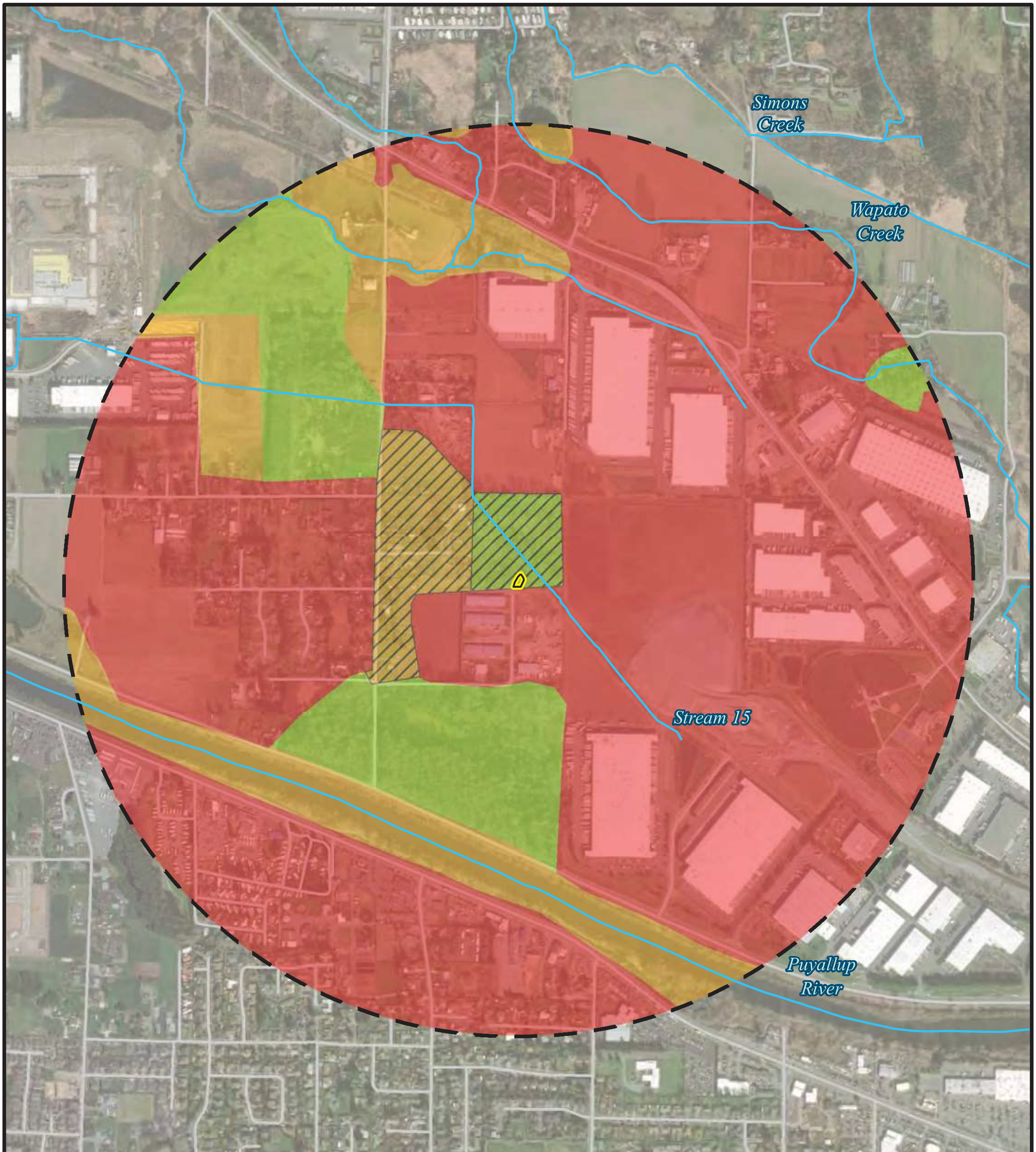
N

0 50 100 200
Feet

HERRERA

Esri, Aerial (2021)

K:\Projects\Y2016\16-06277-000\Project\GISWorking\Wetland_Delineation2021\Ratings_Figures\FigX_ContributingBasin_WLX_letter.mxd



Legend

- Delineated wetland boundary
- 1-km boundary
- Wetland
- Stream (Pierce County)

Habitat type

- High intensity
- Low/Moderate Intensity and accessible
- Low/Moderate Intensity
- Relatively undisturbed
- Relatively undisturbed and accessible

Figure D-34.
Habitat Within a 1-km Boundary of Wetland 89.

N

0 500 1,000 2,000 Feet

HERRERA

Esri, Aerial (2021)

K:\Projects\Y2016\16-06277-000\Project\GISWorking\Wetland_Delineation2021\Ratings_Figures\FigX_Habitat1KM_WLX_letter.mxd

RATING SUMMARY – Western Washington

Name of wetland (or ID #): SR 167 Completion Project – Wetland 93 Date of site visit: 4/20/2021

Rated by R. Baker Trained by Ecology? ☒ Yes ☐ No Date of Training Sep. 2008

HGM Class used for rating Depressional Wetland has multiple HGM classes? ☐ Yes ☒ No

Additional HGM Classes (*if multiple*): n/a

Source of base aerial photo/map ESRI Aerial, 2020

OVERALL WETLAND CATEGORY III (based on functions ☒ or special characteristics ☐)

1. Category of wetland based on FUNCTIONS

Category III – Total score = 16 – 19

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
Enter the appropriate ratings				
Site Potential	L	M	L	
Landscape Potential	H	H	L	
Value	H	M	M	**TOTAL**
Score Based on Ratings	7	7		8

Score for each function based on three ratings

(*order of ratings is not important*)

9 = H,H,H
8 = H,H,M
7 = H,H,L
7 = H,M,M
6 = H,M,L
6 = M,M,M
5 = H,L,L
5 = M,M,L
4 = M,L,L
3 = L,L,L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	CATEGORY
Estuarine	
Wetland of High Conservation Value	
Bog	
Mature Forest	
Old Growth Forest	
Coastal Lagoon	
Interdunal	
None of the above	X

Maps and figures required to answer questions correctly for Western Washington

<u>Depressional Wetlands</u>

Map of:	To answer questions:	Figure #
Cowardin plant classes	D 1.3, H 1.1, H 1.4	D-39
Hydroperiods and location of outlets	D 1.4, H 1.2, D 1.1, D 4.1	D-40
Flow directions and associated features	n/a	D-40a
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	D-40
Map of the contributing basin	D 4.3, D 5.3	D-41
1 km Polygon: Area that extends 1 km from entire wetland edge—including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	D-42
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	D-5
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	D 3.3	D-6

Wetland name or number: Wetland 93

DEPRESSIONAL AND FLATS WETLANDS

Water Quality Functions – Indicators that the site functions to improve water quality

D 1.0. Does the site have the potential to improve water quality?	
D 1.1. Characteristics of surface water outflows from the wetland: Wetland is a depression or flat depression (QUESTION 7 on key) with no surface water leaving it (no outlet) | points = 3	3
D 1.2. The soil 2 in below the surface (or duff layer) is true clay or true organic *(use NRCS definitions).* No = 0	0
D 1.3. Characteristics and distribution of persistent plants (Emergent, Scrub-shrub, and/or Forested Cowardin classes): Wetland has persistent, ungrazed plants < 1/10 of area | points = 0	0
D 1.4. Characteristics of seasonal ponding or inundation: *This is the area that is ponded for at least 2 months. See description in manual.* Area seasonally ponded is < 1/4 total area of wetland | points = 0	0
Total for D 1 Add the points in the boxes above (F9 key)	3

Rating of Site Potential If score is: 0–5 = L *Record the rating on the first page*

D 2.0. Does the landscape have the potential to support the water quality function of the site?	
D 2.1. Does the wetland unit receive stormwater discharges? Yes = 1	1
D 2.2. Is >10% of the area within 150 ft of the wetland in land uses that generate pollutants? Yes = 1	1
D 2.3. Are there septic systems within 250 ft of the wetland? Yes = 1	1
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1–D 2.3? Source: waterfowl droppings Yes = 1	1
Total for D 2 Add the points in the boxes above	4

Rating of Landscape Potential If score is: 3 or 4 = H *Record the rating on the first page*

D 3.0. Is the water quality improvement provided by the site valuable to society?	
D 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, lake, or marine water that is on the 303(d) list? No = 0	0
D 3.2. Is the wetland in a basin or subbasin where an aquatic resource is on the 303(d) list? Yes = 1	1
D 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality (*answer YES if there is a TMDL for the basin in which the unit is found*)? Yes = 2	2
Total for D 3 Add the points in the boxes above	3

Rating of Value If score is: 2–4 = H *Record the rating on the first page*

COMMENTS: Wetland is adjacent to Stream 14, but does not have direct connection. Pierce County indicates homes on septic in area of wetland. Wetland is upstream of Puyallup, which has TMDLs in place.

Hydrologic Functions – Indicators that the site functions to reduce flooding and stream degradation

D 4.0. Does the site have the potential to reduce flooding and erosion?	
D 4.1. Characteristics of surface water outflows from the wetland: Wetland is a depression or flat depression with no surface water leaving it (no outlet) | points = 4	4
D 4.2. Depth of storage during wet periods: *Estimate the height of ponding above the bottom of the outlet. For wetlands with no outlet, measure from the surface of permanent water or if dry, the deepest part.* Marks of ponding less than 0.5 ft (6 in) | points = 0	0
D 4.3. Contribution of the wetland to storage in the watershed: *Estimate the ratio of the area of upstream basin contributing surface water to the wetland to the area of the wetland unit itself.* The area of the basin is less than 10 times the area of the unit | points = 5	5
Total for D 4 Add the points in the boxes above	9

Rating of Site Potential If score is: 6–11 = M *Record the rating on the first page*

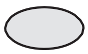
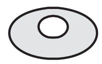
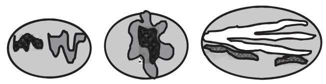
Wetland name or number: Wetland 93

D 5.0. Does the landscape have the potential to support hydrologic functions of the site?	
D 5.1. Does the wetland receive stormwater discharges? Yes = 1	1
D 5.2. Is >10% of the area within 150 ft of the wetland in land uses that generate excess runoff? Yes = 1	1
D 5.3. Is more than 25% of the contributing basin of the wetland covered with intensive human land uses (residential at >1 residence/ac, urban, commercial, agriculture, etc.)? Yes = 1	1
Total for D 5 — Add the points in the boxes above	3
Rating of Landscape Potential — If score is: 3 = H — *Record the rating on the first page*	

D 6.0. Are the hydrologic functions provided by the site valuable to society?	
D 6.1. The unit is in a landscape that has flooding problems. *Choose the description that best matches conditions around the wetland unit being rated. Do not add points. Choose the highest score if more than one condition is met.* The wetland captures surface water that would otherwise flow down-gradient into areas where flooding has damaged human or natural resources (e.g., houses or salmon redds): Surface flooding problems are in a subbasin farther down-gradient | points = 1 **If not applicable chosen above:** Choose an item. **Explanation for 0 points (if required above):**	1
D 6.2. Has the site been identified as important for flood storage or flood conveyance in a regional flood control plan? No = 0	0
Total for D 6 — Add the points in the boxes above	1
Rating of Value — If score is: 1 = M — *Record the rating on the first page*	
COMMENTS:	

These questions apply to wetlands of all HGM classes.
HABITAT FUNCTIONS – Indicators that site functions to provide important habitat

H 1.0. Does the site have the potential to provide habitat?		
H 1.1. Structure of plant community: *Indicators are Cowardin classes and strata within the Forested class.* Check the Cowardin plant classes in the wetland. *Up to 10 patches may be combined for each class to meet the threshold of 1/4 ac or more than 10% of the unit if it is smaller than 2.5 ac. Add the number of structures checked.* ☐ Aquatic bed ☒ Emergent ☐ Scrub-shrub (areas where shrubs have >30% cover) ☐ Forested (areas where trees have >30% cover) *If the unit has a Forested class, check if:* ☐ The Forested class has 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/ground-cover) that each cover 20% within the Forested polygon	1 structure | points = 0	0
H 1.2. Hydroperiods Check the types of water regimes (hydroperiods) present within the wetland. The water regime has to cover more than 10% of the wetland or 1/4 ac to count (*see text for descriptions of hydroperiods*). ☐ Permanently flooded or inundated ☒ Seasonally flooded or inundated ☐ Occasionally flooded or inundated ☒ Saturated only ☐ Permanently flowing stream or river in, or adjacent to, the wetland ☐ Seasonally flowing stream in, or adjacent to, the wetland ☐ **Lake Fringe wetland** ☐ **Freshwater tidal wetland**	2 types present | points = 1 **2 points** **2 points**	1

H 1.3. Richness of plant species Count the number of plant species in the wetland that cover at least 10 ft^2. *Different patches of the same species can be combined to meet the size threshold and you do not have to name the species*. **Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Canadian thistle.** If you counted: 5–19 species | points = 1	1
H 1.4. Interspersion of habitats Decide from the diagrams below whether interspersion among Cowardin plants classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, moderate, low, or none. *If you have four or more plant classes or three classes and open water, the rating is always high.* None | points = 0 **None** = 0 points  **Low** = 1 point  **Moderate** = 2 points  All three diagrams in this row are **HIGH** = 3 points 	0
H 1.5. Special habitat features: Check the habitat features that are present in the wetland. *The number of checks is the number of points*. ☐ Large, downed, woody debris within the wetland (>4 in diameter and 6 ft long). ☐ Standing snags (dbh >4 in) within the wetland ☐ Undercut banks are present for at least 6.6 ft (2 m) **and/or** overhanging plants extends at least 3.3 ft (1 m) over a stream (or ditch) in, or contiguous with the wetland, for at least 33 ft (10 m) ☐ Stable steep banks of fine material that might be used by beaver or muskrat for denning (>30 degree slope) OR signs of recent beaver activity are present (*cut shrubs or trees that have not yet weathered where wood is exposed*) ☐ At least 1/4 ac of thin-stemmed persistent plants or woody branches are present in areas that are permanently or seasonally inundated (*structures for egg-laying by amphibians*) ☒ Invasive plants cover less than 25% of the wetland area in every stratum of plants (*see H 1.1 for list of strata*)	1
Total for H 1 Add the points in the boxes above	3
Rating of Site Potential If score is: 0–6 = L *Record the rating on the first page*	
H 2.0. Does the landscape have the potential to support the habitat functions of the site?	
H 2.1. Accessible habitat (include *only habitat that directly abuts wetland unit*). *Calculate*: % undisturbed habitat <u>1.1</u>**+** [(% moderate and low intensity land uses)2.3/2] <u>1.2</u> **=** **<u>2.3</u>**% If total accessible habitat is: <10% of 1 km Polygon | points = 0	0
H 2.2. Undisturbed habitat in 1 km Polygon around the wetland. *Calculate*: % undisturbed habitat <u>14.4</u>**+** [(% moderate and low intensity land uses)18.1/2] <u>9.1</u> **=** **<u>23.5</u>**% Undisturbed habitat 10–50% and >3 patches | points = 1	1
H 2.3. Land use intensity in 1 km Polygon: 67.5% >50% of 1 km Polygon is high intensity land use | points = (-2)	-2
Total for H 2 Add the points in the boxes above	-1
Rating of Landscape Potential If score is: < 1 = L *Record the rating on the first page*	

H 3.0. Is the habitat provided by the site valuable to society?

H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose only the highest score that applies to the wetland being rated.* — 1

WDFW Priority Habitats within 100 m:

- ☐ Aspen Stands
- ☐ Biodiversity Areas and Corridors
- ☐ Herbaceous Balds
- ☐ Old Growth/Mature Forests
- ☐ Oregon White Oak
- ☒ Riparian
- ☐ Westside Prairies
- ☒ Instream
- ☐ Nearshore
- ☐ Caves
- ☐ Cliffs
- ☐ Talus
- ☐ Snags and Logs

(*Priority habitats listed by WDFW: For complete descriptions of WDFW priority habitats, and the counties in which they can be found, see: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington,* <http://wdfw.wa.gov/publications/00165/wdfw00165.pdf>, *or access the list from here:* <https://wdfw.wa.gov/species-habitats/at-risk/phs/list>.)

Site meets ANY of the following criteria: points = 2

- ☐ It has 3 or more priority habitats within 100 m (checked above)
- ☐ It provides habitat for Threatened or Endangered species (any plant or animal on the state or federal lists)
- ☐ It is mapped as a location for an individual WDFW priority species
- ☐ It is a Wetland of High Conservation Value as determined by the Department of Natural Resources
- ☐ It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan

Site has 1 or 2 priority habitats within 100 m (checked above) points = 1

Site does not meet any of the criteria above points = 0

Rating of Value If score is: 1 = M *Record the rating on the first page*

Legend

Stream

Delineated wetland boundary

Estimated OHWM

Cowardin class

PEM - Palustrine emergent

Figure D-39.
Cowardin Classes for Wetland 93.

0 50 100 200 Feet

HERRERA

ESRI, Aerial (2021)

K:\Projects\Y2016\16-06277-000\Project\GISWorking\Wetland_Delineation2021\Ratings_Figures\FigX_CowardinClass_WLX_letter.mxd

Legend

- Streams (Pierce County 2021)
- Delineated wetland boundary
- Delineated OHWM
- Estimated OHWM
- Wetland
- Stream
- 150ft boundary

Hydroperiod

- Saturated only
- Seasonally flooded

Figure D-40.
Hydroperiod, 150-Foot Boundary, and Location of Outlets for Wetland 93.

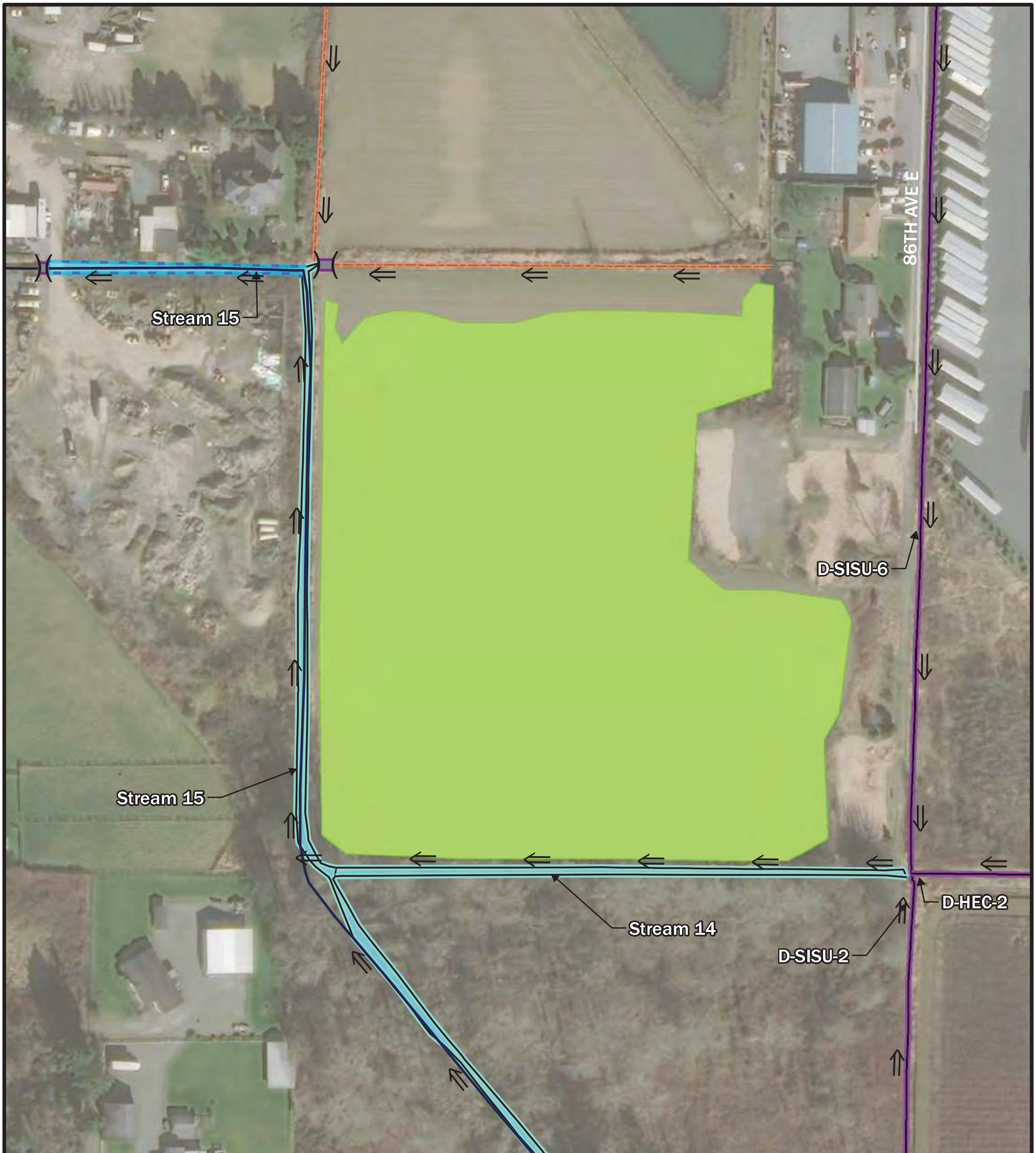
N

0 75 150 300 Feet

HERRERA

ESRI, Aerial (2021)

K:\Projects\Y2016\16-06277-000\Project\GISWorking\Wetland_Delineation2021\Ratings_Figures\FigX_Hydroperiods_WLX_letter.mxd



Legend

- Flow Direction
- Streams (Pierce County 2021)
- Estimated ditch centerline
- Surveyed ditches
- Culverts
- Wetland
- Stream
- Estimated OHWM
- Delineated OHWM

Figure D-40a.
Flow Directions and Features Associated with Wetland 93.

0 75 150 300 Feet

HERRERA

ESRI, Aerial (2020)

K:\Projects\Y2016\16-06277-000\Project\GISWorking\Wetland_Delineation2021\Ratings_Figures\FigX_FlowDirection_WLX_letter.mxd

Legend

Contributing basin

Wetland

Delineated wetland boundary

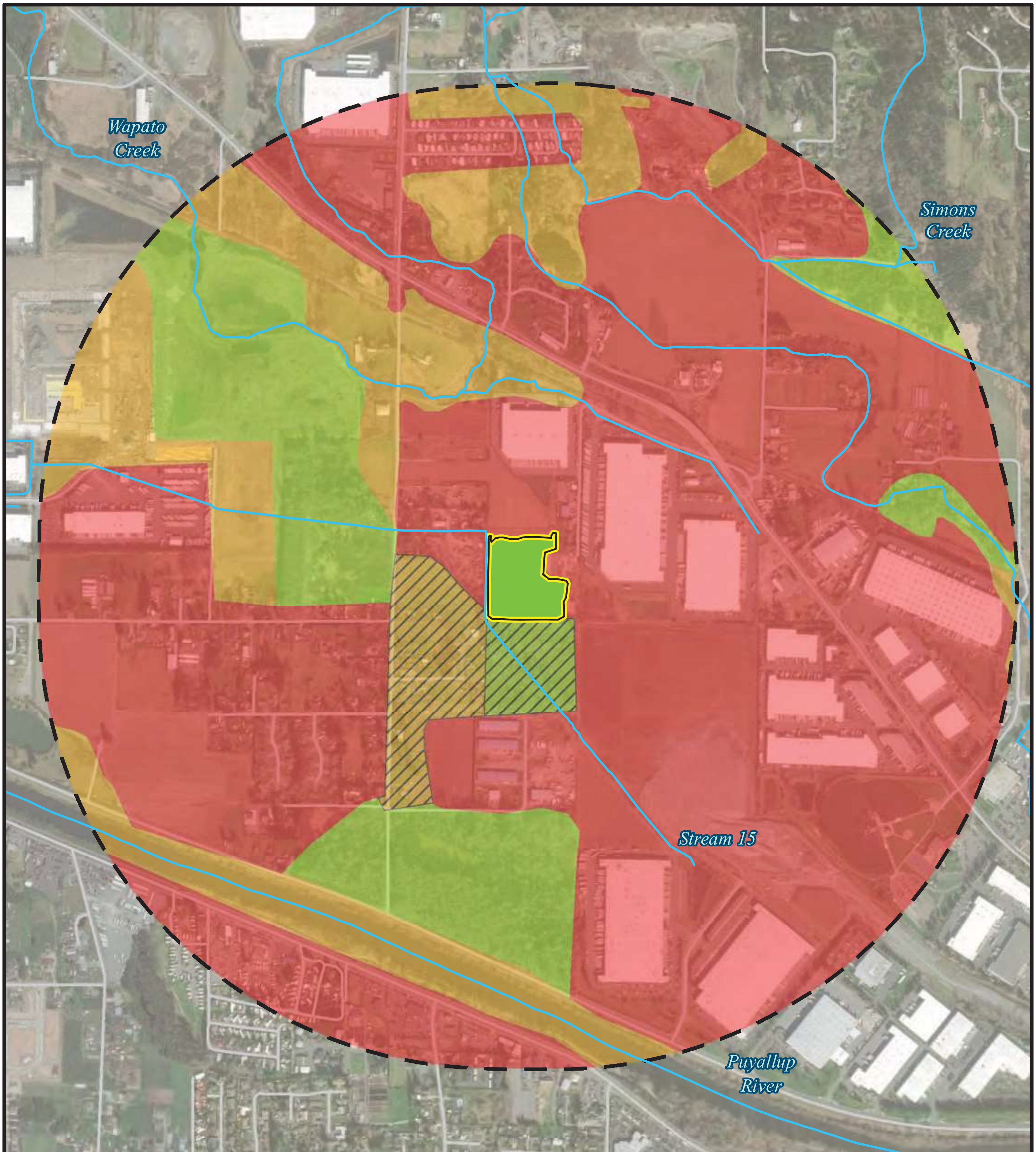
Figure D-41.
Map of Contributing Basin for Wetland 93.

N

0 75 150 300 Feet

Esri, Aerial (2021)

K:\Projects\Y2016\16-06277-000\Project\GISWorking\Wetland_Delineation2021\Ratings_Figures\FigX_ContributingBasin_WLX_letter.mxd



Legend

- Delineated wetland boundary
- 1-km boundary
- Wetland
- Stream (Pierce County)

Habitat type

- High intensity
- Low/Moderate Intensity
- Low/Moderate Intensity and accessible
- Relatively undisturbed
- Relatively undisturbed and accessible

Figure D-42.
Habitat Within a 1-km Boundary of Wetland 93.

0 500 1,000 2,000 Feet

HERRERA

Esri, Aerial (2021)

K:\Projects\Y2016\16-06277-000\Project\GISWorking\Wetland_Delineation2021\Ratings_Figures\FigX_Habitat1KM_WLX_letter.mxd

RATING SUMMARY – Western Washington

Name of wetland (or ID #): SR 167 Completion Project – Wetland 146/148 Date of site visit: 11/30/2022

Rated by J. Hearsey Trained by Ecology? ☒ Yes ☐ No Date of Training 2016

HGM Class used for rating Depressional Wetland has multiple HGM classes? ☐ Yes ☒ No

Additional HGM Classes (*if multiple*):

Source of base aerial photo/map ESRI Aerial, 2020

OVERALL WETLAND CATEGORY III (based on functions ☒ or special characteristics ☐)

1. Category of wetland based on FUNCTIONS

Category III – Total score = 16 – 19

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
Enter the appropriate ratings				
Site Potential	M	L	L	
Landscape Potential	H	H	L	
Value	H	M	M	**TOTAL**
Score Based on Ratings	8	6	4	18

Score for each function based on three ratings

(*order of ratings is not important*)

9 = H,H,H
8 = H,H,M
7 = H,H,L
7 = H,M,M
6 = H,M,L
6 = M,M,M
5 = H,L,L
5 = M,M,L
4 = M,L,L
3 = L,L,L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	CATEGORY
Estuarine	
Wetland of High Conservation Value	
Bog	
Mature Forest	
Old Growth Forest	
Coastal Lagoon	
Interdunal	
None of the above	**X**

Maps and figures required to answer questions correctly for Western Washington

<u>Depressional Wetlands</u>

Map of:	To answer questions:	Figure #
Cowardin plant classes	D 1.3, H 1.1, H 1.4	B-23
Hydroperiods	D 1.4, H 1.2	B-24
Flow directions and associated features	n/a	B-24a
Location of outlet (*can be added to map of hydroperiods)*	D 1.1, D 4.1	B-24
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	B-24
Map of the contributing basin	D 4.3, D 5.3	B-25
1 km Polygon: Area that extends 1 km from entire wetland edge—including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	B-26
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	B-5
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	D 3.3	B-6

Wetland name or number: Wetland 146/148

DEPRESSIONAL AND FLATS WETLANDS

Water Quality Functions – Indicators that the site functions to improve water quality

D 1.0. Does the site have the potential to improve water quality?	
D 1.1. Characteristics of surface water outflows from the wetland: Wetland has an intermittently flowing stream or ditch | points = 2	2
D 1.2. The soil 2 in below the surface (or duff layer) is true clay or true organic *(use NRCS definitions).* No = 0	0
D 1.3. Characteristics and distribution of persistent plants (Emergent, Scrub-shrub, and/or Forested Cowardin classes): Wetland has persistent, ungrazed plants > 95% of area | points = 5	5
D 1.4. Characteristics of seasonal ponding or inundation: *This is the area that is ponded for at least 2 months. See description in manual.* Area seasonally ponded is < 1/4 total area of wetland | points = 0	0
Total for D 1 — Add the points in the boxes above (F9 key)	7

Rating of Site Potential If score is: 6–11 = M *Record the rating on the first page*

D 2.0. Does the landscape have the potential to support the water quality function of the site?	
D 2.1. Does the wetland unit receive stormwater discharges? Yes = 1	1
D 2.2. Is >10% of the area within 150 ft of the wetland in land uses that generate pollutants? Yes = 1	1
D 2.3. Are there septic systems within 250 ft of the wetland? Yes = 1	1
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1–D 2.3? Source: No = 0	0
Total for D 2 — Add the points in the boxes above	3

Rating of Landscape Potential If score is: 3 or 4 = H *Record the rating on the first page*

D 3.0. Is the water quality improvement provided by the site valuable to society?	
D 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, lake, or marine water that is on the 303(d) list? No = 0	0
D 3.2. Is the wetland in a basin or subbasin where an aquatic resource is on the 303(d) list? Yes = 1	1
D 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality (*answer YES if there is a TMDL for the basin in which the unit is found*)? Yes = 2	2
Total for D 3 — Add the points in the boxes above	3

Rating of Value If score is: 2–4 = H *Record the rating on the first page*

COMMENTS: D 2.2: The wetland is adjacent to industrial truck yard with road asphalt and concrete disposal, derelict equipment, and demolition material. D 2.3: Pierce County GIS data indicates homes are outside of sewer service areas. D 3.1: The wetland outlets to Stream 15 which flows for approximately 1.5 miles to Oxbow Lake and eventually the Puyallup River downstream of mapped 303(d). D 3.2 and D 3.3. The wetland is in the Puyallup River basin (HUC 12), which contains 303(d) listed waters and has TMDLs in place.

Hydrologic Functions – Indicators that the site functions to reduce flooding and stream degradation

D 4.0. Does the site have the potential to reduce flooding and erosion?	
D 4.1. Characteristics of surface water outflows from the wetland: Wetland has an intermittently flowing stream or ditch | points = 2	2
D 4.2. Depth of storage during wet periods: *Estimate the height of ponding above the bottom of the outlet. For wetlands with no outlet, measure from the surface of permanent water or if dry, the deepest part.* Marks of ponding less than 0.5 ft (6 in) | points = 0	0
D 4.3. Contribution of the wetland to storage in the watershed: *Estimate the ratio of the area of upstream basin contributing surface water to the wetland to the area of the wetland unit itself.* The area of the basin is 10 to 100 times the area of the unit | points = 3	3
Total for D 4 — Add the points in the boxes above	5

Rating of Site Potential If score is: 0–5 = L *Record the rating on the first page*

D 5.0. Does the landscape have the potential to support hydrologic functions of the site?	
D 5.1. Does the wetland receive stormwater discharges? Yes = 1	1
D 5.2. Is >10% of the area within 150 ft of the wetland in land uses that generate excess runoff? Yes = 1	1
D 5.3. Is more than 25% of the contributing basin of the wetland covered with intensive human land uses (residential at >1 residence/ac, urban, commercial, agriculture, etc.)? Yes = 1	1
Total for D 5 Add the points in the boxes above	3

Rating of Landscape Potential If score is: 3 = H *Record the rating on the first page*

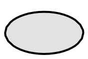
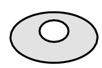
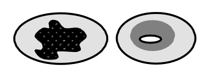
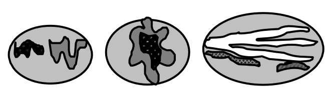
D 6.0. Are the hydrologic functions provided by the site valuable to society?	
D 6.1. The unit is in a landscape that has flooding problems. *Choose the description that best matches conditions around the wetland unit being rated. Do not add points. Choose the highest score if more than one condition is met.* The wetland captures surface water that would otherwise flow down-gradient into areas where flooding has damaged human or natural resources (e.g., houses or salmon redds): Surface flooding problems are in a subbasin farther down-gradient | points = 1 **If not applicable chosen above:** The existing or potential outflow from the wetland is so constrained by human or natural conditions that the water stored by the wetland cannot reach areas that flood. Explain why. | points = 0 **Explanation for 0 points (if required above): designed for infiltration with no inlet or outlets**	1
D 6.2. Has the site been identified as important for flood storage or flood conveyance in a regional flood control plan? No = 0	0
Total for D 6 Add the points in the boxes above	1

Rating of Value If score is: 1 = M *Record the rating on the first page*

COMMENTS:

These questions apply to wetlands of all HGM classes.
HABITAT FUNCTIONS – Indicators that site functions to provide important habitat

H 1.0. Does the site have the potential to provide habitat?	
H 1.1. Structure of plant community: *Indicators are Cowardin classes and strata within the Forested class.* Check the Cowardin plant classes in the wetland. *Up to 10 patches may be combined for each class to meet the threshold of 1/4 ac or more than 10% of the unit if it is smaller than 2.5 ac. Add the number of structures checked.* 2 structures | points = 1 ☐ Aquatic bed ☒ Emergent ☒ Scrub-shrub (areas where shrubs have >30% cover) ☐ Forested (areas where trees have >30% cover) *If the unit has a Forested class, check if:* ☐ The Forested class has 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/ground-cover) that each cover 20% within the Forested polygon	1

H 1.2. Hydroperiods 2 types present | points = 1 Check the types of water regimes (hydroperiods) present within the wetland. The water regime has to cover more than 10% of the wetland or 1/4 ac to count (*see text for descriptions of hydroperiods*). ☐ Permanently flooded or inundated ☐ Seasonally flooded or inundated ☐ Occasionally flooded or inundated ☒ Saturated only ☐ Permanently flowing stream or river in, or adjacent to, the wetland ☒ Seasonally flowing stream in, or adjacent to, the wetland ☐ **Lake Fringe wetland** **2 points** ☐ **Freshwater tidal wetland** **2 points**	1
H 1.3. Richness of plant species Count the number of plant species in the wetland that cover at least 10 ft^2. *Different patches of the same species can be combined to meet the size threshold and you do not have to name the species*. ***Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Canadian thistle.*** If you counted: 5–19 species | points = 1	1
H 1.4. Interspersion of habitats Decide from the diagrams below whether interspersion among Cowardin plants classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, moderate, low, or none. *If you have four or more plant classes or three classes and open water, the rating is always high.* Low | points = 1 **None** = 0 points  **Low** = 1 point  **Moderate** = 2 points  All three diagrams in this row are **HIGH** = 3 points 	1
H 1.5. Special habitat features: Check the habitat features that are present in the wetland. *The number of checks is the number of points*. ☐ Large, downed, woody debris within the wetland (>4 in diameter and 6 ft long). ☐ Standing snags (dbh >4 in) within the wetland ☐ Undercut banks are present for at least 6.6 ft (2 m) **and/or** overhanging plants extends at least 3.3 ft (1 m) over a stream (or ditch) in, or contiguous with the wetland, for at least 33 ft (10 m) ☐ Stable steep banks of fine material that might be used by beaver or muskrat for denning (>30 degree slope) OR signs of recent beaver activity are present (*cut shrubs or trees that have not yet weathered where wood is exposed*) ☐ At least 1/4 ac of thin-stemmed persistent plants or woody branches are present in areas that are permanently or seasonally inundated (*structures for egg-laying by amphibians*) ☐ Invasive plants cover less than 25% of the wetland area in every stratum of plants (*see H 1.1 for list of strata*)	0
Total for H 1 Add the points in the boxes above	4

Rating of Site Potential If score is: 0–6 = L *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support the habitat functions of the site?	
H 2.1. Accessible habitat (include *only habitat that directly abuts wetland unit*). *Calculate*: % undisturbed habitat 0.0 **+** [(% moderate and low intensity land uses) 0.6/2] **0.3** **=** 0.0% If total accessible habitat is: <10% of 1 km Polygon | points = 0	0
H 2.2. Undisturbed habitat in 1 km Polygon around the wetland. *Calculate*: % undisturbed habitat 13.0 **+** [(% moderate and low intensity land uses)20.0/2] 10.0 **=** **23.0**% Undisturbed habitat 10–50% and >3 patches | points = 1	1
H 2.3. Land use intensity in 1 km Polygon: If >50% of 1 km Polygon is high intensity land use | points = (-2)	-2

Total for H 2	Add the points in the boxes above	-1

Rating of Landscape Potential If score is: < 1 = L *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose only the highest score that applies to the wetland being rated.* WDFW Priority Habitats within 100 m: ☐ Aspen Stands ☐ Biodiversity Areas and Corridors ☐ Herbaceous Balds ☐ Old Growth/Mature Forests ☐ Oregon White Oak ☒ Riparian ☐ Westside Prairies ☒ Instream ☐ Nearshore ☐ Caves ☐ Cliffs ☐ Talus ☐ Snags and Logs (*Priority habitats listed by WDFW: For complete descriptions of WDFW priority habitats, and the counties in which they can be found, see: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington,* <http://wdfw.wa.gov/publications/00165/wdfw00165.pdf>, *or access the list from here:* <https://wdfw.wa.gov/species-habitats/at-risk/phs/list>.) Site meets ANY of the following criteria: points = 2 ☐ It has 3 or more priority habitats within 100 m (checked above) ☐ It provides habitat for Threatened or Endangered species (any plant or animal on the state or federal lists) ☐ It is mapped as a location for an individual WDFW priority species ☐ It is a Wetland of High Conservation Value as determined by the Department of Natural Resources ☐ It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan Site has 1 or 2 priority habitats within 100 m (checked above) points = 1 Site does not meet any of the criteria above points = 0	1

Rating of Value If score is: 1 = M *Record the rating on the first page*

Legend

- Stream
- Delineated wetland boundary
- Estimated wetland boundary

Cowardin class

- PEM - Palustrine emergent
- PSS - Palustrine scrub-shrub

Figure **B-23**.
Cowardin Classes for Wetland 146/148.

0 55 110 220 Feet

HERRERA

ESRI, Aerial (2021)

K:\Projects\Y2016\16-06277-000\Pro\WSAR_Rating_Figures_Stage2\WSAR_Rating_Figures_Stage2.aprx\FigX_CowardinClass_WLX

Legend

- Stream (Pierce County 2021)
- Delineated wetland boundary
- Estimated wetland boundary
- Delineated OHWM
- Estimated OHWM
- Wetland
- Stream
- 150ft boundary
- Outlet

Hydroperiod

- Saturated only

Figure **B-24**.
Hydroperiod, 150-**F**oot Boundary, and Location of Outlets for Wetland 146/148.

0 75 150 300 Feet

HERRERA

Esri, Aerial (2021)

K:\Projects\Y2016\16-06277-000\Pro\WSAR_Rating_Figures_Stage2\WSAR_Rating_Figures_Stage2.aprx\FigX_Hydroperiods_WLX

Legend

- Flow Direction
- Streams (Pierce County 2021)
- Estimated ditch centerline
- Culverts
- Wetland
- Stream
- Estimated OHWM
- Delineated OHWM

Figure B-24a.
Flow Directions and Features Associated with Wetland 146/148.

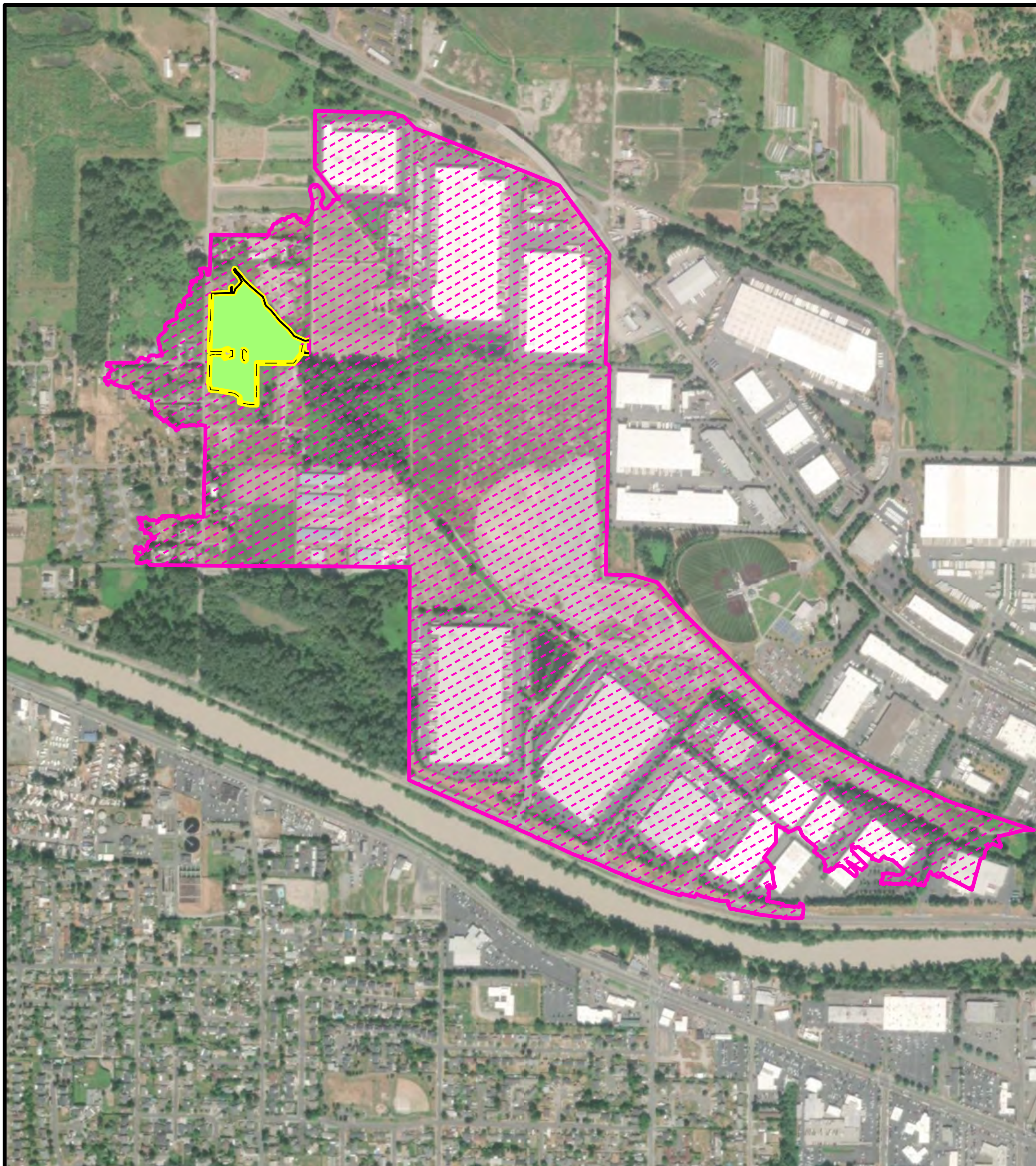
N

0 65 130 260 Feet

HERRERA

Esri, Aerial (2021)

K:\Projects\Y2016\16-06277-000\Pro\WSAR_Rating_Figures_Stage2\WSAR_Rating_Figures_Stage2.aprx\FigX_FlowDirection_WLX



Legend

Contributing basin

Wetland

Delineated wetland boundary

Estimated wetland boundary

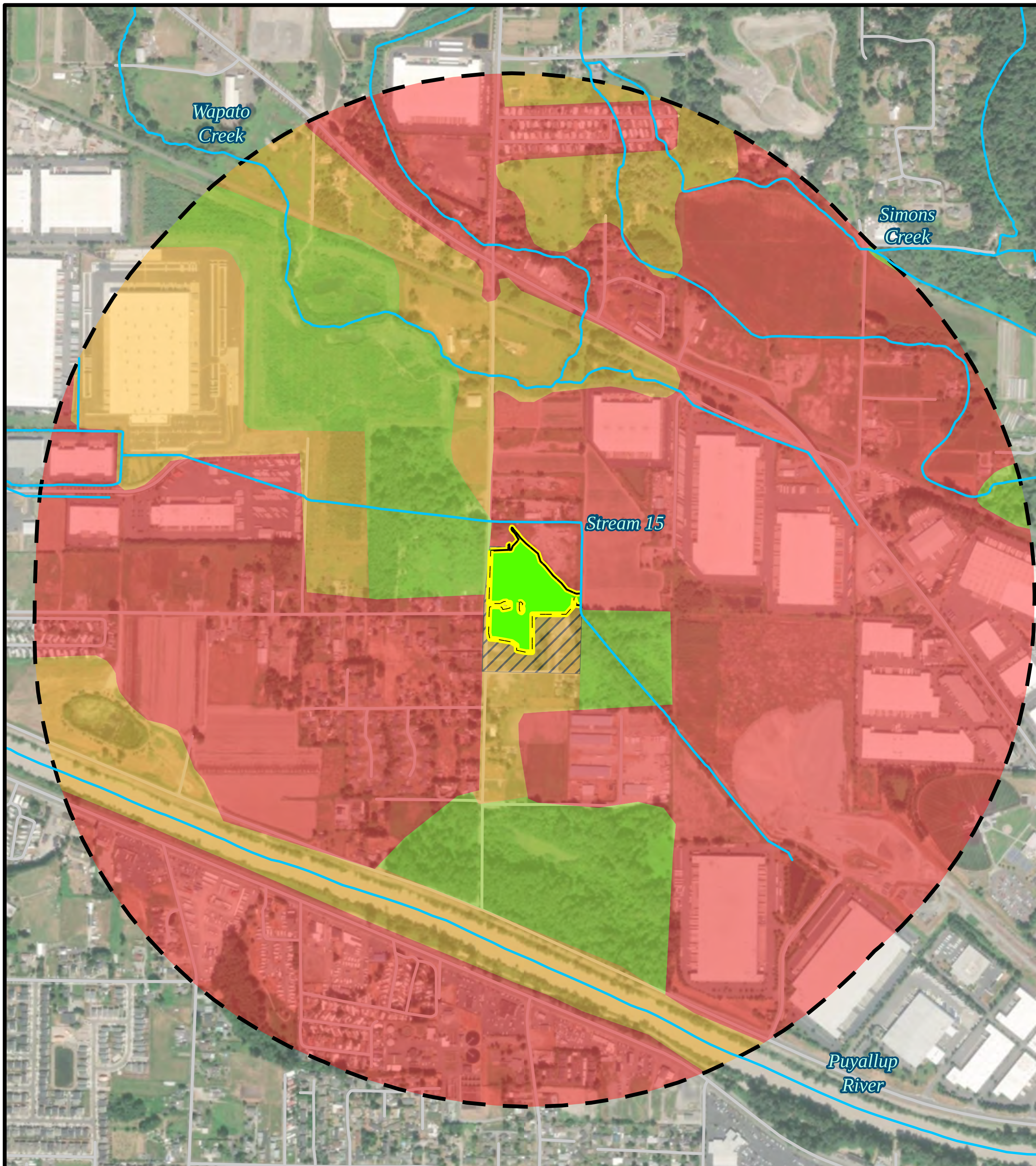
Figure B-25.
Map of Contributing Basin for Wetland 146/148.

0 460 920 1,840 Feet

HERRERA

Esri, Aerial (2021)

K:\Projects\Y2016\16-06277-000\Pro\WSAR_Rating_Figures_Stage2\WSAR_Rating_Figures_Stage2.aprx\FigX_ContributingBasin_WLX



Legend

- Delineated wetland boundary
- Estimated wetland boundary
- 1-km boundary
- Wetland
- Stream (Pierce County)

Habitat type

- High intensity
- Low/Moderate Intensity and accessible
- Low/Moderate Intensity
- Relatively undisturbed

Figure B-26.
Habitat Within a 1-km Boundary of Wetland 146/148.

N

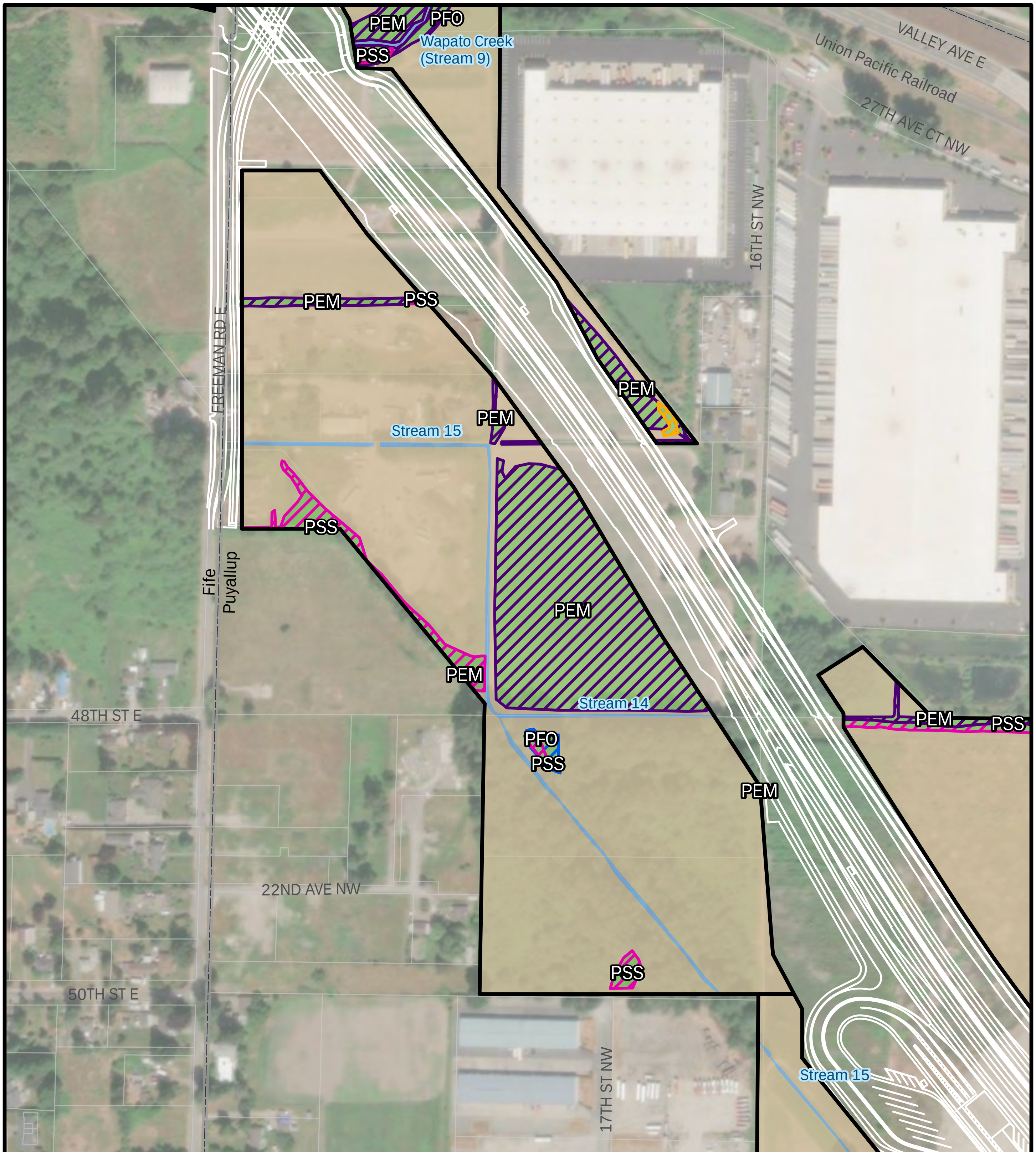
0 500 1,000 2,000 Feet

HERRERA

Esri, Aerial (2021)

K:\Projects\Y2016\16-06277-000\Pro\WSAR_Rating_Figures_Stage2\WSAR_Rating_Figures_Stage2.aprx\FigX_Habitat1KM_WLX

Appendix D
WSDOT State Route 167 Completion Project Mitigation Excerpts



Legend

- Stage 2 RRP Boundary
- Jurisdictional boundary
- Parcel boundaries
- Stage 2 Proposed Road and Shared-Use Path (white line)
- Stream
- Upland
- Wetland
- Bare Ground

CowardinClass

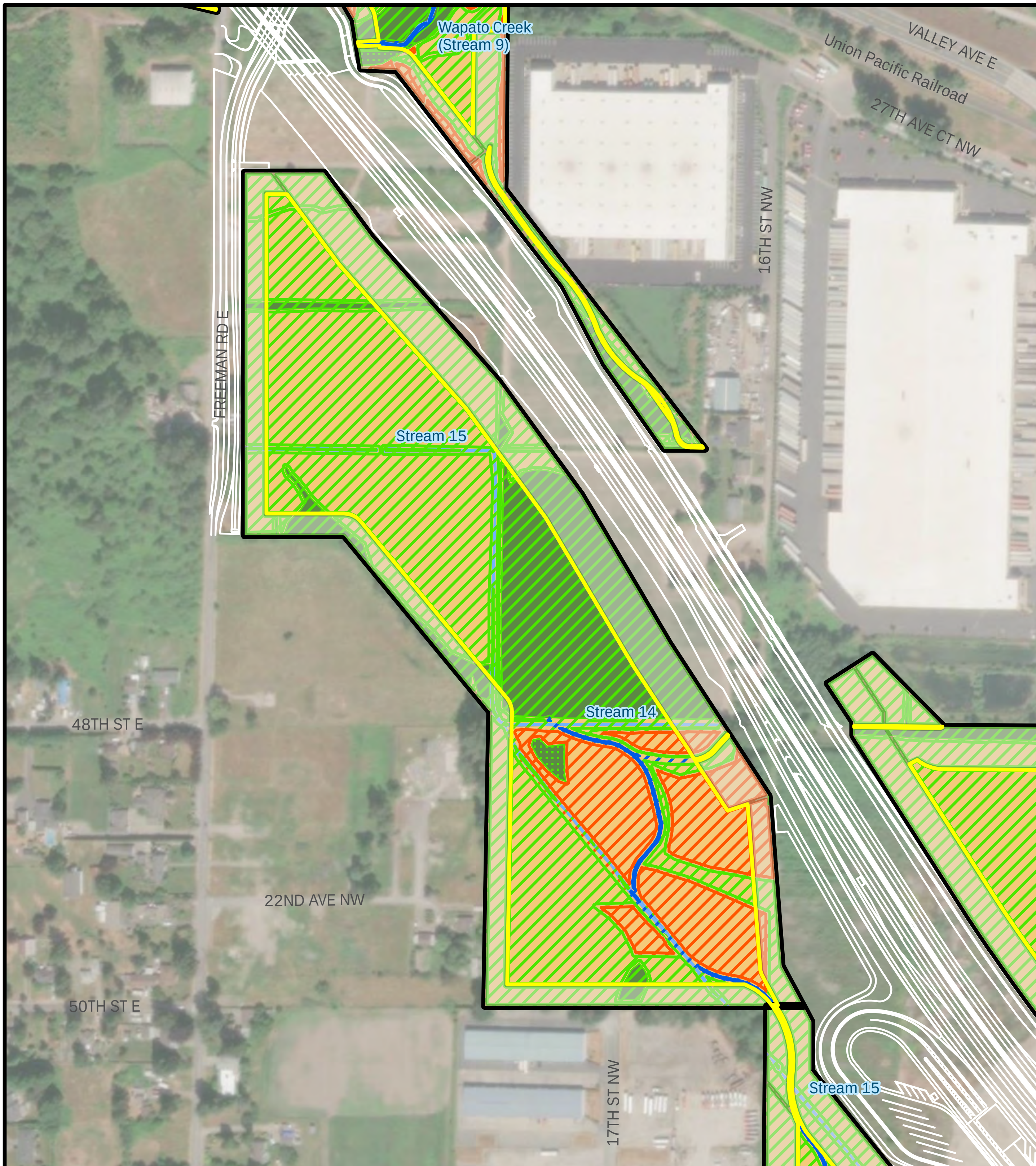
- PEM
- PFO
- PSS

Figure 4-L. Existing Conditions for the SR 167 Completion Project, Stage 2 - Freeman Road Mitigation Site.

0 165 330 660 Feet

Esri Imagery (2023)

K:\Projects\Y2016\16-06277-000\Pro\MitigationPlan_Stage2\MitigationPlan_Stage2.aprx\Fig4_Mitigation_Sites_Existing_Conditions_Stage2
Exported: 8/16/2023 2:36 PM



Legend

- Credit-Generating Area
- Mitigation Buffer
- Stage 2 RRP Boundary
- Stage 2 Proposed Road and Shared-Use Path (white line)
- Wetland Reestablishment (Upland to Wetland)
- Stream Creation (Upland to Stream)
- Upland Enhancement (Upland to Upland)
- Stream Enhancement (Stream to Stream)
- Wetland Rehabilitation (Stream to Wetland)
- Stream Creation (Wetland to Stream)
- Wetland Rehabilitation (Wetland to Wetland)
- Wetland Enhancement (Wetland to Wetland)

Figure 5--L. Proposed Conditions for the SR 167 Completion Project, Stage 2 - Freeman Road Mitigation Site.

N

0 165 330 660 Feet

HERRERA
Science + Planning + Design

Esri Imagery (2023)

K:\Projects\Y2016\16-06277-000\Pro\MitigationPlan_Stage2\MitigationPlan_Stage2.aprx\Fig5_Mitigation_Proposed_Conditions_Stage2
Exported: 8/16/2023 2:37 PM

FILE NAME	O:\proj\Y2016\16-06277-000\CAD\Dwg\Stream Restorartion\XL5105_PS_SPL_01.dgn				
TIME	7:19:38 PM				
DATE	8/15/2023				
PLOTTED BY	tprescott				
DESIGNED BY	G. KAYSER				
ENTERED BY	T. PRESCOTT				
CHECKED BY	K. FORESTER				
PROJ. ENGR.	C. SODERQUIST				
REGIONAL ADM.	J. WHITE	REVISION	DATE	BY	

REGION NO. 10 | STATE WASH | FED.AID PROJ.NO. 0167(059)

JOB NUMBER 22C529

CONTRACT NO.

LOCATION NO. XL5105

CONCEPTUAL DESIGN NOT FOR CONSTRUCTION

Washington State Department of Transportation

SR 167
I-5 TO SR 161
NEW EXPRESSWAY

STREAM PLAN KEY MAP

PLAN REF NO SPL01

SHEET OF SHEETS

LEGEND:

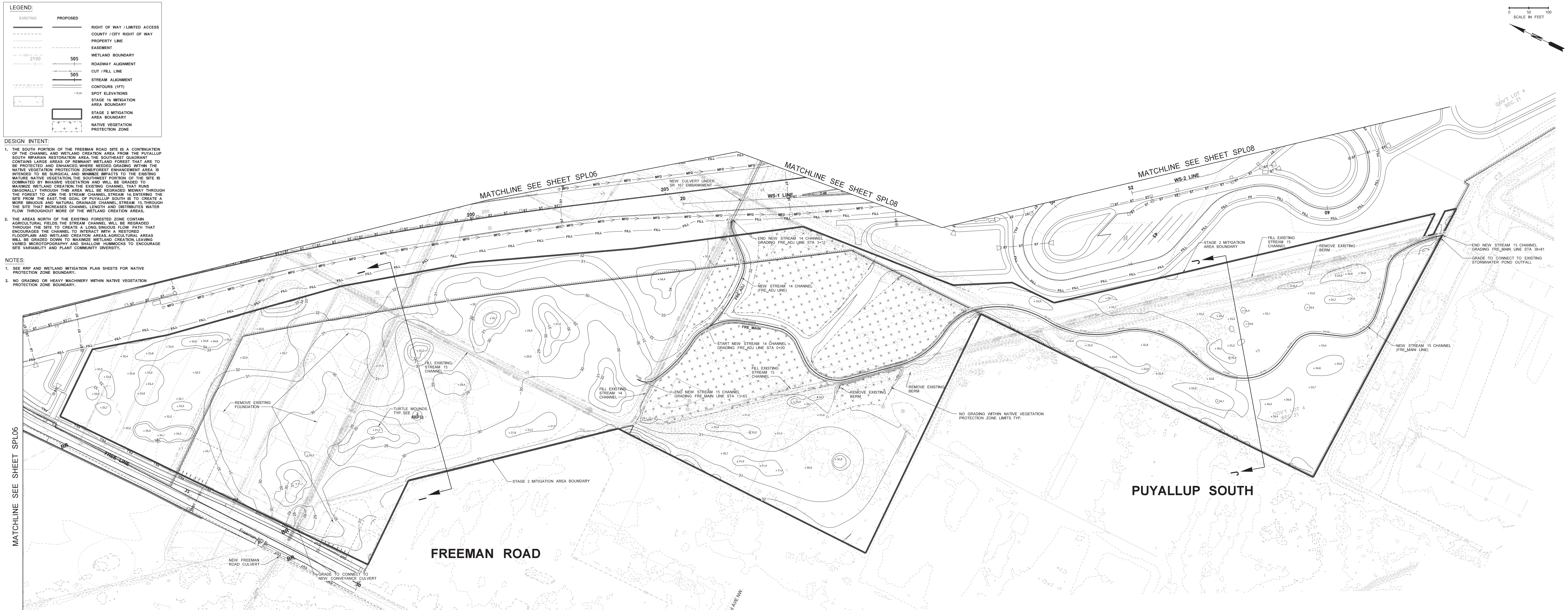
EXISTING	PROPOSED	
		RIGHT OF WAY / LIMITED ACCESS
		COUNTY / CITY RIGHT OF WAY
		PROPERTY LINE
		EASEMENT
2190		WETLAND BOUNDARY
	505	ROADWAY ALIGNMENT
		CUT / FILL LINE
	505	STREAM ALIGNMENT
30		CONTOURS (1FT)
	+15.00	SPOT ELEVATIONS
		STAGE 1b MITIGATION AREA BOUNDARY
		STAGE 2 MITIGATION AREA BOUNDARY
		NATIVE VEGETATION PROTECTION ZONE

DESIGN INTENT:

1. THE SOUTH PORTION OF THE FREEMAN ROAD SITE IS A CONTINUATION OF THE CHANNEL AND WETLAND CREATION AREA FROM THE PUYALLUP SOUTH RIPARIAN RESTORATION AREA. THE SOUTHEAST QUADRANT CONTAINS LARGE AREAS OF REMNANT WETLAND FOREST THAT ARE TO BE PROTECTED AND ENHANCED, WHERE NEEDED. GRADING WITHIN THE NATIVE VEGETATION PROTECTION ZONE/FOREST ENHANCEMENT AREA IS INTENDED TO BE SURGICAL AND MINIMIZE IMPACTS TO THE EXISTING MATURE NATIVE VEGETATION. THE SOUTHWEST PORTION OF THE SITE IS DOMINATED BY INVASIVE VEGETATION AND WILL BE GRADED TO MAXIMIZE WETLAND CREATION. THE EXISTING CHANNEL THAT RUNS DIAGONALLY THROUGH THIS AREA WILL BE REGRADED MIDWAY THROUGH THE FOREST TO JOIN THE STREAM CHANNEL, STREAM 14, ENTERING THE SITE FROM THE EAST. THE GOAL OF PUYALLUP SOUTH IS TO CREATE A MORE SINUOUS AND NATURAL DRAINAGE CHANNEL, STREAM 15, THROUGH THE SITE THAT INCREASES CHANNEL LENGTH AND DISTRIBUTES WATER FLOW THROUGHOUT MORE OF THE WETLAND CREATION AREAS.
2. THE AREAS NORTH OF THE EXISTING FORESTED ZONE CONTAIN AGRICULTURAL FIELDS. THE STREAM CHANNEL WILL BE REGRADED THROUGH THE SITE TO CREATE A LONG, SINUOUS FLOW PATH THAT ENCOURAGES THE CHANNEL TO INTERACT WITH A RESTORED FLOODPLAIN AND WETLAND CREATION AREAS. AGRICULTURAL AREAS WILL BE GRADED DOWN TO MAXIMIZE WETLAND CREATION, LEAVING VARIED MICROTOPOGRAPHY AND SHALLOW HUMMOCKS TO ENCOURAGE SITE VARIABILITY AND PLANT COMMUNITY DIVERSITY.

NOTES:

1. SEE RRP AND WETLAND MITIGATION PLAN SHEETS FOR NATIVE PROTECTION ZONE BOUNDARY.
2. NO GRADING OR HEAVY MACHINERY WITHIN NATIVE VEGETATION PROTECTION ZONE BOUNDARY.



FILE NAME	O:\proj\Y2016\16-06277-000\CAD\Dwg\Stream Restorartion\XL5105_PS_SPL_07.dgn						
TIME	7:25:00 PM				REGION NO. 10	STATE WASH	FED.AID PROJ.NO. 0167(059)
DATE	8/15/2023						
PLOTTED BY	tprescott				JOB NUMBER 22C529		
DESIGNED BY	G. KAYSER						
ENTERED BY	T. PRESCOTT				CONTRACT NO.		LOCATION NO. XL5105
CHECKED BY	K. FORESTER						
PROJ. ENGR.	C. SODERQUIST						
REGIONAL ADM.	J. WHITE	REVISION	DATE	BY			

CONCEPTUAL DESIGN NOT FOR CONSTRUCTION

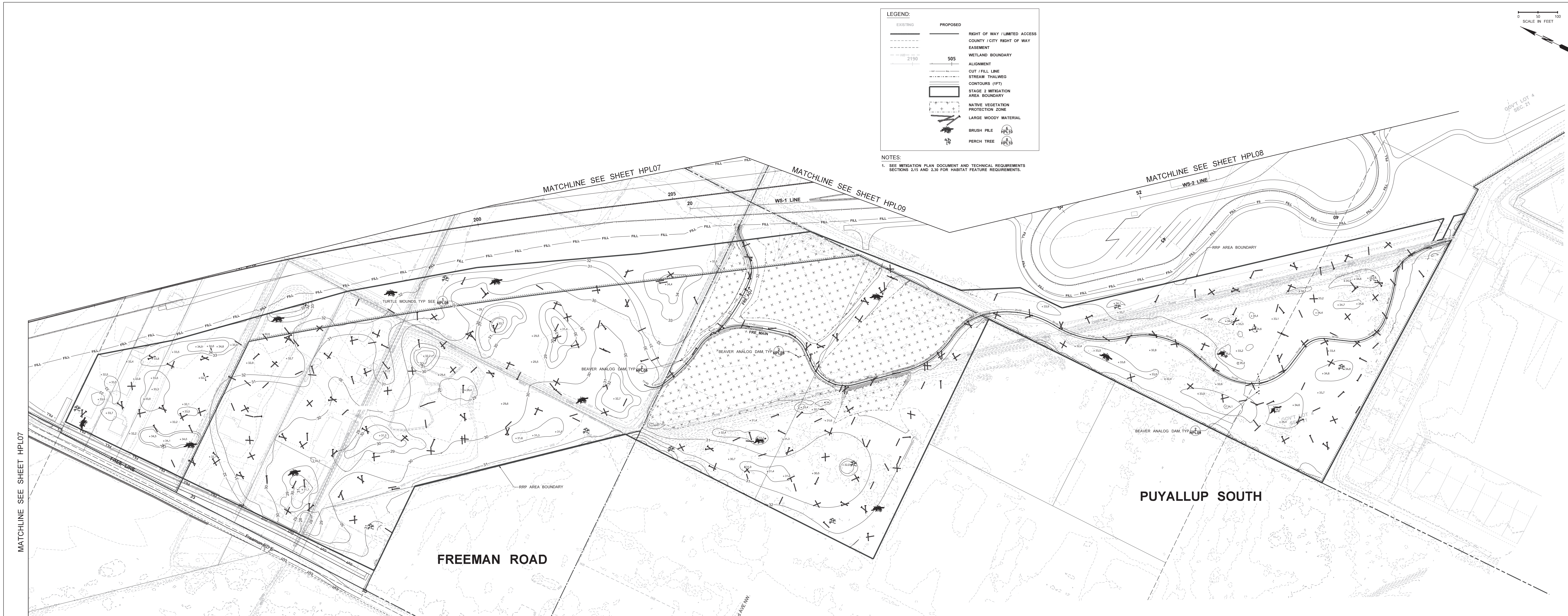
Washington State Department of Transportation

SR 167
I-5 TO SR 161
NEW EXPRESSWAY

STREAM PLAN

PLAN REF NO SPL07

SHEET OF SHEETS



FILE NAME	O:\proj\Y2016\16-06277-000\CAD\Dwg\Habitat\XL5105_PS_HPL_07.dgn			
TIME	3:59:51 PM			
DATE	8/16/2023			
PLOTTED BY	tprescott			
DESIGNED BY	R. TAYLOR			
ENTERED BY	T. PRESCOTT			
CHECKED BY	K. FORESTER			
PROJ. ENGR.	C. SODERQUIST			
REGIONAL ADM.	J. WHITE	REVISION	DATE	BY

REGION NO. 10 | STATE WASH | JOB NUMBER 22C529 | CONTRACT NO.

FED.AID PROJ.NO. 0167(059)

LOCATION NO. XL5105

CONCEPTUAL DESIGN NOT FOR CONSTRUCTION

Washington State Department of Transportation

SR 167
I-5 TO SR 161
NEW EXPRESSWAY

HABITAT PLAN

PLAN REF NO HPL07

SHEET OF SHEETS

PLANTING LEGEND:*

- FORESTED WETLAND (PFO) DECIDUOUS DOMINANT
- NATIVE VEGETATION PROTECTION ZONE
- EMERGENT WETLAND (PEM)
- SCRUB SHRUB WETLAND (PSS)
- AQUATIC VEGETATION
- DENSE HEDGEROW (2 / RRP09)
- BEAVER DETERRENT ZONE (PSS)
- TURTLE MOUND

*NOTE: PLAN HATCH ROTATION VARIES PER SHEET DUE TO DIFFERENT ORIENTATIONS OF NORTH ARROW

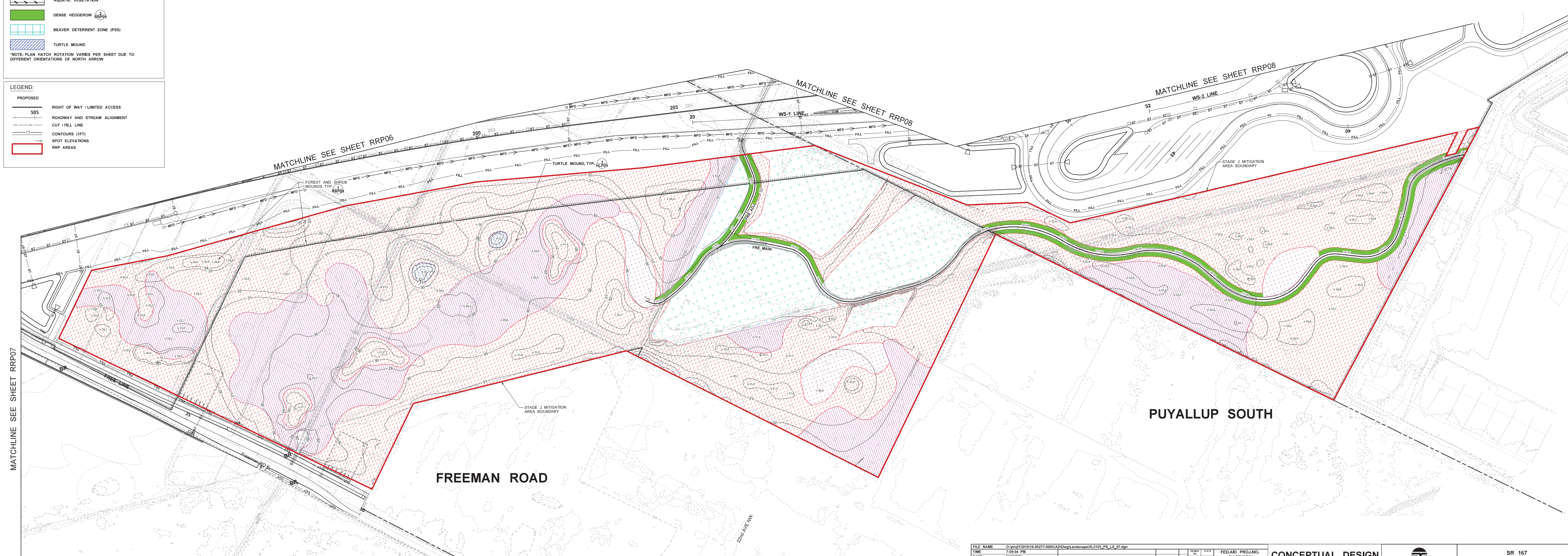
LEGEND:

PROPOSED

- RIGHT OF WAY / LIMITED ACCESS
- 505 ROADWAY AND STREAM ALIGNMENT
- CUT / FILL LINE
- 13 CONTOURS (1FT)
- +14.50 SPOT ELEVATIONS
- RRP AREAS

NOTES:

1. REFER TO RRP10 FOR PLANT ZONE DESCRIPTIONS.
2. PRESERVE EXISTING NATIVE VEGETATION. NATIVE VEGETATION PROTECTION AREAS SHALL REMOVE INVASIVE AND NON-NATIVE WEEDY VEGETATION WHILE PROTECTING EXISTING NATIVE VEGETATION. BARE AREAS SHALL BE REVEGETATED WITH SPECIES APPROPRIATE FOR EACH AREA.



FILE NAME	O:\proj\Y2016\16-06277-000\CAD\Dwg\Landscape\XL5105_PS_LS_07.dgn					
TIME	7:09:04 PM					
DATE	8/15/2023					
PLOTTED BY	tprescott					
DESIGNED BY	R. TAYLOR					
ENTERED BY	T. PRESCOTT					
CHECKED BY	K. FORESTER					
PROJ. ENGR.	C. SODERQUIST					
REGIONAL ADM.	J. WHITE	REVISION	DATE	BY		

REGION NO.	STATE	FED.AID PROJ.NO.
10	WASH	0167(059)
JOB NUMBER 22C529		
CONTRACT NO.		LOCATION NO. XL5105

CONCEPTUAL DESIGN NOT FOR CONSTRUCTION

Washington State Department of Transportation

SR 167
I-5 TO SR 161
NEW EXPRESSWAY

MITIGATION PLAN

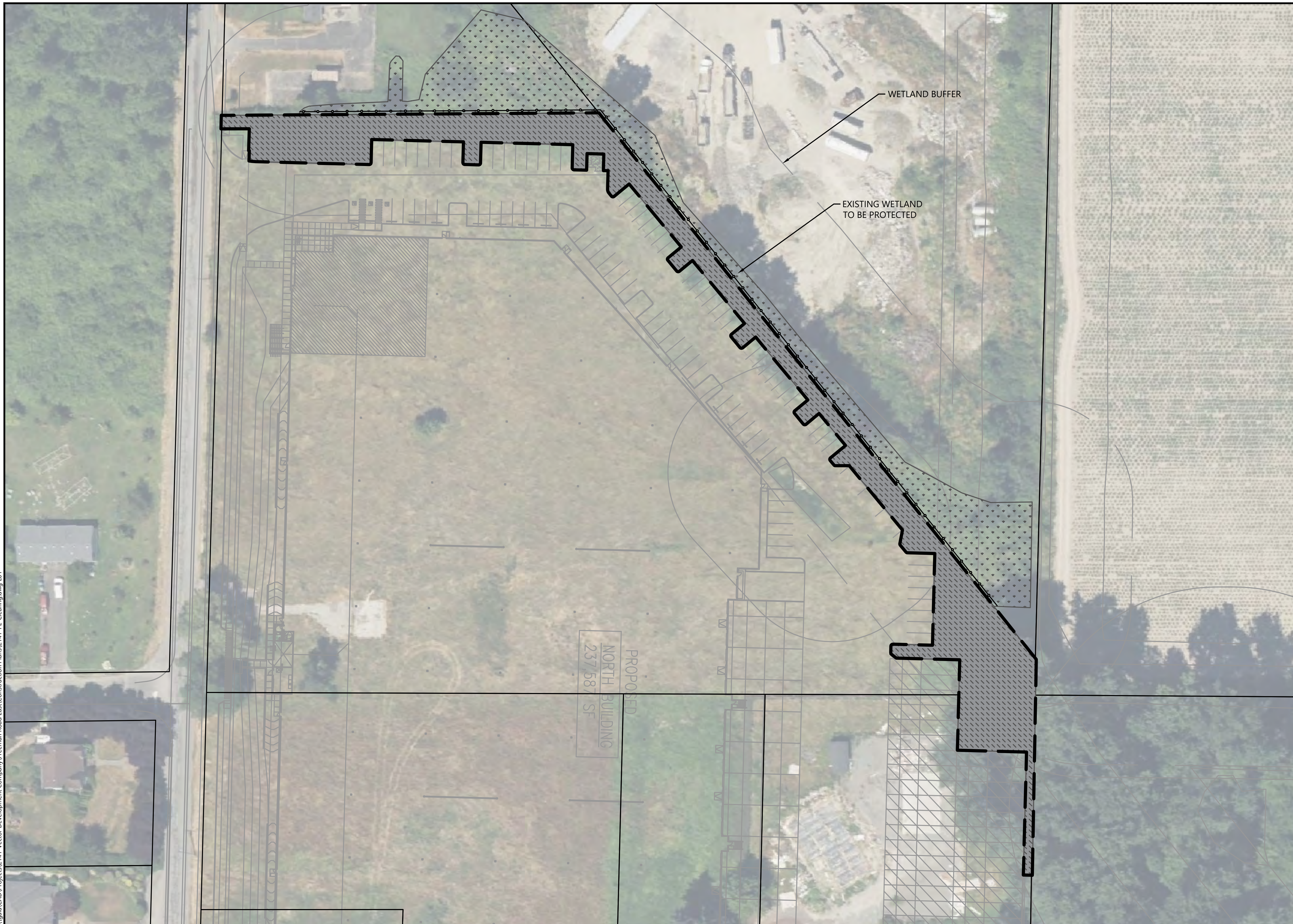
PLAN REF NO RRP07

SHEET OF SHEETS

Table 56g. Objectives and Performance Standards for the SR 167 RRP Wetland and Stream Mitigation – Freeman Road.				
Mitigation Site	**Goal**	**Objective**	**Monitoring Year**	**Performance Standards**
14. Freeman Road	14.1. Restore stream channel	14.1.1 Restore a minimum of 1,292 linear feet of stream channel	Year 10	Combined length of stream channels (as measured in the thalweg) will meet or exceed 1,292 linear feet.
	14.2. Re-establish, rehabilitate, and enhance wetland	14.2.1 Re-establish and rehabilitate a minimum of 15.00 acres of wetland within the CGA • 11.27 acres wetland re-establishment • 3.61 acres wetland rehabilitation • 0.12 acre wetland enhancement	Years 5 and 10	The wetland area at the mitigation site will be delineated using current methods to ensure that the mitigation site contains the anticipated acreage.
		14.2.2 Establish wetland hydrology within re-established wetlands	Years 1, 3, 5, 7, 10	The soils in the wetlands will be saturated to the surface, or standing water will be present within 12 inches of the surface for at least 30 consecutive days during the growing season in years when rainfall meets or exceeds the 30-year average.
	14.3. Improve water quality, hydrologic, and habitat functions in re-established, rehabilitated, and enhanced wetlands	14.3.1 Establish native woody vegetation in wetland	Year 1	Stem density in planted scrub shrub and forested areas will meet or exceed 1,600 stems per acre. Planting density should exceed this metric to account for die-off.
			Year 3	Cover of native saplings, trees, and shrubs in planted forested and scrub-shrub wetland will be at least 20 percent.
			Year 5	Cover of native woody vegetation in planted forested and scrub-shrub wetland will be at least 35 percent.
			Year 7	Cover of native woody vegetation in planted forested and scrub-shrub wetland will be at least 50 percent.
			Year 10	Cover of native woody vegetation in planted forested and scrub-shrub wetland will be at least 75 percent.
			Year 10	A minimum of 10 species of native shrubs and trees will be present in the wetland by the end of the monitoring period.
		14.3.2 Control invasive species	All years	Washington State-listed or county-listed Class A weeds, Japanese knotweed, and purple loosestrife observed in any area of the mitigation site must be eradicated. All occurrences shall be immediately reported to the site manager and an eradication program will be initiated within 30 days of the report.
			Years 1 through 9	Non-designated Class B and Class C noxious weeds including reed canarygrass will not exceed 20 percent cover.
			Year 10	Non-designated Class B and Class C noxious weeds excluding reed canarygrass will not exceed 20 percent cover. Reed canarygrass will only exist as an understory component that does not outcompete native woody vegetation.
		14.3.3 Install fish and wildlife habitat structures	Year 0	Install a minimum of: • 8 perch trees • 10 brush piles • 5 nest boxes • 2 bat boxes on an existing mature tree
	14.4. Improve habitat functions in upland enhancement areas	14.4.1 Control invasive species	All years	Washington State-listed or county-listed Class A weeds, Japanese knotweed, and purple loosestrife observed in any area of the mitigation site must be eradicated. All occurrences shall be immediately reported to the site manager and an eradication program will be initiated within 30 days of the report.
			Years 1 through 9	Non-designated Class B and Class C noxious weeds including reed canarygrass will not exceed 20 percent cover.
			Year 10	Non-designated Class B and Class C noxious weeds excluding reed canarygrass will not exceed 20 percent cover. Reed canarygrass will only exist as an understory component that does not outcompete native woody vegetation.

Table 56g. Objectives and Performance Standards for the SR 167 RRP Wetland and Stream Mitigation – Freeman Road.				
Mitigation Site	**Goal**	**Objective**	**Monitoring Year**	**Performance Standards**
14. Freeman Road	14.4 (continued) Improve habitat functions in upland areas	14.4.2 Enhance native understory vegetation	Year 0	The contractor will provide GPS locations of any underplanted areas.
			Year 1	Planted vegetation will achieve 100 percent survival 1 year after the site is planted. If all dead woody plantings are replaced, the performance measure will be met.
			Years 2 and 3	Planted vegetation will exhibit 80 percent survival within 2 to 3 years after installation.
		14.4.3 Establish native trees and shrubs in upland	Year 1	Stem density in planted scrub shrub and forested areas will meet or exceed 1,600 stems per acre. Planting density should exceed this metric to account for die off.
			Year 3	Cover of native saplings, trees, and shrubs in planted forested and scrub-shrub wetland will be at least 20 percent.
			Year 5	Cover of native woody vegetation in planted forested and scrub-shrub wetland will be at least 35 percent.
			Year 7	Cover of native woody vegetation in planted forested and scrub-shrub wetland will be at least 50 percent.
			Year 10	Cover of native woody vegetation in planted forested and scrub-shrub wetland will be at least 75 percent.
			Year 10	A minimum of 10 species of native shrubs and trees will be present in the wetland by the end of the monitoring period.

Appendix E
On-Site Mitigation Design Plans



LEGEND:

- LIMIT OF WORK
- PARCEL (GIS, PIERCE COUNTY)
- CLEAR AND GRUB
- EXISTING WETLAND
- SILT FENCE

CLEARING NOTES:

1. REMOVE INVASIVE SPECIES WITHIN CLEAR AND GRUB AREAS. INVASIVE SPECIES MUST BE REMOVED BEFORE PROPOSED PLANTS CAN BE INSTALLED.
2. NO WORK SHALL OCCUR IN WITHIN WETLAND.
3. REFER TO PLANTING GUIDELINES.

NORTH

0 40 80

SCALE IN FEET

NOTES:

1. HORIZONTAL DATUM: WASHINGTON STATE PLANE SOUTH ZONE, NAD83, U.S. SURVEY FEET
2. AERIAL: BING MAPS
3. SITE PLAN SOURCE: SYNTHESIS PLLC
3. ENGINEERING SOURCE: BARGHAUSEN CONSULTING ENGINEERS, INC

PLAN INTENDED TO BE VIEWED IN COLOR. ADJACENT BLOCK IS "BLUE"

ONE INCH

AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

\\gala\CAD\Projects\2141-Vector Development Company\Freeman Road East\Construction Plans\2141-PL-Clearing.dwg L01

Dec 18, 2024 8:39pm Randersen

ANCHOR QEA

VECTOR DEVELOPMENT COMPANY

REVISIONS

REV	DATE	BY	APP'D	DESCRIPTION

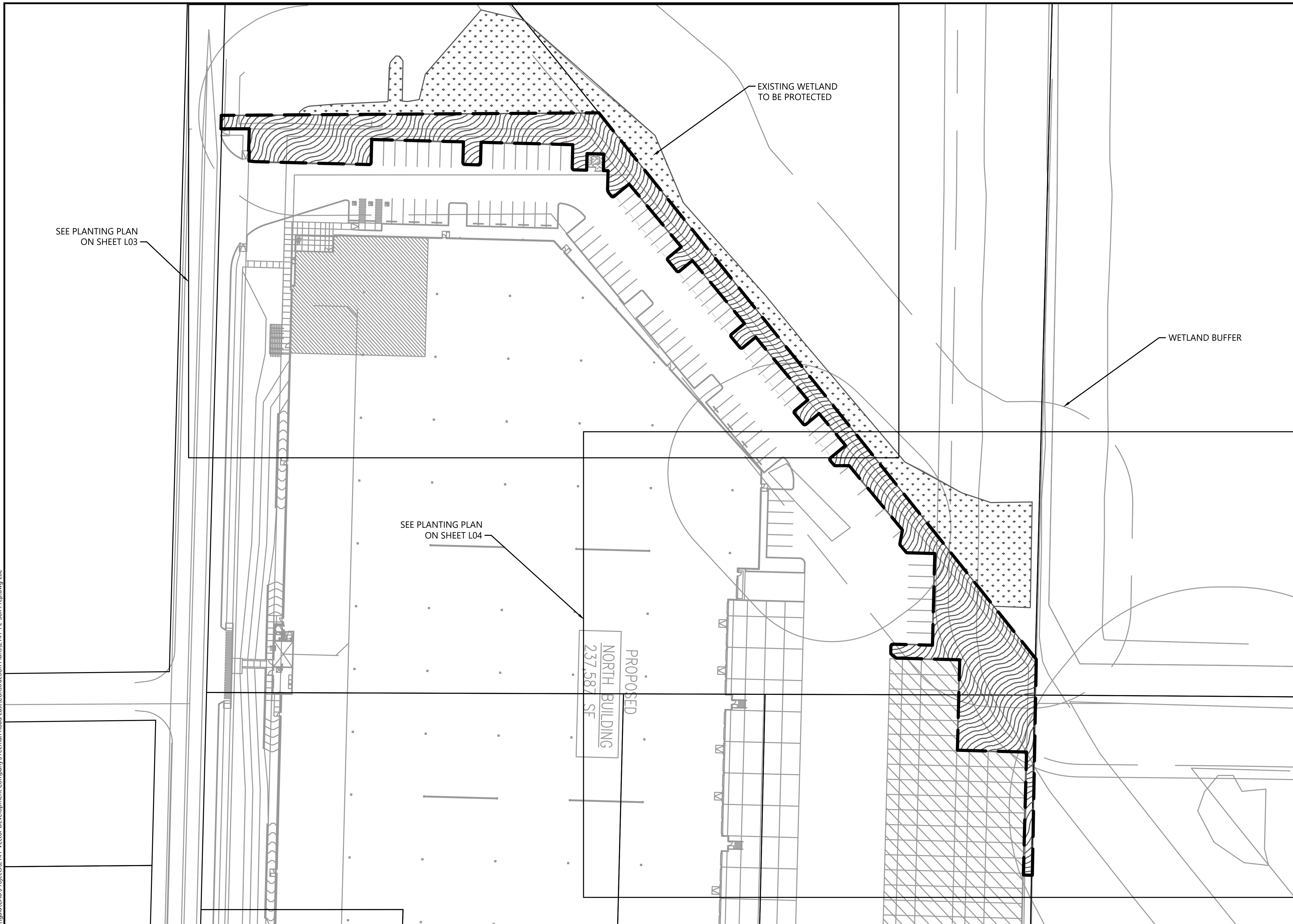
DESIGNED BY: R. ANDERSEN
DRAWN BY: R. ANDERSEN
CHECKED BY: A. SPOONER
APPROVED BY: A. SPOONER
SCALE: AS NOTED
DATE: DECEMBER 2024

FREEMAN ROAD EAST
PUYALLUP, WA

CLEARING PLAN

L01

SHEET # 1 OF 5



LEGEND:

- LIMIT OF WORK
- PARCEL (GIS, PIERCE COUNTY)
- EXISTING WETLAND
- 12' DEPTH PLANTING SOIL

CLEARING NOTES:

1. REMOVE INVASIVE SPECIES WITHIN CLEAR AND GRUB AREAS. INVASIVE SPECIES MUST BE REMOVED BEFORE PROPOSED PLANTS CAN BE INSTALLED.
2. NO WORK SHALL OCCUR IN WITHIN WETLAND.
3. REFER TO PLANTING GUIDELINES.

NORTH

0 40 80

SCALE IN FEET

NOTES:

1. HORIZONTAL DATUM: WASHINGTON STATE PLANE SOUTH ZONE, NAD83, U.S. SURVEY FEET
2. AERIAL: BING MAPS
3. SITE PLAN SOURCE: SYNTHESIS PLLC
3. ENGINEERING SOURCE: BARGHAUSEN CONSULTING ENGINEERS, INC

PLAN INTENDED TO BE VIEWED IN COLOR. ADJACENT BLOCK IS "BLUE"

ONE INCH

AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

\\gala\CAD\Projects\2141-Vector Development Company\Freeman Road East\Construction Plans\2141-PL-Soil Prep.dwg L02

Dec 18, 2024 8:39pm Randersen

ANCHOR QEA

VECTOR DEVELOPMENT COMPANY

REVISIONS

REV	DATE	BY	APP'D	DESCRIPTION

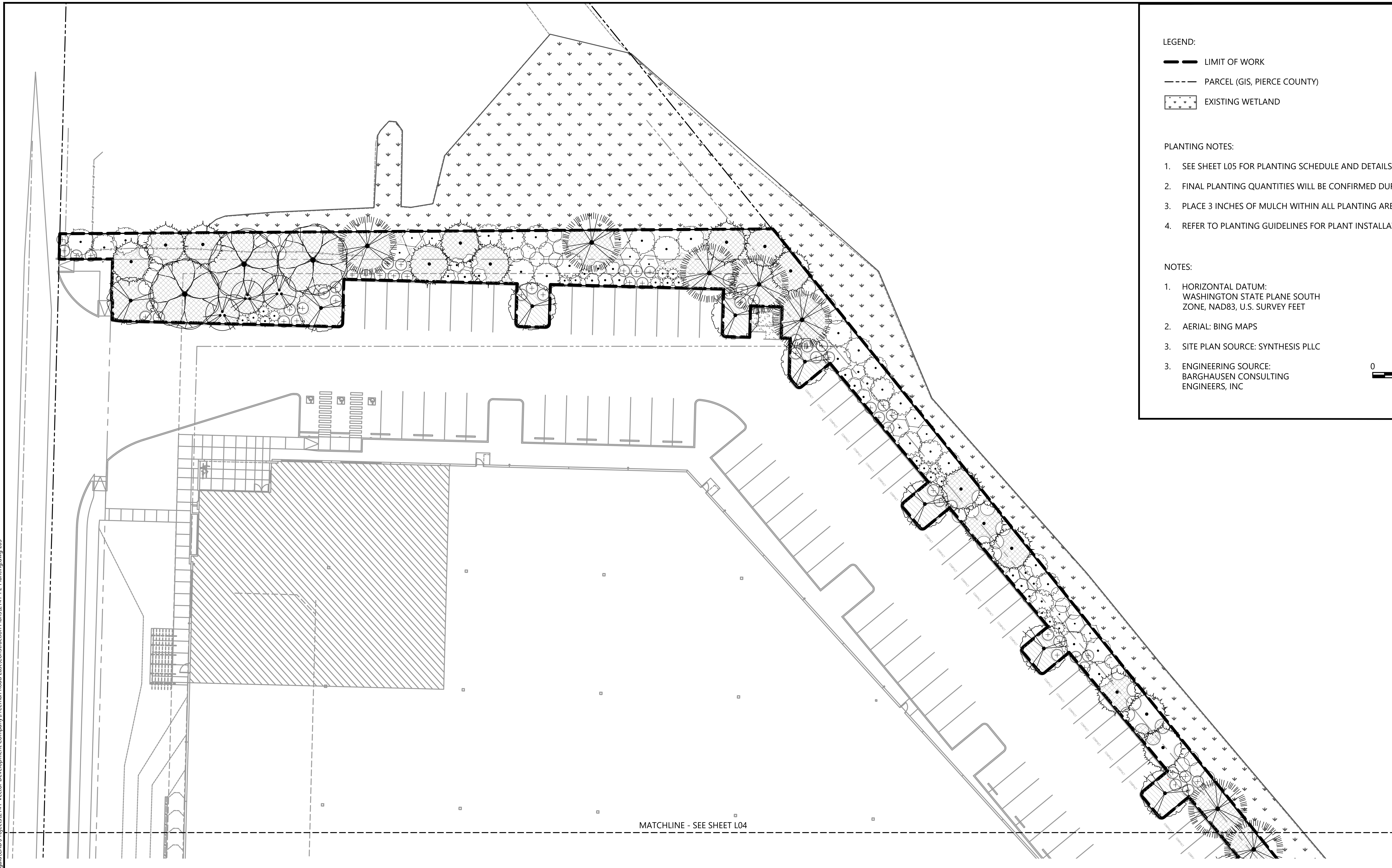
DESIGNED BY: R. ANDERSEN
DRAWN BY: R. ANDERSEN
CHECKED BY: A. SPOONER
APPROVED BY: A. SPOONER
SCALE: AS NOTED
DATE: DECEMBER 2024

FREEMAN ROAD EAST
PUYALLUP, WA

SOIL PREPARATION AND PLANTING KEY PLAN

L02

SHEET # 2 OF 5



LEGEND:

- LIMIT OF WORK
- PARCEL (GIS, PIERCE COUNTY)
- EXISTING WETLAND

PLANTING NOTES:

1. SEE SHEET L05 FOR PLANTING SCHEDULE AND DETAILS.
2. FINAL PLANTING QUANTITIES WILL BE CONFIRMED DURING FINAL DESIGN.
3. PLACE 3 INCHES OF MULCH WITHIN ALL PLANTING AREAS.
4. REFER TO PLANTING GUIDELINES FOR PLANT INSTALLATION.

NOTES:

1. HORIZONTAL DATUM: WASHINGTON STATE PLANE SOUTH ZONE, NAD83, U.S. SURVEY FEET
2. AERIAL: BING MAPS
3. SITE PLAN SOURCE: SYNTHESIS PLLC
3. ENGINEERING SOURCE: BARGHAUSEN CONSULTING ENGINEERS, INC

NORTH

0 10 20

SCALE IN FEET

PLAN INTENDED TO BE VIEWED IN COLOR. ADJACENT BLOCK IS "BLUE"

ONE INCH

AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

\\gala\CAD\Projects\2141-Vector Development Company\Freeman Road East\Construction Plans\2141-PL-Planting.dwg L03

Dec 18, 2024 8:39pm Randersen

ANCHOR QEA

VECTOR DEVELOPMENT COMPANY

REVISIONS

REV	DATE	BY	APP'D	DESCRIPTION

DESIGNED BY: R. ANDERSEN
DRAWN BY: R. ANDERSEN
CHECKED BY: A. SPOONER
APPROVED BY: A. SPOONER
SCALE: AS NOTED
DATE: DECEMBER 2024

FREEMAN ROAD EAST
PUYALLUP, WA

PLANTNG PLAN (1 OF 2)

L03

SHEET # 3 OF 5

LEGEND:

- LIMIT OF WORK
- PARCEL (GIS, PIERCE COUNTY)
- EXISTING WETLAND

PLANTING NOTES:

1. SEE SHEET L05 FOR PLANTING SCHEDULE AND DETAILS.
2. FINAL PLANTING QUANTITIES WILL BE CONFIRMED DURING FINAL DESIGN.
3. PLACE 3 INCHES OF MULCH WITHIN ALL PLANTING AREAS.
4. REFER TO PLANTING GUIDELINES FOR PLANT INSTALLATION.

NOTES:

1. HORIZONTAL DATUM:
   WASHINGTON STATE PLANE SOUTH
   ZONE, NAD83, U.S. SURVEY FEET
2. AERIAL: BING MAPS
3. SITE PLAN SOURCE: SYNTHESIS PLLC
3. ENGINEERING SOURCE:
   BARGHAUSEN CONSULTING
   ENGINEERS, INC

NORTH

0 10 20

SCALE IN FEET

PLAN INTENDED TO BE VIEWED IN COLOR. ADJACENT BLOCK IS "BLUE"

ONE INCH AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

\\gala\CAD\Projects\2141-Vector Development Company\Freeman Road East\Construction Plans\2141-PL-Planting.dwg L04

Dec 18, 2024 8:39pm Randersen

ANCHOR QEA

VECTOR DEVELOPMENT COMPANY

REVISIONS

REV	DATE	BY	APP'D	DESCRIPTION

DESIGNED BY: R. ANDERSEN
DRAWN BY: R. ANDERSEN
CHECKED BY: A. SPOONER
APPROVED BY: A. SPOONER
SCALE: AS NOTED
DATE: DECEMBER 2024

FREEMAN ROAD EAST
PUYALLUP, WA

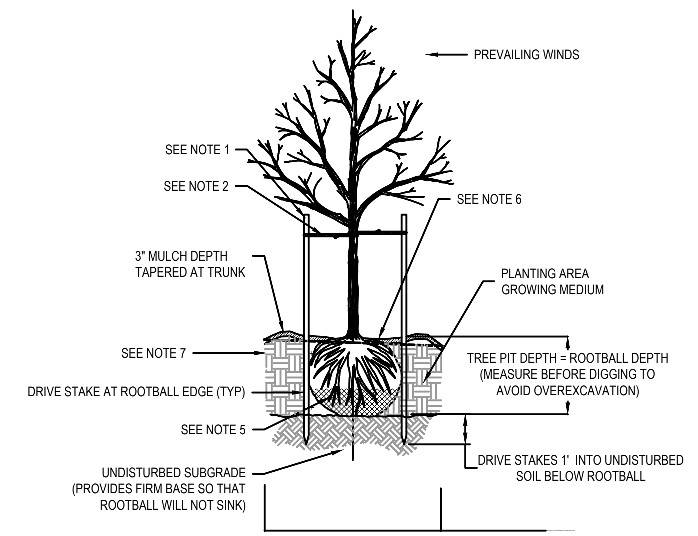
PLANTING PLAN (2 OF 2)

L04

SHEET # 4 OF 5

PLANTING SCHEDULE

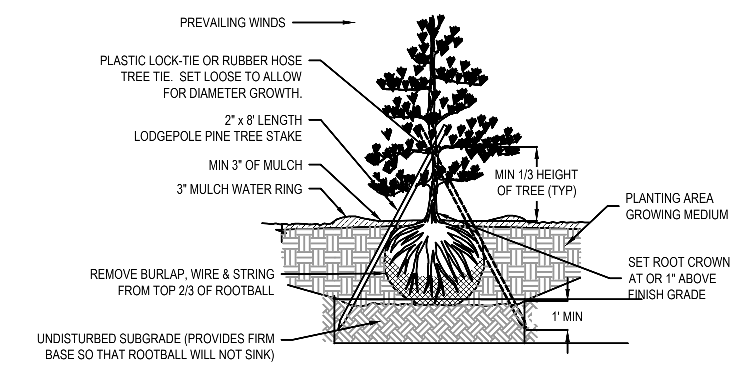
SYMBOL	BOTANICAL / COMMON NAME	SIZE	SPACING	QTY	DETAIL
TREES					
	Acer circinatum / Vine Maple	1 gal.	As shown	9	1/L05
	Cornus nuttallii / Pacific Dogwood	5 gal.	As shown	6	1/L05
	Pinus contorta / Shore Pine	2 gal	As shown	12	2/L05
	Pseudotsuga menziesii / Douglas Fir	2 gal	As shown	24	2/L05
	Rhamnus purshiana / Cascara	2 gal	As shown	11	1/L05
SHRUBS					
	Arctostaphylos columbiana / Hairy Manzanita	1 gal.	4' o.c.	37	
	Cornus sericea / Red Twig Dogwood	1 gal.	5' o.c.	40	
	Corylus cornuta / Western Hazelnut	1 gal.	8' o.c.	24	
	Myrica californica / Pacific Wax Myrtle	1 gal.	10' o.c.	29	3/L05
	Rosa woodsii / Mountain Rose	1 gal.	4' o.c.	35	
	Sorbus sitchensis / Western Mountain Ash	1 gal.	6' o.c.	18	
	Symphoricarpos albus / Common White Snowberry	1 gal.	5' o.c.	95	
GROUND COVERS					
	Arctostaphylos uva-ursi / Kinnikinnick	4"	36" o.c.	284	4/L05
	Mahonia nervosa / Oregon Grape	4"	36" o.c.	1,280	



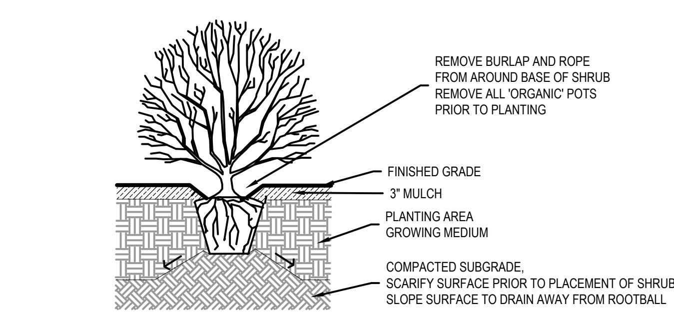
NOTES:

1. STAKE TREES WITH (2) 2" DIAMETER (8' LENGTH) LODGEPOLE PINE OR DOUGLAS FIR STAKES.
2. CHAINLOCK TREE TIE. LOOP EACH TIE AROUND TREE LOOSELY TO PROVIDE 1" SLACK FOR DIAMETER GROWTH.
3. ONE STAKE PER TREE ON WINDWARD SIDE.
4. SECOND STAKE ON LEEWARD SIDE.
5. REMOVE ALL WIRE AND STRING. REMOVE TOP 2/3 OF BURLAP.
6. SHAPE SOIL TO PROVIDE 3' DIAMETER OR ROOTBALL DIAMETER, WHICHEVER IS GREATER, WATERING RING.
7. ROUGHEN SIDES OF PLANTING HOLE MAXIMIZE EXCAVATED AREA WITHOUT UNDERMINING ADJACENT IMPROVEMENTS.
8. MULCH AREA TO BE CLEAR OF GRASS, WEEDS, ETC. TO REDUCE COMPETITION WITH TREE ROOTS.

1/L03 DECIDUOUS TREE PLANTING
SCALE:NTS



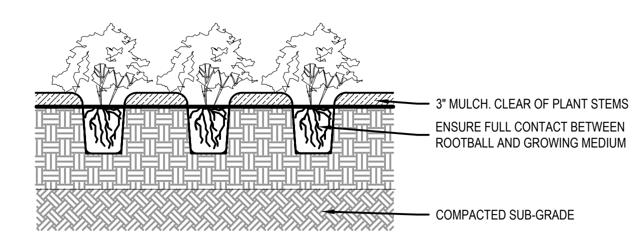
2/L03 CONIFEROUS TREE PLANTING
SCALE:NTS



NOTES:

1. SHRUB TO BE PLANTED WITH ELEVATION OF TOP OF ROOTBALL OR POT LEVEL WITH FINISH GRADE OF GROWING MEDIUM.
2. COMPOSTED BARK MULCH AT TO BE KEPT AT LEAST 50mm AWAY FROM STEMS OF SHRUB.
3. PLANTING PIT MUST BE FREE DRAINING

3/L03 SHRUB PLANTING
SCALE:NTS



NOTES:

1. PLANT TO BE PLANTED WITH TOP OF ROOTBALL LEVEL WITH FINISH GRADE.
2. MULCH TO BE KEPT AT LEAST 2" AWAY FROM STEMS.
3. PRUNE ANY BROKEN OR DAMAGED BRANCHES AND DOUBLE LEADERS USING APPROVED PRUNING TOOLS AND STANDARD I.S.A. PRUNING PRACTICES, SEE SPECIFICATIONS.
4. A REPRESENTATIVE AREA OF EACH PLANT SPECIES IS TO BE LAID OUT AND APPROVED BY CONTRACT ADMINSTRATOR PRIOR TO PLANTING

4/L03 GROUNDCOVER PLANTING
SCALE:NTS

PLAN INTENDED TO BE VIEWED IN COLOR. ADJACENT BLOCK IS "BLUE"

ONE INCH

AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

\\gala\CAD\Projects\2141-Vector Development Company\Freeman Road East\Construction Plans\2141-PL- Planting Details.dwg L05

Dec 18, 2024 8:39pm Randersen

ANCHOR QEA

VECTOR DEVELOPMENT COMPANY

REVISIONS

REV	DATE	BY	APP'D	DESCRIPTION

DESIGNED BY: R. ANDERSEN
DRAWN BY: R. ANDERSEN
CHECKED BY: A. SPOONER
APPROVED BY: A. SPOONER
SCALE: AS NOTED
DATE: DECEMBER 2024

FREEMAN ROAD EAST
PUYALLUP, WA

PLANTING SCHEDULE AND DETAILS

L05

SHEET # 4 OF 5

Tab 7.0

7.0 OTHER PERMITS

7.0 OTHER PERMITS

Other permits for this project site include:

- NPDES General Permit from the Department of Ecology
- Site Development Permit from the City of Puyallup
- Grade and Fill Permit from the City of Puyallup
- Right of Way Permits from the City of Puyallup and Fife

Tab 8.0

8.0 CONSTRUCTION STORMWATER POLLUTION PREVENTION PLAN

A complete Construction Stormwater Pollution Prevention Plan is included within this section.

Construction Stormwater General Permit (CSWGP)

Stormwater Pollution Prevention Plan (SWPPP)

for

Freeman Logistics

Prepared for:

Department of Ecology

Southwest Regional Office

Permittee / Owner	Developer	Operator / Contractor
Vector Development Company	Vector Development Company	TBD

East of Freeman Road, between 48th St E and N Levee Rd

Certified Erosion and Sediment Control Lead (CESCL)

Name	Organization	Contact Phone Number
TBD	TBD	TBD

SWPPP Prepared By

Name	Organization	Contact Phone Number
Jason McArdel	Barghausen Consulting Engineers, Inc.	425-251-6222

SWPPP Preparation Date

12/23/2024

Project Construction Dates

Activity / Phase	Start Date	End Date
TBD	TBD	TBD

Table of Contents

Appendix/Glossary

A. Site Map
B. BMP Detail
C. Correspondence
D. Site Inspection Form
E. Construction Stormwater General Permit (CSWGP)
F. 303(d) List Waterbodies / TMDL Waterbodies Information
G. Contaminated Site Information
H. Engineering Calculations

List of Acronyms and Abbreviations

Acronym / Abbreviation	Explanation
303(d)	Section of the Clean Water Act pertaining to Impaired Waterbodies
BFO	Bellingham Field Office of the Department of Ecology
BMP(s)	Best Management Practice(s)
CESCL	Certified Erosion and Sediment Control Lead
CO_2	Carbon Dioxide
CRO	Central Regional Office of the Department of Ecology
CSWGP	Construction Stormwater General Permit
CWA	Clean Water Act
DMR	Discharge Monitoring Report
DO	Dissolved Oxygen
Ecology	Washington State Department of Ecology
EPA	United States Environmental Protection Agency
ERO	Eastern Regional Office of the Department of Ecology
ERTS	Environmental Report Tracking System
ESC	Erosion and Sediment Control
GULD	General Use Level Designation
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbidity Units
NWRO	Northwest Regional Office of the Department of Ecology
pH	Power of Hydrogen
RCW	Revised Code of Washington
SPCC	Spill Prevention, Control, and Countermeasure
su	Standard Units
SWMMEW	Stormwater Management Manual for Eastern Washington
SWMMWW	Stormwater Management Manual for Western Washington
SWPPP	Stormwater Pollution Prevention Plan
TESC	Temporary Erosion and Sediment Control
SWRO	Southwest Regional Office of the Department of Ecology
TMDL	Total Maximum Daily Load
VFO	Vancouver Field Office of the Department of Ecology
WAC	Washington Administrative Code
WSDOT	Washington Department of Transportation
WWHM	Western Washington Hydrology Model

Project Information (1.0)

Project/Site Name: Freeman Logistics
Street/Location: East of Freeman Road between 48th St E and N Levee Rd
City: Puyallup State: WA Zip code: 98037
Subdivision: Pierce County
Receiving waterbody: Puyallup River

Existing Conditions (1.1)

Total acreage (including support activities such as off-site equipment staging yards, material storage areas, borrow areas).

Total acreage: 24.05 acres

Disturbed acreage: 25.59 acres

Existing structures: Existing structures have been demolished per a separate work order.

Landscape topography: Generally flat

Existing drainage patterns: Sheet flows to the northeast, eventually converging with an existing open channel system and converging with the Oxbow Lake approximately 1.25 miles downstream of the project site.

Existing Vegetation: Scattered vegetation and trees.

Critical Areas: No critical areas exist on the project site.

List of known impairments for 303(d) listed or Total Maximum Daily Load (TMDL) for the receiving waterbody:

Table 1 includes a list of suspected and/or known contaminants associated with the construction activity.

Table 1 – Summary of Site Pollutant Constituents

Constituent (Pollutant)	Location	Depth	Concentration
[Insert Text]	[Insert Text]	[Insert Text]	[Insert Text]

Proposed Construction Activities (1.2)

Description of site development (example: subdivision):
Commercial warehouses with parking and frontage improvements.

Description of construction activities (example: site preparation, demolition, excavation):
Final improvements of proposed buildings and associated parking.

Description of site drainage including flow from and onto adjacent properties. Must be consistent with Site Map in Appendix A:
There are no drainage devices onsite and all drainage consists of sheet flow and shallow concentrated flow. The outlet point for the majority of runoff from the site is a 12" concrete culvert which crosses under Freeman Road at the northwest property corner.

Description of final stabilization (example: extent of revegetation, paving, landscaping):
Buildings upright construction, pavement and associated landscaping.

Contaminated Site Information:
Proposed activities regarding contaminated soils or groundwater (example: on-site treatment system, authorized sanitary sewer discharge):
Dewatering might be necessary during some utility excavations. No contaminated soils are known to exist near the project site.

Construction Stormwater Best Management Practices (BMPs) (2.0)

The SWPPP is a living document reflecting current conditions and changes throughout the life of the project. These changes may be informal (i.e. hand-written notes and deletions). Update the SWPPP when the CESCL has noted a deficiency in BMPs or deviation from original design.

The 12 Elements (2.1)

Element 1: Preserve Vegetation / Mark Clearing Limits (2.1.1)

To protect adjacent properties and to reduce the area of soil exposed to construction, the limits of construction will be clearly marked before land-disturbing activities begin. Trees that are to be preserved, as well as all sensitive areas and their buffers, shall be clearly delineated, both in the field and on the plans. In general, natural vegetation and native topsoil shall be retained in an undisturbed state to the maximum extent possible. The BMP relevant to marking the clearing limits that will be applied for this project include the following:

List and describe BMPs:

- High Visibility Fence (BMP C103)

  Install colored orange fence to protect areas that are not to be disturbed, and mark trees to be preserved.

- Silt Fence (BMP C233)

  Silt fencing shall be used to control sediment flow offsite or into Gardiner Creek throughout the construction process.

Installation Schedules: All BMPs to preserve vegetation and mark clearing limits are to be installed prior to clearing and grading.

Inspection and Maintenance plan: All fencing is to be inspected at the end of each day's work and repaired if found to be noncompliant with BMP specifications.

Responsible Staff: Certified Erosion and Sediment Control Lead.

Element 2: Establish Construction Access (2.1.2)

Construction access or activities occurring on unpaved areas shall be minimized, yet where necessary, access points shall be stabilized to minimize the tracking of sediment onto public roads. Street sweeping and street cleaning shall be employed where necessary to prevent sediment from entering state waters. All wash wastewater shall be controlled onsite. The specific BMPs related to establishing construction access that will be used on this project are as follows:

List and describe BMPs:

- Stabilized Construction Entrance (BMP C105)

  A stabilized construction entrance will be used to minimize the amount of sediment transported off site onto the existing roadway by construction traffic.

- Construction Road/Parking Area Stabilization (BMP C107)

  Proposed roads shall be stabilized immediately after grading to reduce erosion by construction traffic or surface water runoff. During vertical construction, apply quarry spall base on drive approaches for buildings lot/pad access or in other high traffic areas such as material equipment storage and concrete washout areas.

- Concrete Washout Area (BMP C154)

  Conduct washout off-site or perform on-site concrete washout in a designated area. This is done to prevent pollutants from entering surface or ground water.

If sediment is tracked off site, clean the affected roadway thoroughly at the end of each day or more frequently, as necessary. Remove sediment from roads by shoveling, sweeping, or pickup and transport of the sediment to a controlled sediment disposal area.

Conduct street washing only after sediment removal in accordance with special condition S9.D.2.d. Control street wash wastewater by pumping back on site or otherwise preventing it from discharging off site into catch basins, stormwater conveyance systems, creek, or rivers that connect to waters of the State.

Installation Schedules: Installation schedule to be determined by the General Contractor.

Inspection and Maintenance plan: Inspection and maintenance is to take place at the end of each day's work.

Responsible Staff: Certified Erosion and Sediment Control Lead.

Element 3: Control Flow Rates (2.1.3)

In order to protect the properties and waterways downstream of the project site, stormwater discharges from the site will be controlled. The Specific BMPs for the flow control that shall be used on this project include the following:

Will you construct stormwater retention and/or detention facilities?
☒ Yes ☐ No

Will you use permanent infiltration ponds or other low impact development (example: rain gardens, bio-retention, porous pavement) to control flow during construction?
☐ Yes ☒ No

List and describe BMPs:

- Sediment Pond (BMP C241)

The project site is located west of the Cascade Mountain Crest. As a result, the project must comply with the Minimum Requirement 7 (Ecology 2012). Minimum Requirement 7 states that projects must provide flow control to reduce the impacts of stormwater runoff from impervious surfaces and land cover conversions.

Essentially, discharge rates of stormwater from the site will be controlled where increases in impervious area or soil compaction during construction could lead to downstream erosion, or where necessary to meet local agency stormwater discharge requirements (e.g. discharge to combined sewer systems).

Installation Schedules: Installation schedule to be determined by the General Contractor.

Inspection and Maintenance plan: Inspection and maintenance is to take place at the end of each day's work.

Responsible Staff: Certified Erosion and Sediment Control Lead.

Element 4: Install Sediment Controls (2.1.4)

All stormwater runoff from disturbed areas shall pass through an appropriate sediment removal BMP before leaving the construction site or prior to being discharge to a detention facility. The specific BMPs to be used for controlling sediment on this project are as follows:

List and describe BMPs:

- Silt Fence (BMP C233)

  During site development phase, silt fence will be used along the downhill perimeter of the project to prevent sediment from leaving the site.

  During the building/vertical phase, sediment control will not be necessary on all building bearing pads, as many are flat with well established grass cover. The rest of the landscaped areas and onsite parks will drain to the parking lots or have runoff collected by yard drains. Temporary stabilized lots with slope, or less well established grass cover will be inspected during wet weather conditions and, if required, silt fence may be used as a sediment control. Before removing vegetation on the lots, silt fence will be installed as a sediment control behind curb.

- Storm Drain Inlet Protection (BMP C220)

  Catch basins and storm drain inlets within the project boundary and downstream will have an approved form of inlet protection installed. This will prevent coarse sediment from entering the drainage system prior to permanent stabilization of the disturbed drainage area.

- Temporary Sedimentation Pond (BMP C241)
  Temporary sedimentation ponds will be installed prior to grading the site to ensure proper sediment control from storm runoff prior to discharge from the project site.

  In addition, sediment will be removed from paved areas in and adjacent to construction work areas manually or using a mechanical sweepers, as needed to minimize tracking of sediments on vehicle tires away from the site and to minimize the transmission of sediments from adjacent streets in runoff.

Installation Schedules: Installation schedule to be determined by the General Contractor

Inspection and Maintenance plan: Inspection and maintenance is to take place at the end of each day's work.

Responsible Staff: Certified Erosion and Sediment Control Lead

Element 5: Stabilize Soils (2.1.5)

Exposed and unworked soils shall be stabilized with the application of effective BMPs to prevent erosion throughout the life of the project. The specific BMPs for soil stabilization that shall be used in this project are as follows:

West of the Cascade Mountains Crest

Season	Dates	Number of Days Soils Can be Left Exposed
During the Dry Season	May 1 – September 30	7 days
During the Wet Season	October 1 – April 30	2 days

Soils must be stabilized at the end of the shift before a holiday or weekend if needed based on the weather forecast.

Anticipated project dates: Start date: TBD End date: TBD

Will you construct during the wet season?
☒ Yes ☐ No

List and describe BMPs:

- Temporary and Permanent Seeding (BMP C120)
  Following final or fine grading activity in the rear and side yards, permanent seeding shall be placed on exposed soil to provide permanent erosion protection.

- Mulching (BMP C121)

  During the site development phase, mulching will be used for areas that will be unworked for more than 2 days. Temporary seeding will be applied to areas that will be unworked for more than 7 days. During the building phase, the construction area will be significantly stabilized through well established grass cover. Proposed driveways will receive base course materials as described under Element #2 above. Areas cleared for building foundations or utility and irrigation placement will be temporarily stabilized by one of the following methods which are based on the period exposed soils are left unworked:

  - If exposed soils are left unworked for more than 7 days during the dry season and 2 days during the wet season but less than 30 days, mulching shall be applied.

  - If exposed soils are left unworked for more than 30 days, temporary or permanent seeding shall be applied.

- Nets and Blankets (BMP C122)

Once final or fine grading activity has been completed, install Jute Matting on slopes prior to planting.

- Sodding (BMP C124)

  Following final or fine grading activity in the front yard, sod shall be placed on exposed soil to provide permanent and immediate erosion protection.

- Plastic Covering (BMP C123)

- Topsoiling (BMP C125)

  Utilize stockpile management during all phases of construction per BMP. Cover stockpiles with plastic covering to prevent erosion during rain events.

- Wattles (BMP C235)

  Install wattles downslope of newly landscaped areas to control sediment runoff until stabilization.

  Cement or Calcium Chloride may be used for soil stabilization and dewatering. See section 4.2.2 for pH Sampling Requirements.

  The project site is located west of the Cascade Mountain Crest. As such, no soils shall remain exposed and unworked for more than 7 days during the dry season (May 1 to September 30) and 2 days during the wet season (October 1 to April 30). Regardless of the time of year, all soils shall be stabilized at the end of the shift before a holiday or weekend if needed based on weather forecasts.

  Cut and fill slopes will be stabilized as soon as possible and soil stockpiles will be temporarily covered with plastic sheeting. All stockpiled soils shall be stabilized from erosion, protected with sediment trapping measures, and where possible, be located away from storm drain inlets, waterways, and drainage channels.

Installation Schedules: Installation schedule to be determined by the General Contractor

Inspection and Maintenance plan: Inspection and maintenance is to take place at the end of each day's work.

Responsible Staff: Certified Erosion and Sediment Control Lead

Element 6: Protect Slopes (2.1.6)

All cut and fill slopes will be designed, constructed, and protected in a manner that minimizes erosion. The following specific BMPs will be used to protect slopes for this project:

Will steep slopes be present at the site during construction?

☒ Yes ☐ No

List and describe BMPs:

- Temporary and Permanent Seeding (BMP C120)

  The portion of the site that is being developed is mostly level. Sloping areas within the disturbed portion of the site will be treated as described under Element 5 above.

Installation Schedules: Installation schedule to be determined by the General Contractor

Inspection and Maintenance plan: Inspection and maintenance is to take place at the end of each day's work.

Responsible Staff: Certified Erosion and Sediment Control Lead

Element 7: Protect Drain Inlets (2.1.7)

Drain inlets will be protected using the following BMP methods:

List and describe BMPs:

- Storm Drain Inlet Protection (BMP C220)

  Prior to construction, storm drain inlet protection will be utilized on all catch basins in the roadway along the frontage of any areas receiving stormwater from construction activities within the permitted area. Install inlet protection once permanent storm drain inlets on site are constructed.

Installation Schedules: Installation schedule to be determined by the General Contractor.

Inspection and Maintenance plan: Inspection and maintenance is to take place at the end of each day's work.

Responsible Staff: Certified Erosion and Sediment Control Lead.

Element 8: Stabilize Channels and Outlets (2.1.8)

Where site runoff is to be conveyed in channels or discharged to a stream or some other natural drainage point, efforts will be made to prevent downstream erosion. The specific BMPs for channel and outlet stabilization that shall be used on this project include:

Provide stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent stream banks, slopes, and downstream reaches, will be installed at the outlets of all conveyance systems.

List and describe BMPs:

- Interceptor Dike and Swale (BMP C200)

  During the site development phase, interceptor dikes and swales shall be constructed down slope and on site of the construction site to convey stormwater to an erosion control facility.

- Check Dams (BMP C207)

  Check dams shall be used to reduce the velocity and energy of concentrated flow in swales or ditches.

- Outlet Protection (BMP C209)

Installation Schedules: Installation schedule to be determined by the General Contractor

Inspection and Maintenance plan: Inspection and maintenance is to take place at the end of each day's work.

Responsible Staff: Certified Erosion and Sediment Control Lead

Element 9: Control Pollutants (2.1.9)

All pollutants, including waste materials and demolition debris, that occur onsite shall be handled and disposed of in a manner that does not cause contamination of stormwater. Good housekeeping and preventative measures will be taken to ensure that the site will be kept clean, well organized, and free of debris. If required, BMPs to be implemented to control specific sources of pollutants are discussed below.

The following pollutants are anticipated to be present on-site:

Table 2 – Pollutants

Pollutant (List pollutants and source, if applicable)
Installation of sediment and erosion controls
Installation of stabilized exits
Vehicle tracking
Clearing and grubbing operations
Grading operations
Exposed soils and slopes
Import/export operations
Utility excavation operations
Landscaping operations
Topsoil stripping and stockpiling
Fine grading of home sites
Vertical Construction
Concrete

List and describe BMPs:

- Housekeeping BMPs

The following sections describe the controls, including storage practices to minimize exposure of the materials to stormwater as well as spill prevention and response practices. All pollutants, including waste materials and demolition debris, that occur onsite shall be handled and disposed of in a manner that does not cause contamination of stormwater.

Vehicles, construction equipment, and/or petroleum product storage/dispensing:

- All vehicles, equipment, and petroleum product storage/dispensing areas will be inspected regularly to detect any leaks or spills, and to identify maintenance needs to prevent leaks or spills. Secondary containment such as drip pans will be placed under any leaking vehicles or equipment. All petroleum product storage containers will be placed in secondary containment (see spill prevention and control below).

- On-site fueling tanks and petroleum product storage containers shall include secondary containment.

- Spill prevention measures, such as drip pans, will be used when conducting maintenance and repair of vehicles or equipment or when vehicle/equipment leaks are observed.

- In order to perform emergency repairs on site, temporary plastic will be placed beneath and, if raining, over the vehicle.

- Contaminated surfaces shall be cleaned immediately following any discharge or spill incident.

Chemical storage:

- Any chemicals stored in the construction areas will conform to the appropriate source control BMPs listed in Volume IV of the Ecology stormwater manual. In Western WA, all chemicals shall have cover, containment, and protection provided on site, per BMP C153 for Material Delivery, Storage and Containment in SWMMWW 2012.

- Application of agricultural chemicals, including fertilizers and pesticides, shall be conducted in a manner and at application rates that will not result in loss of chemical to stormwater runoff. Manufacturers' recommendations for application procedures and rates shall be followed.

Concrete and grout:

- Process water and slurry resulting from concrete work will be prevented from entering the waters of the State by implementing Concrete Handling measures (BMP C151) and Sawcutting and Surfacing Pollution Prevention (BMP C152).

Sanitary wastewater:

- Proper sanitary and septic waste management are waste management and material pollution controls that prevent the discharge of pollutants to stormwater from sanitary and septic waste by providing convenient, well-maintained facilities, and arranging for regular service and disposal. Implement as follows:
    - Facilities should be located away from drainage facilities, watercourses, and from traffic circulation.
    - Provide a sufficient quantity of facilities to accommodate the workforce.
    - Temporary sanitary facilities must be equipped with containment to prevent discharge of pollutants to the stormwater drainage system of the receiving water.
    - When subjected to high winds or risk of high winds, temporary sanitary facilities should be secured to prevent overturning.
    - Sanitary facilities should be located in a convenient location.
    - Sanitary or septic wastes should be treated or disposed of in accordance with state and local requirements.
    - Sanitary facilities should be maintained in good working order by a licensed service.

Solid and Liquid Waste:

- Solid and liquid waste generated during construction such as construction materials, contaminated materials, and waste materials from maintenance activities will be prevented from entering the waters of the State. Solid and liquid waste shall be handled in accordance with BMPs for Storage of Liquid, Food Waste, or Dangerous Waste Containers and BMPs for Loading and Unloading Areas for Liquid or Solid Materials.
    - Solid waste will be stored in secure, clearly marked containers.
    - Promptly contain and clean up solid and liquid pollutant leaks and spills including oils, solvents, fuels, and dust from manufacturing operations on any exposed soil, vegetation, or paved area.
    - Sweep paved material handling and storage areas regularly as needed, for the collection and disposal of dust and debris that could contaminate stormwater. Do not hose down pollutants from any area to the ground, storm drain, conveyance ditch, or receiving water unless necessary for dust control purposes to meet air quality regulations.

Installation Schedules: The described BMPs will be implemented while all pollution generating materials are onsite.

Inspection and Maintenance plan: Inspection and maintenance is to take place at the end of each day's work.

Responsible Staff: Certified Erosion and Sediment Control Lead

Will maintenance, fueling, and/or repair of heavy equipment and vehicles occur on-site?
☐ Yes ☒ No

List and describe BMPs:

Spill Prevention and Control BMPs

Prevent or reduce the discharge of pollutants to drainage systems or watercourses from leaks and spills by reducing the chance for spills, stopping the source of spills, containing and cleaning up spills, properly disposing of spill materials, and training employees. This best management practice covers only spill prevention and control. However, Materials Delivery and Storage (BMP C153), also contains useful information, particularly on spill prevention.

- To the extent that the work can be accomplished safely, spills of oil, petroleum products, and substances listed under 40 CFR parts 110,117, and 302, and sanitary and septic wastes should be contained and cleaned up immediately.
- Store hazardous materials and wastes in covered containers and protect from vandalism.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- Train employees in spill prevention and cleanup.
- Designate responsible individuals to oversee and enforce control measures.
- Spills should be covered and protected from stormwater runon during rainfall to the
- extent that it doesn’t compromise clean up activities.
- Do not bury or wash spills with water.

- Store and dispose of used clean up materials, contaminated materials, and recovered spill material that is no longer suitable for the intended purpose in conformance with the provisions in applicable BMPs.
- Do not allow water used for cleaning and decontamination to enter storm drains or watercourses. Collect and dispose of contaminated water in accordance WSDOE regulations.
- Contain water overflow or minor water spillage and do not allow it to discharge into drainage facilities or watercourses.
- Place proper storage, cleanup, and spill reporting instructions for hazardous materials stored or used on the project site in an open, conspicuous, and accessible location.
- Keep waste storage areas clean, well organized, and equipped with ample clean supplies as appropriate for the materials being stored. Perimeter controls, containment structures, covers, and liners should be repaired or replaced as needed to maintain proper function.

Cleanup:

- Clean up leaks and spills immediately.
- Use a rag for small spills on paved surfaces, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to either a certified laundry (rags) or disposed of as hazardous waste.
- Never hose down or bury dry material spills. Clean up as much of the material as possible and dispose of properly.
- The spill kit should include, at a minimum:
    - 1-Water Resistant Nylon Bag
    - 3-Oil Absorbent Socks 3”x 4’
    - 2-Oil Absorbent Socks 3”x 10’
    - 12-Oil Absorbent Pads 17”x19”
    - 1-Pair Splash Resistant Goggles
    - 3-Pair Nitrile Gloves
    - 10-Disposable Bags with Ties
    - Instructions
- Spill kits will be located in areas with a high potential for spills and deployed in a manner that allows rapid access and use by contractors. Some heavy equipment may have on-board spill kits for small spills. Spill control kits will be inspected and inventoried each construction season to confirm all required items are present. Spill control kits will be inventoried after each emergency event and restocked as needed.

Minor Spills:

- Minor spills typically involve small quantities of oil, gasoline, paint, etc. which can be controlled at the discovery of the spill.
- Contain the spread of the spill.
- Use absorbent materials on small spills rather than hosing down or burying the spill.
- Notify the project foreman immediately
- Recover spilled materials.
- Clean the contaminated area and properly dispose of contaminated materials.
- If the spill occurs on paved or impermeable surfaces, clean up using "dry" methods (absorbent materials, cat litter and/or rags). Contain the spill by encircling with absorbent materials and do not let the spill spread widely.

- If the spill occurs in dirt areas, immediately contain the spill by constructing an earthen dike. Dig up and properly dispose of contaminated soil.
- If the spill occurs during rain, cover spill with tarps or other material to prevent contaminating runoff.

Semi-Significant Spills:

- Semi-significant spills still can be controlled by the first responder along with the aid of other personnel such as laborers and the foreman, etc. This response may require the cessation of all other activities. Spills should be cleaned up immediately.

Significant/Hazardous Spills

- For significant or hazardous spills that cannot be controlled by personnel in the immediate vicinity, the following steps should be taken:
    - Notify the local emergency response by dialing 911. In addition to 911, the contractor will notify the proper City or County officials. All emergency phone numbers will be posted at the construction site.
    - Contact your Supervisor and the Divisional Environmental Manager. For spills of federal reportable quantities, (examples are listed below) in conformance with the requirements in 40 CFR parts 110,119, and 302, the Division Environmental Manager (DEM) will notify the National Response Center at (800) 424-8802. The DEM will notify the Department of Ecology and any other applicable agencies.
- The services of a spills contractor or a Haz-Mat team should be obtained immediately. Construction personnel should not attempt to clean up until the appropriate and qualified staffs have arrived at the job site.
- Notification should first be made by telephone and followed up with a written report. Other agencies which may need to be consulted include, but are not limited to, the Public Works Department, the Coast Guard, the Highway Patrol, the City/County Police Department and Department of Ecology.
- Federal regulations require that any significant oil spill into a water body or onto an adjoining shoreline be reported to the National Response Center (NRC) at 800-424-8802 (24 hours).

Installation Schedules: The described BMPs will be implemented while all pollution generating materials are onsite.

Inspection and Maintenance plan: Inspection and maintenance is to take place at the end of each day's work.

Responsible Staff: Certified Erosion and Sediment Control Lead.

Will wheel wash or tire bath system BMPs be used during construction?
☒ Yes ☐ No

List and describe BMPs:

- Wheel Wash (BMP C106)

Discharge wheel wash or tire bath wastewater to a separate on-site treatment system that prevents discharge to surface water, such as closed-loop recirculation or upland land application, or to the sanitary sewer with local sewer district approval.

Installation Schedules: The described BMPs will be implemented while all pollution generating materials are onsite.

Inspection and Maintenance plan: Inspection and maintenance is to take place at the end of each day's work.

Responsible Staff: Certified Erosion and Sediment Control Lead.

Will pH-modifying sources be present on-site?
☒ Yes ☐ No

Table 3 – pH-Modifying Sources

☐	None
☒	Bulk cement
☐	Cement kiln dust
☐	Fly ash
☒	Other cementitious materials
☒	New concrete washing or curing waters
☒	Waste streams generated from concrete grinding and sawing
☐	Exposed aggregate processes
☐	Dewatering concrete vaults
☐	Concrete pumping and mixer washout waters
☐	Recycled concrete
☐	Other (i.e., calcium lignosulfate) [please describe:]

List and describe BMPs:

- pH Control for High pH Water (BMP C253)
- High pH Neutralization using CO_2 (BMP C252) (Implemented only after notifying the local Jurisdiction.)
- Sawcutting and Surfacing Pollution Prevention

Installation Schedules: The described BMPs will be implemented while all pollution generating materials are onsite.

Inspection and Maintenance plan: Inspection and maintenance is to take place at the end of each day's work.

Responsible Staff: Certified Erosion and Sediment Control Lead.

Concrete trucks must not be washed out onto the ground, or into storm drains, open ditches, streets, or streams. Excess concrete must not be dumped on-site, except in designated concrete washout areas with appropriate BMPs installed.

Element 10: Control Dewatering (2.1.10)

Table 4 – Dewatering BMPs

☐	Infiltration
☒	Transport off-site in a vehicle (vacuum truck for legal disposal)
☐	Ecology-approved on-site chemical treatment or other suitable treatment technologies
☐	Sanitary or combined sewer discharge with local sewer district approval (last resort)
☐	Use of sedimentation bag with discharge to ditch or swale (small volumes of localized dewatering)

List and describe BMPs: Infiltration capacities shall be field verified. Dewatering maybe required during utility excavations. Sump pumps to be utilized as needed.

Installation Schedules: The described BMPs will be implemented while all pollution generating materials are onsite.

Inspection and Maintenance plan: Inspection and maintenance is to take place at the end of each day's work.

Responsible Staff: Certified Erosion and Sediment Control Lead.

Element 11: Maintain BMPs (2.1.11)

All temporary and permanent Erosion and Sediment Control (ESC) BMPs shall be maintained and repaired as needed to ensure continued performance of their intended function.

Maintenance and repair shall be conducted in accordance with each particular BMP specification (see *Volume II of the SWMMWW or Chapter 7 of the SWMMEW*).

Visual monitoring of all BMPs installed at the site will be conducted at least once every calendar week and within 24 hours of any stormwater or non-stormwater discharge from the site. If the site becomes inactive and is temporarily stabilized, the inspection frequency may be reduced to once every calendar month.

All temporary ESC BMPs shall be removed within 30 days after final site stabilization is achieved or after the temporary BMPs are no longer needed.

Trapped sediment shall be stabilized on-site or removed. Disturbed soil resulting from removal of either BMPs or vegetation shall be permanently stabilized.

Additionally, protection must be provided for all BMPs installed for the permanent control of stormwater from sediment and compaction. BMPs that are to remain in place following completion of construction shall be examined and restored to full operating condition. If sediment enters these BMPs during construction, the sediment shall be removed and the facility shall be returned to conditions specified in the construction documents.

Element 12: Manage the Project (2.1.12)

The project will be managed based on the following principles:

- Projects will be phased to the maximum extent practicable and seasonal work limitations will be taken into account.
- Inspection and monitoring:
    - Inspection, maintenance and repair of all BMPs will occur as needed to ensure performance of their intended function.
    - Site inspections and monitoring will be conducted in accordance with Special Condition S4 of the CSWGP. Sampling locations are indicated on the Site Map. Sampling station(s) are located in accordance with applicable requirements of the CSWGP.
- Maintain an updated SWPPP.
    - The SWPPP will be updated, maintained, and implemented in accordance with Special Conditions S3, S4, and S9 of the CSWGP.

As site work progresses the SWPPP will be modified routinely to reflect changing site conditions. The SWPPP will be reviewed monthly to ensure the content is current.

Table 5 – Management

☒	Design the project to fit the existing topography, soils, and drainage patterns
☒	Emphasize erosion control rather than sediment control
☒	Minimize the extent and duration of the area exposed
☒	Keep runoff velocities low
☒	Retain sediment on-site
☒	Thoroughly monitor site and maintain all ESC measures
☒	Schedule major earthwork during the dry season
☐	Other (please describe)

Table 6 – BMP Implementation Schedule

Phase of Construction Project	Stormwater BMPs	Date	Wet/Dry Season
[Insert construction activity]	[Insert BMP]	[MM/DD/YYYY]	[Insert Season]

Phase of Construction Project	Stormwater BMPs	Date	Wet/Dry Season
[Insert construction activity]	[Insert BMP]	[MM/DD/YYYY]	[Insert Season]

Element 13: Protect Low Impact Development (LID) BMPs (2.1.13)

This project proposes infiltration facilities that will require additional protections to ensure that they perform as intended. This project will protect all On-Site Stormwater Management (LID BMPs) by:

a) Protection of LID BMPs from sedimentation will be accomplished through the installation and maintenance of erosion and sediment control BMPs. This project will implement a infiltration trench in order to collect stormwater runoff near the intersection of Freeman Road and N Levee Road. These facilities will be maintained to fully functionality as sediment collects during construction.
b) Protection of LID BMPs from compaction by construction equipment and foot traffic. The location of proposed infiltration facilities has been included on the TESC plans and shall be protected to the greatest extent feasible by avoiding compaction of the soils and avoiding stormwater runoff from entering the proposed infiltration area until site development work is complete.
c) Protection of LID BMPs from sediment-laden runoff to base materials by collection of stormwater runoff and conveyance to the proposed sediment control facilities. Muddy construction equipment shall be prohibited from base materials (proposed subgrade) or LID BMP designated areas.
d) Protection of LID BMPs infiltration performance will be accomplished by cleaning using the procedures in accordance with the Department of Ecology's *Stormwater Management Manual for Western Washington (DOE SMMWW 2019).*
e) Protection of LID BMPs shall be accomplished by prohibiting all heavy equipment off existing soils under proposed LID BMP locations that are close to final grade. Restricting where construction equipment can be staged helps retain the long term design infiltration rate of the soils.

List and describe BMPs:

BMP C200 Interceptor Dike and Swale

BMP C207 Check Dams

BMP C233 Silt Fence

Installation Schedules: TBD

Inspection and Maintenance plan:

Interceptor Dike and Swale Maintenance

- Inspect diversion dikes and interceptor swales once a week and after every rainfall. Immediately remove sediment from the flow area.
- Damage caused by construction traffic or other activity must be repaired before the end of each working day

- Check outlets and make timely repairs as needed to avoid gully formation. When the area below the temporary diversion dike is permanently stabilized, remove the dike and fill and stabilize the channel to blend with the natural surface.

Check Dam Maintenance

- Check dams shall be monitored for performance and sediment accumulation during and after each runoff producing rainfall. Sediment shall be removed when it reaches one half the sump depth.
- Anticipate submergence and deposition above the check dam and erosion from high flows around the edges of the dam.
- If significant erosion occurs between dams, install a protective riprap liner in that portion of the channel.

Silt Fence Maintenance

- Repair any damage immediately.
- Intercept and convey all evident concentrated flows uphill of the silt fence to an infiltration pond.
- Check the uphill side of the fence for signs of the fence clogging and acting as a barrier to flow and then causing channelization of flows parallel to the fence. If this occurs, replace the fence or remove the trapped sediment.
- Remove sediment deposits when the deposit reaches approximately one-third the height of the silt fence, or install a second silt fence.
- Replace filter fabric that has deteriorated due to ultraviolet breakdown.

Responsible Staff: Contractor/CESL

Pollution Prevention Team (3.0)

Table 7 – Team Information

Title	Name(s)	Phone Number
Certified Erosion and Sediment Control Lead (CESCL)	TBD	
Resident Engineer	Jason McArdel	425-251-6222
Emergency Ecology Contact	Southwest Regional Office: WA Emergency Management Division	1-800-258-5990
Emergency Permittee/ Owner Contact	Tyler Litzenberger	425-968-5115
Non-Emergency Owner Contact		
Monitoring Personnel	TBD	
Ecology Regional Office	Southwest Regional Office	(360) 407-6300

Monitoring and Sampling Requirements (4.0)

Monitoring includes visual inspection, sampling for water quality parameters of concern, and documentation of the inspection and sampling findings in a site log book. A site log book will be maintained for all on-site construction activities and will include:

- A record of the implementation of the SWPPP and other permit requirements
- Site inspections
- Stormwater sampling data

The site log book must be maintained on-site within reasonable access to the site and be made available upon request to Ecology or the local jurisdiction.

Numeric effluent limits may be required for certain discharges to 303(d) listed waterbodies. See CSWGP Special Condition S8 and Section 5 of this template.

Site Inspection (4.1)

Site inspections will be conducted at least once every calendar week and within 24 hours following any discharge from the site. For sites that are temporarily stabilized and inactive, the required frequency is reduced to once per calendar month.

The discharge point(s) are indicated on the Site Map (see Appendix A) and in accordance with the applicable requirements of the CSWGP.

Stormwater Quality Sampling (4.2)

Turbidity Sampling (4.2.1)

Requirements include calibrated turbidity meter or transparency tube to sample site discharges for compliance with the CSWGP. Sampling will be conducted at all discharge points at least once per calendar week.

Method for sampling turbidity:

Table 8 – Turbidity Sampling Method

☒	Turbidity Meter/Turbidimeter (required for disturbances 5 acres or greater in size)
☐	Transparency Tube (option for disturbances less than 1 acre and up to 5 acres in size)

The benchmark for turbidity value is 25 nephelometric turbidity units (NTU) and a transparency less than 33 centimeters.

If the discharge's turbidity is 26 to 249 NTU **or** the transparency is less than 33 cm but equal to or greater than 6 cm, the following steps will be conducted:

1. Review the SWPPP for compliance with Special Condition S9. Make appropriate revisions within 7 days of the date the discharge exceeded the benchmark.

2. Immediately begin the process to fully implement and maintain appropriate source control and/or treatment BMPs as soon as possible. Address the problems within 10 days of the date the discharge exceeded the benchmark. If installation of necessary treatment BMPs is not feasible within 10 days, Ecology may approve additional time when the Permittee requests an extension within the initial 10-day response period.
3. Document BMP implementation and maintenance in the site log book.

If the turbidity exceeds 250 NTU **or** the transparency is 6 cm or less at any time, the following steps will be conducted:

1. Telephone or submit an electronic report to the applicable Ecology Region's Environmental Report Tracking System (ERTS) within 24 hours. https://www.ecology.wa.gov/About-us/Get-involved/Report-an-environmental-issue
   - Central Region (Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, Yakima): (509) 575-2490
   - Eastern Region (Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman): (509) 329-3400
   - Northwest Region (King, Kitsap, Island, San Juan, Skagit, Snohomish, Whatcom): (425) 649-7000
   - Southwest Region (Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Lewis, Mason, Pacific, Pierce, Skamania, Thurston, Wahkiakum,): (360) 407-6300
2. Immediately begin the process to fully implement and maintain appropriate source control and/or treatment BMPs as soon as possible. Address the problems within 10 days of the date the discharge exceeded the benchmark. If installation of necessary treatment BMPs is not feasible within 10 days, Ecology may approve additional time when the Permittee requests an extension within the initial 10-day response period
3. Document BMP implementation and maintenance in the site log book.
4. Continue to sample discharges daily until one of the following is true:
   - Turbidity is 25 NTU (or lower).
   - Transparency is 33 cm (or greater).
   - Compliance with the water quality limit for turbidity is achieved.
     - 1 - 5 NTU over background turbidity, if background is less than 50 NTU
     - 1% - 10% over background turbidity, if background is 50 NTU or greater
   - The discharge stops or is eliminated.

pH Sampling (4.2.2)

pH monitoring is required for "Significant concrete work" (i.e. greater than 1000 cubic yards poured concrete or recycled concrete over the life of the project).The use of engineered soils (soil amendments including but not limited to Portland cement-treated base [CTB], cement kiln dust [CKD] or fly ash) also requires pH monitoring.

For significant concrete work, pH sampling will start the first day concrete is poured and continue until it is cured, typically three (3) weeks after the last pour.

For engineered soils and recycled concrete, pH sampling begins when engineered soils or recycled concrete are first exposed to precipitation and continues until the area is fully stabilized.

If the measured pH is 8.5 or greater, the following measures will be taken:

1. Prevent high pH water from entering storm sewer systems or surface water.
2. Adjust or neutralize the high pH water to the range of 6.5 to 8.5 su using appropriate technology such as carbon dioxide (CO_2) sparging (liquid or dry ice).
3. Written approval will be obtained from Ecology prior to the use of chemical treatment other than CO_2 sparging or dry ice.

Method for sampling pH:

Table 9 – pH Sampling Method

☒	pH meter
☐	pH test kit
☐	Wide range pH indicator paper

Discharges to 303(d) or Total Maximum Daily Load (TMDL) Waterbodies (5.0)

303(d) Listed Waterbodies (5.1)

Is the receiving water 303(d) (Category 5) listed for turbidity, fine sediment, phosphorus, or pH?

☐ Yes ☒ No

List the impairment(s):

N/A

TMDL Waterbodies (5.2)

Waste Load Allocation for CWSGP discharges:

N/A

List and describe BMPs:

N/A

Discharges to TMDL receiving waterbodies will meet in-stream water quality criteria at the point of discharge.

The Construction Stormwater General Permit Proposed New Discharge to an Impaired Water Body form is included in Appendix F.

Reporting and Record Keeping (6.0)

Record Keeping (6.1)

Site Log Book (6.1.1)

A site log book will be maintained for all on-site construction activities and will include:

- A record of the implementation of the SWPPP and other permit requirements
- Site inspections
- Sample logs

Records Retention (6.1.2)

Records will be retained during the life of the project and for a minimum of three (3) years following the termination of permit coverage in accordance with Special Condition S5.C of the CSWGP.

Permit documentation to be retained on-site:

- CSWGP
- Permit Coverage Letter
- SWPPP
- Site Log Book

Permit documentation will be provided within 14 days of receipt of a written request from Ecology. A copy of the SWPPP or access to the SWPPP will be provided to the public when requested in writing in accordance with Special Condition S5.G.2.b of the CSWGP.

Updating the SWPPP (6.1.3)

The SWPPP will be modified if:

- Found ineffective in eliminating or significantly minimizing pollutants in stormwater discharges from the site.
- There is a change in design, construction, operation, or maintenance at the construction site that has, or could have, a significant effect on the discharge of pollutants to waters of the State.

The SWPPP will be modified within seven (7) days if inspection(s) or investigation(s) determine additional or modified BMPs are necessary for compliance. An updated timeline for BMP implementation will be prepared.

Reporting (6.2)

Discharge Monitoring Reports (6.2.1)

Cumulative soil disturbance is one (1) acre or larger; therefore, Discharge Monitoring Reports (DMRs) will be submitted to Ecology monthly. If there was no discharge during a given monitoring period the DMR will be submitted as required, reporting “No Discharge”. The DMR due date is fifteen (15) days following the end of each calendar month.

DMRs will be reported online through Ecology’s WQWebDMR System.

To sign up for WQWebDMR go to:
https://www.ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Water-quality-permits-guidance/WQWebPortal-guidance

Notification of Noncompliance (6.2.2)

If any of the terms and conditions of the permit is not met, and the resulting noncompliance may cause a threat to human health or the environment, the following actions will be taken:

1. Ecology will be notified within 24-hours of the failure to comply by calling the applicable Regional office ERTS phone number (Regional office numbers listed below).
2. Immediate action will be taken to prevent the discharge/pollution or otherwise stop or correct the noncompliance. If applicable, sampling and analysis of any noncompliance will be repeated immediately and the results submitted to Ecology within five (5) days of becoming aware of the violation.
3. A detailed written report describing the noncompliance will be submitted to Ecology within five (5) days, unless requested earlier by Ecology.

Specific information to be included in the noncompliance report is found in Special Condition S5.F.3 of the CSWGP.

Anytime turbidity sampling indicates turbidity is 250 NTUs or greater, or water transparency is 6 cm or less, the Ecology Regional office will be notified by phone within 24 hours of analysis as required by Special Condition S5.A of the CSWGP.

- Central Region at (509) 575-2490 for Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, or Yakima County
- Eastern Region at (509) 329-3400 for Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, or Whitman County
- Northwest Region at (425) 649-7000 for Island, King, Kitsap, San Juan, Skagit, Snohomish, or Whatcom County
- Southwest Region at (360) 407-6300 for Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Lewis, Mason, Pacific, Pierce, Skamania, Thurston, or Wahkiakum

Include the following information:

1. Your name and / Phone number
2. Permit number
3. City / County of project
4. Sample results
5. Date / Time of call
6. Date / Time of sample
7. Project name

In accordance with Special Condition S4.D.5.b of the CSWGP, the Ecology Regional office will be notified if chemical treatment other than CO_2 sparging is planned for adjustment of high pH water.

Appendix/Glossary

A. Site Map
B. BMP Detail
C. Correspondence
D. Site Inspection Form
E. Construction Stormwater General Permit (CSWGP)
F. 303(d) List Waterbodies / TMDL Waterbodies Information
G. Contaminated Site Information
H. Engineering Calculations

APPENDIX A

REFERENCE: MapQuest (2022)

Scale: *Horizontal:* ***N.T.S.*** *Vertical:* ***N/A***	*For:* Freeman Road Logistics Fife, Washington
Barghausen Consulting Engineers, Inc. 18215 72nd Avenue South Kent, WA 98032 425.251.6222 **barghausen.com**	*Title:* VICINITY MAP

Job Number
21585

DATE: 09/01/22

P:\21000s\21585\exhibit\graphics\21585 vmap.cdr

APPENDIX B

Maintenance Standards

Inspect the area frequently to make sure flagging remains in place and the area remains undisturbed. Replace all damaged flagging immediately. Remove all materials located in the buffer area that may impede the ability of the vegetation to act as a filter.

BMP C103: High-Visibility Fence

Purpose

High-visibility fencing is intended to:

- Restrict clearing to approved limits.
- Prevent disturbance of sensitive areas, their buffers, and other areas required to be left undisturbed.
- Limit construction traffic to designated construction entrances, exits, or internal roads.
- Protect areas where marking with survey tape may not provide adequate protection.

Conditions of Use

To establish clearing limits plastic, fabric, or metal fence may be used:

- At the boundary of sensitive areas, their buffers, and other areas required to be left uncleared.
- As necessary to control vehicle access to and on the site.

Design and Installation Specifications

High-visibility plastic fence shall be composed of a high-density polyethylene material and shall be at least four feet in height. Posts for the fencing shall be steel or wood and placed every 6 feet on center (maximum) or as needed to ensure rigidity. The fencing shall be fastened to the post every six inches with a polyethylene tie. On long continuous lengths of fencing, a tension wire or rope shall be used as a top stringer to prevent sagging between posts. The fence color shall be high-visibility orange. The fence tensile strength shall be 360 lbs/ft using the ASTM D4595 testing method.

If appropriate install fabric silt fence in accordance with BMP C233: Silt Fence to act as high-visibility fence. Silt fence shall be at least 3 feet high and must be highly visible to meet the requirements of this BMP.

Metal fences shall be designed and installed according to the manufacturer's specifications.

Metal fences shall be at least 3 feet high and must be highly visible.

Fences shall not be wired or stapled to trees.

Maintenance Standards

If the fence has been damaged or visibility reduced, it shall be repaired or replaced immediately and visibility restored.

BMP C105: Stabilized Construction Access

Purpose

Stabilized construction accesses are established to reduce the amount of sediment transported onto paved roads outside the project site by vehicles or equipment. This is done by constructing a stabilized pad of quarry spalls at entrances and exits for project sites.

Conditions of Use

Construction accesses shall be stabilized wherever traffic will be entering or leaving a construction site if paved roads or other paved areas are within 1,000 feet of the site.

For residential subdivision construction sites, provide a stabilized construction access for each residence, rather than only at the main subdivision entrance. Stabilized surfaces shall be of sufficient length/width to provide vehicle access/parking, based on lot size and configuration.

On large commercial, highway, and road projects, the designer should include enough extra materials in the contract to allow for additional stabilized accesses not shown in the initial Construction SWPPP. It is difficult to determine exactly where access to these projects will take place; additional materials will enable the contractor to install them where needed.

Design and Installation Specifications

See Figure II-3.1: Stabilized Construction Access for details. Note: the 100' minimum length of the access shall be reduced to the maximum practicable size when the size or configuration of the site does not allow the full length (100').

Construct stabilized construction accesses with a 12-inch thick pad of 4-inch to 8-inch quarry spalls, a 4-inch course of asphalt treated base (ATB), or use existing pavement. Do not use crushed concrete, cement, or calcium chloride for construction access stabilization because these products raise pH levels in stormwater and concrete discharge to waters of the State is prohibited.

A separation geotextile shall be placed under the spalls to prevent fine sediment from pumping up into the rock pad. The geotextile shall meet the standards listed in Table II-3.2: Stabilized Construction Access Geotextile Standards.

Table II-3.2: Stabilized Construction Access Geotextile Standards

Geotextile Property	Required Value
Grab Tensile Strength (ASTM D4751)	200 psi min.

Table II-3.2: Stabilized Construction Access Geotextile Standards (continued)

Geotextile Property	Required Value
Grab Tensile Elongation (ASTM D4632)	30% max.
Mullen Burst Strength (ASTM D3786-80a)	400 psi min.
AOS (ASTM D4751)	20-45 (U.S. standard sieve size)

- Consider early installation of the first lift of asphalt in areas that will be paved; this can be used as a stabilized access. Also consider the installation of excess concrete as a stabilized access. During large concrete pours, excess concrete is often available for this purpose.
- Fencing (see BMP C103: High-Visibility Fence) shall be installed as necessary to restrict traffic to the construction access.
- Whenever possible, the access shall be constructed on a firm, compacted subgrade. This can substantially increase the effectiveness of the pad and reduce the need for maintenance.
- Construction accesses should avoid crossing existing sidewalks and back of walk drains if at all possible. If a construction access must cross a sidewalk or back of walk drain, the full length of the sidewalk and back of walk drain must be covered and protected from sediment leaving the site.

Alternative Material Specification

WSDOT has raised safety concerns about the Quarry Spall rock specified above. WSDOT observes that the 4-inch to 8-inch rock sizes can become trapped between Dually truck tires, and then released off-site at highway speeds. WSDOT has chosen to use a modified specification for the rock while continuously verifying that the Stabilized Construction Access remains effective. To remain effective, the BMP must prevent sediment from migrating off site. To date, there has been no performance testing to verify operation of this new specification. Jurisdictions may use the alternative specification, but must perform increased off-site inspection if they use, or allow others to use, it.

Stabilized Construction Accesses may use material that meets the requirements of WSDOT's *Standard Specifications for Road, Bridge, and Municipal Construction* Section 9-03.9(1) (WSDOT, 2016) for ballast except for the following special requirements.

The grading and quality requirements are listed in Table II-3.3: Stabilized Construction Access Alternative Material Requirements.

Table II-3.3: Stabilized Construction Access Alternative Material Requirements

Sieve Size	Percent Passing
2½″	99-100

Table II-3.3: Stabilized Construction Access Alternative Material Requirements (continued)

Sieve Size	Percent Passing
2″	65-100
¾″	40-80
No. 4	5 max.
No. 100	0-2
% Fracture	75 min.

- All percentages are by weight.
- The sand equivalent value and dust ratio requirements do not apply.
- The fracture requirement shall be at least one fractured face and will apply the combined aggregate retained on the No. 4 sieve in accordance with FOP for AASHTO T 335.

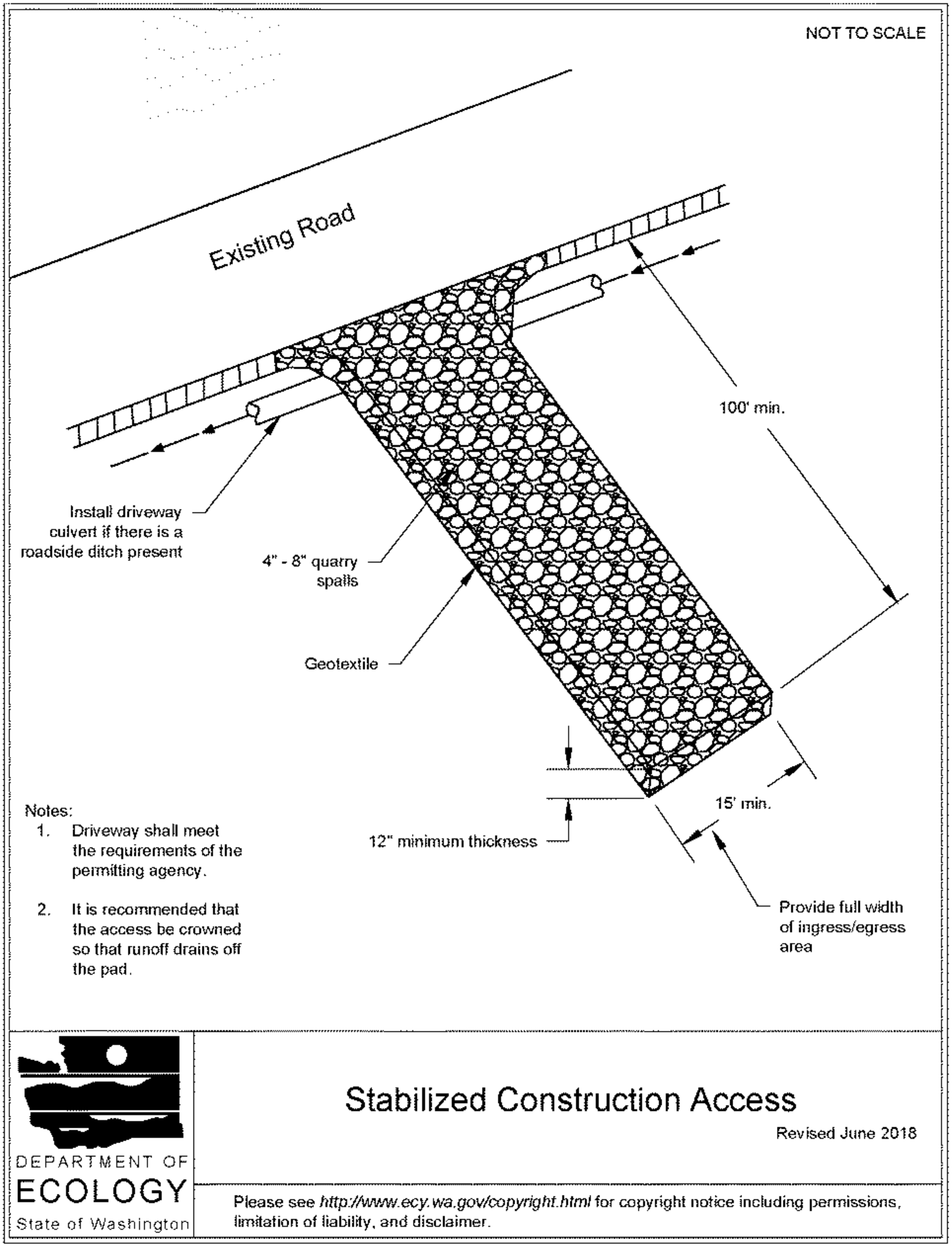
Maintenance Standards

Quarry spalls shall be added if the pad is no longer in accordance with the specifications.

- If the access is not preventing sediment from being tracked onto pavement, then alternative measures to keep the streets free of sediment shall be used. This may include replacement/cleaning of the existing quarry spalls, street sweeping, an increase in the dimensions of the access, or the installation of BMP C106: Wheel Wash.
- Any sediment that is tracked onto pavement shall be removed by shoveling or street sweeping. The sediment collected by sweeping shall be removed or stabilized on site. The pavement shall not be cleaned by washing down the street, except when high efficiency sweeping is ineffective and there is a threat to public safety. If it is necessary to wash the streets, the construction of a small sump to contain the wash water shall be considered. The sediment would then be washed into the sump where it can be controlled.
- Perform street sweeping by hand or with a high efficiency sweeper. Do not use a non-high efficiency mechanical sweeper because this creates dust and throws soils into storm systems or conveyance ditches.
- Any quarry spalls that are loosened from the pad, which end up on the roadway shall be removed immediately.
- If vehicles are entering or exiting the site at points other than the construction access(es), BMP C103: High-Visibility Fence shall be installed to control traffic.

- Upon project completion and site stabilization, all construction accesses intended as permanent access for maintenance shall be permanently stabilized.

Figure II-3.1: Stabilized Construction Access



Approved as Functionally Equivalent

Ecology has approved products as able to meet the requirements of this BMP. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept these products, or may require additional testing prior to consideration for local use. Products that Ecology has approved as functionally equivalent are available for review on Ecology's website at:

https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies

BMP C106: Wheel Wash

Purpose

Wheel washes reduce the amount of sediment transported onto paved roads by washing dirt from the wheels of motor vehicles prior to the motor vehicles leaving the construction site.

Conditions of Use

- Use a wheel wash when BMP C105: Stabilized Construction Access is not preventing sediment from being tracked off site.
- Wheel washing is generally an effective BMP when installed with careful attention to topography. For example, a wheel wash can be detrimental if installed at the top of a slope abutting a right-of-way where the water from the dripping truck can run unimpeded into the street.
- Pressure washing combined with an adequately sized and surfaced pad with direct drainage to a large 10-foot x 10-foot sump can be very effective.
- Wheel wash wastewater is not stormwater. It is commonly called process water, and must be discharged to a separate on-site treatment system that prevents discharge to waters of the State, or to the sanitary sewer with local sewer district approval.
- Wheel washes may use closed-loop recirculation systems to conserve water use.
- Wheel wash wastewater shall not include wastewater from concrete washout areas.
- When practical, the wheel wash should be placed in sequence with BMP C105: Stabilized Construction Access. Locate the wheel wash such that vehicles exiting the wheel wash will enter directly onto BMP C105: Stabilized Construction Access. In order to achieve this, BMP C105: Stabilized Construction Access may need to be extended beyond the standard installation to meet the exit of the wheel wash.

Design and Installation Specifications

Suggested details are shown in Figure II-3.2: Wheel Wash. The Local Permitting Authority may allow other designs. A minimum of 6 inches of asphalt treated base (ATB) over crushed base material or 8 inches over a good subgrade is recommended to pave the wheel wash.

Use a low clearance truck to test the wheel wash before paving. Either a belly dump or lowboy will work well to test clearance.

Keep the water level from 12 to 14 inches deep to avoid damage to truck hubs and filling the truck tongues with water.

Midpoint spray nozzles are only needed in extremely muddy conditions.

Wheel wash systems should be designed with a small grade change, 6- to 12-inches for a 10-foot-wide pond, to allow sediment to flow to the low side of pond to help prevent re-suspension of sediment. A drainpipe with a 2- to 3-foot riser should be installed on the low side of the pond to allow for easy cleaning and refilling. Polymers may be used to promote coagulation and flocculation in a closed-loop system. Polyacrylamide (PAM) added to the wheel wash water at a rate of 0.25 - 0.5 pounds per 1,000 gallons of water increases effectiveness and reduces cleanup time. If PAM is already being used for dust or erosion control and is being applied by a water truck, the same truck can be used to change the wash water.

Maintenance Standards

The wheel wash should start out each day with fresh water.

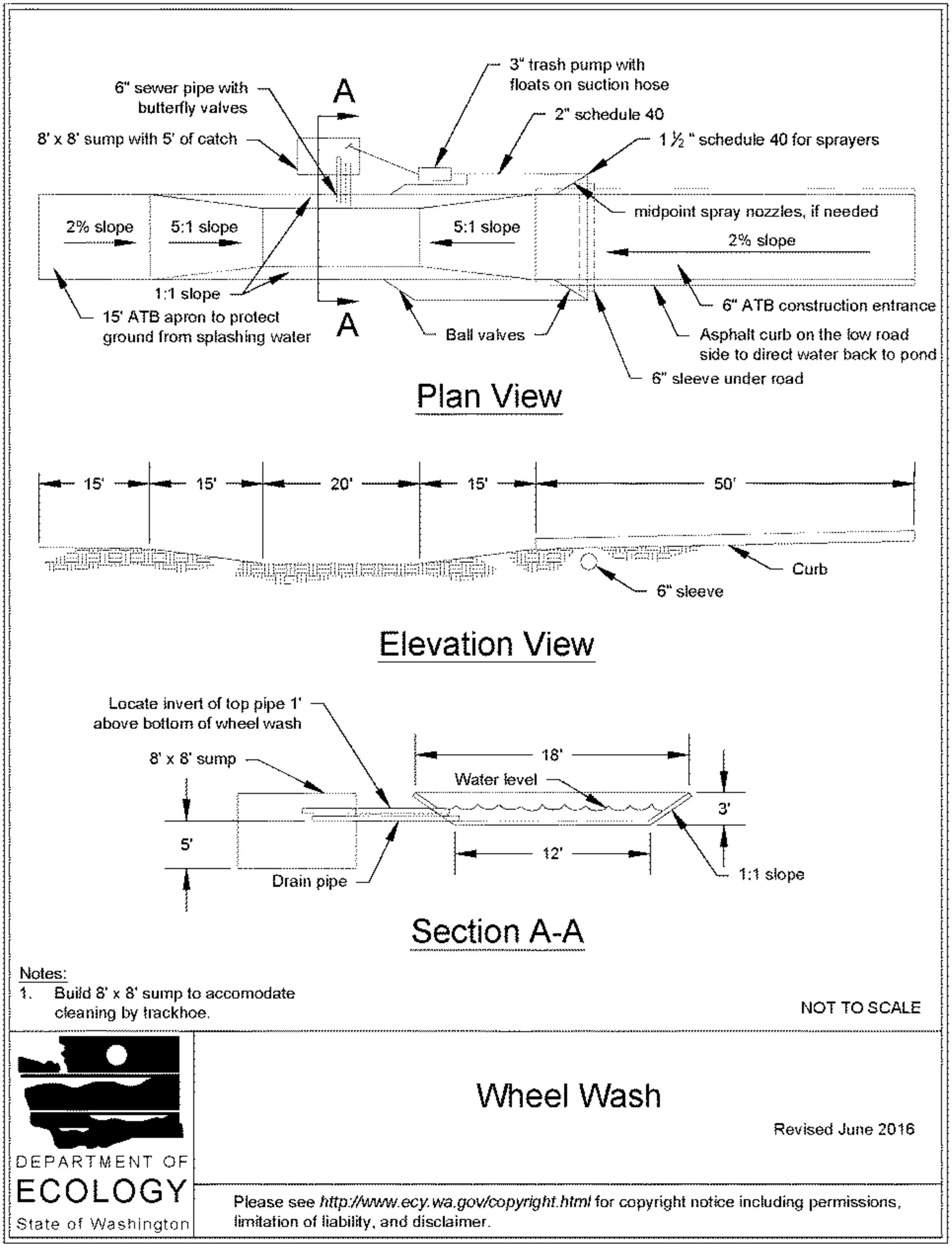
The wheel wash water should be changed a minimum of once per day. On large earthwork jobs where more than 10-20 trucks per hour are expected, the wheel wash water will need to be changed more often.

Approved as Functionally Equivalent

Ecology has approved products as able to meet the requirements of this BMP. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept these products, or may require additional testing prior to consideration for local use. Products that Ecology has approved as functionally equivalent are available for review on Ecology's website at:

https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies

Figure II-3.2: Wheel Wash



BMP C107: Construction Road / Parking Area Stabilization

Purpose

Stabilizing roads, parking areas, and other on-site vehicle transportation routes immediately after grading reduces erosion caused by construction traffic or stormwater runoff.

Conditions of Use

Roads and parking areas shall be stabilized wherever they are constructed, whether permanent or temporary, for use by construction traffic.

BMP C103: High-Visibility Fence shall be installed, if necessary, to limit the access of vehicles to only those roads and parking areas that are stabilized.

Design and Installation Specifications

- On areas that will receive asphalt as part of the project, install the first lift as soon as possible.
- A 6-inch depth of 2- to 4-inch crushed rock, gravel base, or crushed surfacing base course shall be applied immediately after grading or utility installation. A 4-inch course of asphalt treated base (ATB) may also be used, or the road/parking area may be paved. It may also be possible to use cement or calcium chloride for soil stabilization. If cement or cement kiln dust is used for roadbase stabilization, pH monitoring and BMP C252: Treating and Disposing of High pH Water is necessary to evaluate and minimize the effects on stormwater. If the area will not be used for permanent roads, parking areas, or structures, a 6-inch depth of hog fuel may also be used, but this is likely to require more maintenance. Whenever possible, construction roads and parking areas shall be placed on a firm, compacted subgrade.
- Temporary road gradients shall not exceed 15 percent. Roadways shall be carefully graded to drain. Drainage ditches shall be provided on each side of the roadway in the case of a crowned section, or on one side in the case of a super-elevated section. Drainage ditches shall be directed to a sediment control BMP.
- Rather than relying on ditches, it may also be possible to grade the road so that runoff sheetflows into a heavily vegetated area with a well-developed topsoil. Landscaped areas are not adequate. If this area has at least 50 feet of vegetation that water can flow through, then it is generally preferable to use the vegetation to treat runoff, rather than a sediment pond or trap. The 50 feet shall not include wetlands or their buffers. If runoff is allowed to sheetflow through adjacent vegetated areas, it is vital to design the roadways and parking areas so that no concentrated runoff is created.
- Storm drain inlets shall be protected to prevent sediment-laden water entering the drainage system (see BMP C220: Inlet Protection).

Maintenance Standards

Inspect stabilized areas regularly, especially after large storm events.

Crushed rock, gravel base, etc., shall be added as required to maintain a stable driving surface and to stabilize any areas that have eroded.

Following construction, these areas shall be restored to pre-construction condition or better to prevent future erosion.

Perform street cleaning at the end of each day or more often if necessary.

BMP C120: Temporary and Permanent Seeding

Purpose

Seeding reduces erosion by stabilizing exposed soils. A well-established vegetative cover is one of the most effective methods of reducing erosion.

Conditions of Use

Use seeding throughout the project on disturbed areas that have reached final grade or that will remain unworked for more than 30 days.

The optimum seeding windows for western Washington are April 1 through June 30 and September 1 through October 1.

Between July 1 and August 30 seeding requires irrigation until 75 percent grass cover is established.

Between October 1 and March 30 seeding requires a cover of mulch or an erosion control blanket until 75 percent grass cover is established.

Review all disturbed areas in late August to early September and complete all seeding by the end of September. Otherwise, vegetation will not establish itself enough to provide more than average protection.

Mulch is required at all times for seeding because it protects seeds from heat, moisture loss, and transport due to runoff. Mulch can be applied on top of the seed or simultaneously by hydroseeding. See BMP C121: Mulching for specifications.

Seed and mulch all disturbed areas not otherwise vegetated at final site stabilization. Final stabilization means the completion of all soil disturbing activities at the site and the establishment of a permanent vegetative cover, or equivalent permanent stabilization measures (such as pavement, riprap, gabions, or geotextiles) which will prevent erosion. See BMP T5.13: Post-Construction Soil Quality and Depth.

Design and Installation Specifications

General

- Install channels intended for vegetation before starting major earthwork and hydroseed with a Bonded Fiber Matrix. For vegetated channels that will have high flows, install erosion control blankets over the top of hydroseed. Before allowing water to flow in vegetated channels, establish 75 percent vegetation cover. If vegetated channels cannot be established by seed before water flow; install sod in the channel bottom — over top of hydromulch and erosion control blankets.

- Confirm the installation of all required surface water control measures to prevent seed from washing away.
- Hydroseed applications shall include a minimum of 1,500 pounds per acre of mulch with 3 percent tackifier. See BMP C121: Mulching for specifications.
- Areas that will have seeding only and not landscaping may need compost or meal-based mulch included in the hydroseed in order to establish vegetation. Re-install native topsoil on the disturbed soil surface before application. See BMP T5.13: Post-Construction Soil Quality and Depth.
- When installing seed via hydroseeding operations, only about 1/3 of the seed actually ends up in contact with the soil surface. This reduces the ability to establish a good stand of grass quickly. To overcome this, consider increasing seed quantities by up to 50 percent.
- Enhance vegetation establishment by dividing the hydromulch operation into two phases:
    - Phase 1- Install all seed and fertilizer with 25-30 percent mulch and tackifier onto soil in the first lift.
    - Phase 2- Install the rest of the mulch and tackifier over the first lift.

  Or, enhance vegetation by:
    - Installing the mulch, seed, fertilizer, and tackifier in one lift.
    - Spread or blow straw over the top of the hydromulch at a rate of 800-1000 pounds per acre.
    - Hold straw in place with a standard tackifier.

  Both of these approaches will increase cost moderately but will greatly improve and enhance vegetative establishment. The increased cost may be offset by the reduced need for:
    - Irrigation.
    - Reapplication of mulch.
    - Repair of failed slope surfaces.

  This technique works with standard hydromulch (1,500 pounds per acre minimum) and Bonded Fiber Matrix/ Mechanically Bonded Fiber Matrix (BFM/MBFMs) (3,000 pounds per acre minimum).
- Seed may be installed by hand if:
    - Temporary and covered by straw, mulch, or topsoil.
    - Permanent in small areas (usually less than 1 acre) and covered with mulch, topsoil, or erosion blankets.
- The seed mixes listed in Table II-3.4: Temporary and Permanent Seed Mixes include

recommended mixes for both temporary and permanent seeding.

- Apply these mixes, with the exception of the wet area seed mix, at a rate of 120 pounds per acre. This rate can be reduced if soil amendments or slow-release fertilizers are used. Apply the wet area seed mix at a rate of 60 pounds per acre.
- Consult the local suppliers or the local conservation district for their recommendations. The appropriate mix depends on a variety of factors, including location, exposure, soil type, slope, and expected foot traffic. Alternative seed mixes approved by the local authority may be used, depending on the soil type and hydrology of the area.

Table II-3.4: Temporary and Permanent Seed Mixes

Common Name	Latin Name	% Weight	% Purity	% Germination
Temporary Erosion Control Seed Mix A standard mix for areas requiring a temporary vegetative cover.				
Chewings or annual blue grass	*Festuca rubra var. commutata* or *Poa anna*	40	98	90
Perennial rye	*Lolium perenne*	50	98	90
Redtop or colonial bentgrass	*Agrostis alba* or *Agrostis tenuis*	5	92	85
White dutch clover	*Trifolium repens*	5	98	90
Landscaping Seed Mix A recommended mix for landscaping seed.				
Perennial rye blend	*Lolium perenne*	70	98	90
Chewings and red fescue blend	*Festuca rubra var. commutata* or *Festuca rubra*	30	98	90
Low-Growing Turf Seed Mix A turf seed mix for dry situations where there is no need for watering. This mix requires very little maintenance.				
Dwarf tall fescue (several varieties)	*Festuca arundinacea var.*	45	98	90
Dwarf perennial rye (Barclay)	*Lolium perenne var. barclay*	30	98	90
Red fescue	*Festuca rubra*	20	98	90
Colonial bentgrass	*Agrostis tenuis*	5	98	90
Bioswale Seed Mix A seed mix for bioswales and other intermittently wet areas.				
Tall or meadow fes-	*Festuca arundin-*	75-80	98	90

Table II-3.4: Temporary and Permanent Seed Mixes (continued)

Common Name	Latin Name	% Weight	% Purity	% Germination
cue	*acea* or *Festuca elatior*			
Seaside/Creeping bentgrass	*Agrostis palustris*	10-15	92	85
Redtop bentgrass	*Agrostis alba* or *Agrostis gigantea*	5-10	90	80
Wet Area Seed Mix A low-growing, relatively non-invasive seed mix appropriate for very wet areas that are not regulated wetlands. Consult Hydraulic Permit Authority (HPA) for seed mixes if applicable.				
Tall or meadow fescue	*Festuca arundinacea* or *Festuca elatior*	60-70	98	90
Seaside/Creeping bentgrass	*Agrostis palustris*	10-15	98	85
Meadow foxtail	*Alepocurus pratensis*	10-15	90	80
Alsike clover	*Trifolium hybridum*	1-6	98	90
Redtop bentgrass	*Agrostis alba*	1-6	92	85
Meadow Seed Mix A recommended meadow seed mix for infrequently maintained areas or non-maintained areas where colonization by native plants is desirable. Likely applications include rural road and utility right-of-way. Seeding should take place in September or very early October in order to obtain adequate establishment prior to the winter months. Consider the appropriateness of clover, a fairly invasive species, in the mix. Amending the soil can reduce the need for clover.				
Redtop or Oregon bentgrass	*Agrostis alba* or *Agrostis oregonensis*	20	92	85
Red fescue	*Festuca rubra*	70	98	90
White dutch clover	*Trifolium repens*	10	98	90

Roughening and Rototilling

- The seedbed should be firm and rough. Roughen all soil no matter what the slope. Track walk slopes before seeding if engineering purposes require compaction. Backblading or smoothing of slopes greater than 4H:1V is not allowed if they are to be seeded.
- Restoration-based landscape practices require deeper incorporation than that provided by a simple single-pass rototilling treatment. Wherever practical, initially rip the subgrade to improve long-term permeability, infiltration, and water inflow qualities. At a minimum,

permanent areas shall use soil amendments to achieve organic matter and permeability performance defined in engineered soil/landscape systems. For systems that are deeper than 8 inches complete the rototilling process in multiple lifts, or prepare the engineered soil system per specifications and place to achieve the specified depth.

Fertilizers

- Conducting soil tests to determine the exact type and quantity of fertilizer is recommended. This will prevent the over-application of fertilizer.
- Organic matter is the most appropriate form of fertilizer because it provides nutrients (including nitrogen, phosphorus, and potassium) in the least water-soluble form.
- In general, use 10-4-6 N-P-K (nitrogen-phosphorus-potassium) fertilizer at a rate of 90 pounds per acre. Always use slow-release fertilizers because they are more efficient and have fewer environmental impacts. Do not add fertilizer to the hydromulch machine, or agitate, more than 20 minutes before use. Too much agitation destroys the slow-release coating.
- There are numerous products available that take the place of chemical fertilizers. These include several with seaweed extracts that are beneficial to soil microbes and organisms. If 100 percent cottonseed meal is used as the mulch in hydroseed, chemical fertilizer may not be necessary. Cottonseed meal provides a good source of long-term, slow-release, available nitrogen.

Bonded Fiber Matrix and Mechanically Bonded Fiber Matrix

- On steep slopes use Bonded Fiber Matrix (BFM) or Mechanically Bonded Fiber Matrix (MBFM) products. Apply BFM/MBFM products at a minimum rate of 3,000 pounds per acre with approximately 10 percent tackifier. Achieve a minimum of 95 percent soil coverage during application. Numerous products are available commercially. Most products require 24-36 hours to cure before rainfall and cannot be installed on wet or saturated soils. Generally, products come in 40-50 pound bags and include all necessary ingredients except for seed and fertilizer.
- Install products per manufacturer's instructions.
- BFMs and MBFMs provide good alternatives to blankets in most areas requiring vegetation establishment. Advantages over blankets include:
    - BFM and MBFMs do not require surface preparation.
    - Helicopters can assist in installing BFM and MBFMs in remote areas.
    - On slopes steeper than 2.5H:1V, blanket installers may require ropes and harnesses for safety.
    - Installing BFM and MBFMs can save at least $1,000 per acre compared to blankets.

Maintenance Standards

Reseed any seeded areas that fail to establish at least 75 percent cover (100 percent cover for areas that receive sheet or concentrated flows). If reseeding is ineffective, use an alternate method such as sodding, mulching, nets, or blankets.

- Reseed and protect by mulch any areas that experience erosion after achieving adequate cover. Reseed and protect by mulch any eroded area.
- Supply seeded areas with adequate moisture, but do not water to the extent that it causes run-off.

Approved as Functionally Equivalent

Ecology has approved products as able to meet the requirements of this BMP. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept these products, or may require additional testing prior to consideration for local use. Products that Ecology has approved as functionally equivalent are available for review on Ecology's website at:

https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies

BMP C121: Mulching

Purpose

Mulching soils provides immediate temporary protection from erosion. Mulch also enhances plant establishment by conserving moisture, holding fertilizer, seed, and topsoil in place, and moderating soil temperatures. There are a variety of mulches that can be used. This section discusses only the most common types of mulch.

Conditions of Use

As a temporary cover measure, mulch should be used:

- For less than 30 days on disturbed areas that require cover.
- At all times for seeded areas, especially during the wet season and during the hot summer months.
- During the wet season on slopes steeper than 3H:1V with more than 10 feet of vertical relief.

Mulch may be applied at any time of the year and must be refreshed periodically.

For seeded areas, mulch may be made up of 100 percent:

- cottonseed meal;
- fibers made of wood, recycled cellulose, hemp, or kenaf;

- compost;
- or blends of these.

Tackifier shall be plant-based, such as guar or alpha plantago, or chemical-based such as polyacrylamide or polymers.

Generally, mulches come in 40-50 pound bags. Seed and fertilizer are added at time of application.

Recycled cellulose may contain polychlorinated biphenyl (PCBs). Ecology recommends that products should be evaluated for PCBs prior to use.

Refer to BMP C126: Polyacrylamide (PAM) for Soil Erosion Protection for conditions of use. PAM shall not be directly applied to water or allowed to enter a water body.

Any mulch or tackifier product used shall be installed per the manufacturer's instructions.

Design and Installation Specifications

For mulch materials, application rates, and specifications, see Table II-3.6: Mulch Standards and Guidelines. Consult with the local supplier or the local conservation district for their recommendations. Increase the application rate until the ground is 95% covered (i.e. not visible under the mulch layer). Note: Thickness may be increased for disturbed areas in or near sensitive areas or other areas highly susceptible to erosion.

Where the option of "Compost" is selected, it should be a coarse compost that meets the size gradations listed in Table II-3.5: Size Gradations of Compost as Mulch Material when tested in accordance with Test Method 02.02-B found in *Test Methods for the Examination of Composting and Compost* (Thompson, 2001).

Table II-3.5: Size Gradations of Compost as Mulch Material

Sieve Size	Percent Passing
3"	100%
1"	90% - 100%
3/4"	70% - 100%
1/4"	40% - 100%

Mulch used within the ordinary high-water mark of surface waters should be selected to minimize potential flotation of organic matter. Composted organic materials have higher specific gravities (densities) than straw, wood, or chipped material. Consult the Hydraulic Permit Authority (HPA) for mulch mixes if applicable.

Maintenance Standards

The thickness of the mulch cover must be maintained.

Any areas that experience erosion shall be remulched and/or protected with a net or blanket. If the erosion problem is drainage related, then the problem shall be fixed and the eroded area remulched.

Table II-3.6: Mulch Standards and Guidelines

Mulch Material	Guideline	Description
Straw	Quality Standards	Air-dried; free from undesirable seed and coarse material.
	Application Rates	2"-3" thick; 5 bales per 1,000 sf or 2-3 tons per acre
	Remarks	Cost-effective protection when applied with adequate thickness. Hand-application generally requires greater thickness than blown straw. The thickness of straw may be reduced by half when used in conjunction with seeding. In windy areas straw must be held in place by crimping, using a tackifier, or covering with netting. Blown straw always has to be held in place with a tackifier as even light winds will blow it away. Straw, however, has several deficiencies that should be considered when selecting mulch materials. It often introduces and/or encourages the propagation of weed species and it has no significant long-term benefits It should also not be used within the ordinary high-water elevation of surface waters (due to flotation).
Hydromulch	Quality Standards	No growth inhibiting factors.
	Application Rates	Approx. 35-45 lbs per 1,000 sf or 1,500 - 2,000 lbs per acre
	Remarks	Shall be applied with hydromulcher. Shall not be used without seed and tackifier unless the application rate is at least doubled. Fibers longer than about 3/4 - 1 inch clog hydromulch equipment. Fibers should be kept to less than 3/4 inch.
Compost	Quality Standards	No visible water or dust during handling. Must be produced per WAC 173-350, Solid Waste Handling Standards, but may have up to 35% biosolids.
	Application Rates	2" thick min.; approx. 100 tons per acre (approx. 750 lbs per cubic yard)
	Remarks	More effective control can be obtained by increasing thickness to 3". Excellent mulch for protecting final grades until landscaping because it can be directly seeded or tilled into soil as an amendment. Compost used for mulch has a coarser size gradation than compost used for BMP C125: Topsoiling / Composting or BMP T5.13: Post-Construction Soil Quality and Depth. It is more stable and practical to use in wet areas and during rainy weather conditions. Do not use near wetlands or near phosphorous impaired water bodies.
Chipped Site Vegetation	Quality Standards	Gradations from fines to 6 inches in length for texture, variation, and interlocking properties. Include a mix of various sizes so that the average size is between 2- and 4- inches.
	Application Rates	2" thick min.;

Table II-3.6: Mulch Standards and Guidelines (continued)

Mulch Material	Guideline	Description
	Remarks	This is a cost-effective way to dispose of debris from clearing and grubbing, and it eliminates the problems associated with burning. Generally, it should not be used on slopes above approx. 10% because of its tendency to be transported by runoff. It is not recommended within 200 feet of surface waters. If permanent seeding or planting is expected shortly after mulch, the decomposition of the chipped vegetation may tie up nutrients important to grass establishment. Note: thick application of this material over existing grass, herbaceous species, and some groundcovers could smother and kill vegetation.
Wood-Based Mulch	Quality Standards	No visible water or dust during handling. Must be purchased from a supplier with a Solid Waste Handling Permit or one exempt from solid waste regulations.
	Application Rates	2" thick min.; approx. 100 tons per acre (approx. 750 lbs. per cubic yard)
	Remarks	This material is often called "wood straw" or "hog fuel". The use of mulch ultimately improves the organic matter in the soil. Special caution is advised regarding the source and composition of wood-based mulches. Its preparation typically does not provide any weed seed control, so evidence of residual vegetation in its composition or known inclusion of weed plants or seeds should be monitored and prevented (or minimized).
Wood Strand Mulch	Quality Standards	A blend of loose, long, thin wood pieces derived from native conifer or deciduous trees with high length-to-width ratio.
	Application Rates	2" thick min.
	Remarks	Cost-effective protection when applied with adequate thickness. A minimum of 95-percent of the wood strand shall have lengths between 2 and 10-inches, with a width and thickness between 1/16 and 1/2-inches. The mulch shall not contain resin, tannin, or other compounds in quantities that would be detrimental to plant life. Sawdust or wood shavings shall not be used as mulch. [Specification 9-14.4(4) from the *Standard Specifications for Road, Bridge, and Municipal Construction* (WSDOT, 2016)

BMP C122: Nets and Blankets

Purpose

Erosion control nets and blankets are intended to prevent erosion and hold seed and mulch in place on steep slopes and in channels so that vegetation can become well established. In addition, some nets and blankets can be used to permanently reinforce turf to protect drainage ways during high flows.

Nets (commonly called matting) are strands of material woven into an open, but high-tensile strength net (for example, coconut fiber matting). Blankets are strands of material that are not tightly woven, but instead form a layer of interlocking fibers, typically held together by a biodegradable or photodegradable netting (for example, excelsior or straw blankets). They generally have lower tensile strength than nets, but cover the ground more completely. Coir (coconut fiber) fabric comes as both nets and blankets.

Conditions of Use

Erosion control netting and blankets shall be made of natural plant fibers unaltered by synthetic materials.

Erosion control nets and blankets should be used:

- To aid permanent vegetated stabilization of slopes 2H:1V or greater and with more than 10 feet of vertical relief.
- For drainage ditches and swales (highly recommended). The application of appropriate netting or blanket to drainage ditches and swales can protect bare soil from channelized runoff while vegetation is established. Nets and blankets also can capture a great deal of sediment due to their open, porous structure. Nets and blankets can be used to permanently stabilize channels and may provide a cost-effective, environmentally preferable alternative to riprap.

Disadvantages of nets and blankets include:

- Surface preparation is required.
- On slopes steeper than 2.5H:1V, net and blanket installers may need to be roped and harnessed for safety.
- They cost at least $4,000-6,000 per acre installed.

Advantages of nets and blankets include:

- Installation without mobilizing special equipment.
- Installation by anyone with minimal training
- Installation in stages or phases as the project progresses.
- Installers can hand place seed and fertilizer as they progress down the slope.
- Installation in any weather.
- There are numerous types of nets and blankets that can be designed with various parameters in mind. Those parameters include: fiber blend, mesh strength, longevity, biodegradability, cost, and availability.

An alternative to nets and blankets in some limited conditions is BMP C202: Riprap Channel Lining. Ensure that BMP C202: Riprap Channel Lining is appropriate before using it as a substitute for nets and blankets.

Design and Installation Specifications

- See Figure II-3.3: Channel Installation (Clackamas County et al., 2008) and Figure II-3.4: Slope Installation for typical orientation and installation of nets and blankets used in channels and as slope protection. Note: these are typical only; all nets and blankets must be installed per manufacturer's installation instructions.
- Installation is critical to the effectiveness of these products. If good ground contact is not achieved, runoff can concentrate under the product, resulting in significant erosion.
- Installation of nets and blankets on slopes:
  1. Complete final grade and track walk up and down the slope.
  2. Install hydromulch with seed and fertilizer.
  3. Dig a small trench, approximately 12 inches wide by 6 inches deep along the top of the slope.
  4. Install the leading edge of the net/blanket into the small trench and staple approximately every 18 inches. NOTE: Staples are metal, "U"-shaped, and a minimum of 6 inches long. Longer staples are used in sandy soils. Biodegradable stakes are also available.
  5. Roll the net/blanket slowly down the slope as the installer walks backward. NOTE: The net/blanket rests against the installer's legs. Staples are installed as the net/blanket is unrolled. It is critical that the proper staple pattern is used for the net/blanket being installed. The net/blanket is not to be allowed to roll down the slope on its own as this stretches the net/blanket, making it impossible to maintain soil contact. In addition, no one is allowed to walk on the net/blanket after it is in place.
  6. If the net/blanket is not long enough to cover the entire slope length, the trailing edge of the upper net/blanket should overlap the leading edge of the lower net/blanket and be stapled. On steeper slopes, this overlap should be installed in a small trench, stapled, and covered with soil.
- With the variety of products available, it is impossible to cover all the details of appropriate use and installation. Therefore, it is critical that the designer consult the manufacturer's information and that a site visit takes place in order to ensure that the product specified is appropriate. Information is also available in WSDOT's *Standard Specifications for Road, Bridge, and Municipal Construction* Division 8-01 and Division 9-14 (WSDOT, 2016).
- Use jute matting in conjunction with mulch (BMP C121: Mulching). Excelsior, woven straw blankets and coir (coconut fiber) blankets may be installed without mulch. There are many other types of erosion control nets and blankets on the market that may be appropriate in certain circumstances.
- In general, most nets (e.g., jute matting) require mulch in order to prevent erosion because they have a fairly open structure. Blankets typically do not require mulch because they usually provide complete protection of the surface.
- Extremely steep, unstable, wet, or rocky slopes are often appropriate candidates for use of synthetic blankets, as are riverbanks, beaches and other high-energy environments. If

synthetic blankets are used, the soil should be hydromulched first.

- 100-percent biodegradable blankets are available for use in sensitive areas. These organic blankets are usually held together with a paper or fiber mesh and stitching which may last up to a year.
- Most netting used with blankets is photodegradable, meaning it breaks down under sunlight (not UV stabilized). However, this process can take months or years even under bright sun. Once vegetation is established, sunlight does not reach the mesh. It is not uncommon to find non-degraded netting still in place several years after installation. This can be a problem if maintenance requires the use of mowers or ditch cleaning equipment. In addition, birds and small animals can become trapped in the netting.

Maintenance Standards

- Maintain good contact with the ground. Erosion must not occur beneath the net or blanket.
- Repair and staple any areas of the net or blanket that are damaged or not in close contact with the ground.
- Fix and protect eroded areas if erosion occurs due to poorly controlled drainage.

Figure II-3.3: Channel Installation

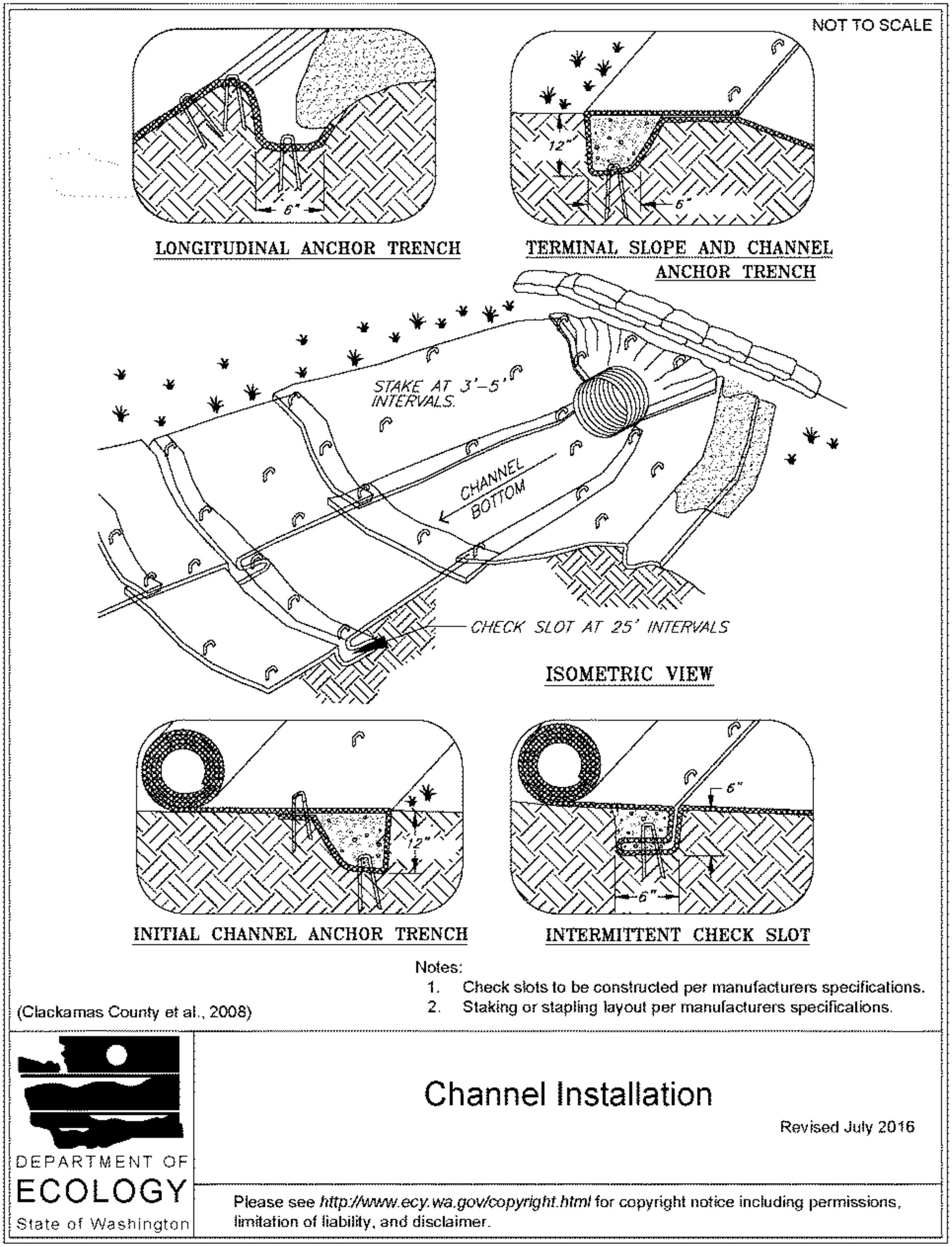
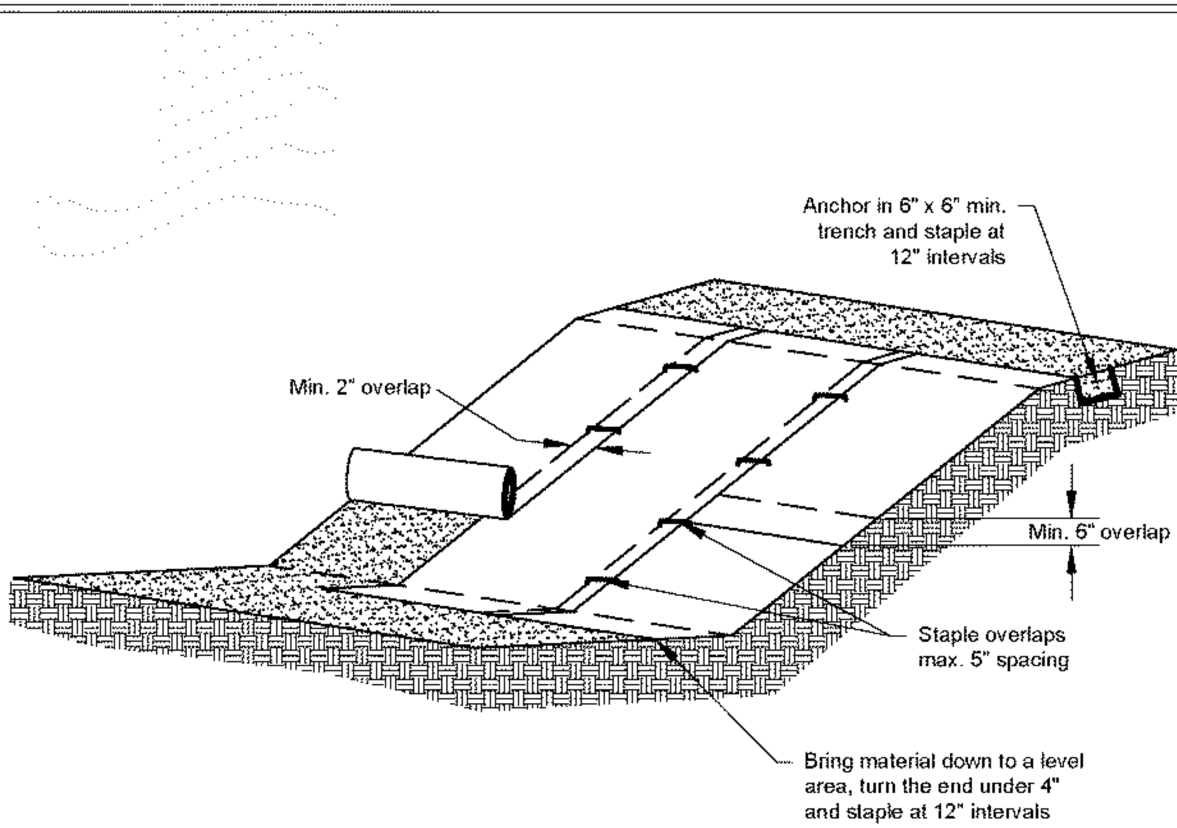


Figure II-3.4: Slope Installation



Notes:

1. Slope surface shall be smooth before placement for proper soil contact.
2. Stapling pattern as per manufacturer's recommendations.
3. Do not stretch blankets/mattings tight - allow the rolls to mold to any irregularities.
4. For slopes less than 3H:1V, rolls may be placed in horizontal strips.
5. If there is a berm at the top of the slope, anchor upslope of the berm.
6. Lime, fertilize, and seed before installation. Planting of shrubs, trees, etc. should occur after installation.

NOT TO SCALE

DEPARTMENT OF ECOLOGY
State of Washington

Slope Installation

Revised June 2016

BMP C123: Plastic Covering

Purpose

Plastic covering provides immediate, short-term erosion protection to slopes and disturbed areas.

Conditions of Use

Plastic covering may be used on disturbed areas that require cover measures for less than 30 days, except as stated below.

- Plastic is particularly useful for protecting cut and fill slopes and stockpiles. However, the relatively rapid breakdown of most polyethylene sheeting makes it unsuitable for applications greater than six months.
- Due to rapid runoff caused by plastic covering, do not use this method upslope of areas that might be adversely impacted by concentrated runoff. Such areas include steep and/or unstable slopes.
- Plastic sheeting may result in increased runoff volumes and velocities, requiring additional on-site measures to counteract the increases. Creating a trough with wattles or other material can convey clean water away from these areas.
- To prevent undercutting, trench and backfill rolled plastic covering products.
- Although the plastic material is inexpensive to purchase, the cost of installation, maintenance, removal, and disposal add to the total costs of this BMP.
- Whenever plastic is used to protect slopes, install water collection measures at the base of the slope. These measures include plastic-covered berms, channels, and pipes used to convey clean rainwater away from bare soil and disturbed areas. Do not mix clean runoff from a plastic covered slope with dirty runoff from a project.
- Other uses for plastic include:
  - Temporary ditch liner.
  - Pond liner in temporary sediment pond.
  - Liner for bermed temporary fuel storage area if plastic is not reactive to the type of fuel being stored.
  - Emergency slope protection during heavy rains.
  - Temporary drainpipe (“elephant trunk”) used to direct water.

Design and Installation Specifications

- Plastic slope cover must be installed as follows:
  1. Run plastic up and down the slope, not across the slope.
  2. Plastic may be installed perpendicular to a slope if the slope length is less than 10 feet.

3. Provide a minimum of 8-inch overlap at the seams.
4. On long or wide slopes, or slopes subject to wind, tape all seams.
5. Place plastic into a small (12-inch wide by 6-inch deep) slot trench at the top of the slope and backfill with soil to keep water from flowing underneath.
6. Place sand filled burlap or geotextile bags every 3 to 6 feet along seams and tie them together with twine to hold them in place.
7. Inspect plastic for rips, tears, and open seams regularly and repair immediately. This prevents high velocity runoff from contacting bare soil, which causes extreme erosion.
8. Sandbags may be lowered into place tied to ropes. However, all sandbags must be staked in place.

- Plastic sheeting shall have a minimum thickness of 0.06 millimeters.
- If erosion at the toe of a slope is likely, a gravel berm, riprap, or other suitable protection shall be installed at the toe of the slope in order to reduce the velocity of runoff.

Maintenance Standards

- Torn sheets must be replaced and open seams repaired.
- Completely remove and replace the plastic if it begins to deteriorate due to ultraviolet radiation.
- Completely remove plastic when no longer needed.
- Dispose of old tires used to weight down plastic sheeting appropriately.

Approved as Functionally Equivalent

Ecology has approved products as able to meet the requirements of this BMP. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept these products, or may require additional testing prior to consideration for local use. Products that Ecology has approved as functionally equivalent are available for review on Ecology's website at:

https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies

BMP C124: Sodding

Purpose

The purpose of sodding is to establish turf for immediate erosion protection and to stabilize drainage paths where concentrated overland flow will occur.

Conditions of Use

Sodding may be used in the following areas:

- Disturbed areas that require short-term or long-term cover.
- Disturbed areas that require immediate vegetative cover.
- All waterways that require vegetative lining. Waterways may also be seeded rather than sodded, and protected with a net or blanket.

Design and Installation Specifications

Sod shall be free of weeds, of uniform thickness (approximately 1-inch thick), and shall have a dense root mat for mechanical strength.

The following steps are recommended for sod installation:

1. Shape and smooth the surface to final grade in accordance with the approved grading plan. Consider any areas (such as swales) that need to be overexcavated below design elevation to allow room for placing soil amendment and sod.
2. Amend 4 inches (minimum) of compost into the top 8 inches of the soil if the organic content of the soil is less than ten percent or the permeability is less than 0.6 inches per hour. See https://ecology.wa.gov/Waste-Toxics/Reducing-recycling-waste/Organic-materials/Managing-organics-compost for further information.
3. Fertilize according to the sod supplier's recommendations.
4. Work lime and fertilizer 1 to 2 inches into the soil, and smooth the surface.
5. Lay strips of sod beginning at the lowest area to be sodded and perpendicular to the direction of water flow. Wedge strips securely into place. Square the ends of each strip to provide for a close, tight fit. Stagger joints at least 12 inches. Staple on slopes steeper than 3H:1V. Staple the upstream edge of each sod strip.
6. Roll the sodded area and irrigate.
7. When sodding is carried out in alternating strips or other patterns, seed the areas between the sod immediately after sodding.

Maintenance Standards

If the grass is unhealthy, the cause shall be determined and appropriate action taken to reestablish a healthy groundcover. If it is impossible to establish a healthy groundcover due to frequent saturation, instability, or some other cause, the sod shall be removed, the area seeded with an appropriate mix, and protected with a net or blanket.

BMP C125: Topsoiling / Composting

Purpose

Topsoiling and composting provide a suitable growth medium for final site stabilization with vegetation. While not a permanent cover practice in itself, topsoiling and composting are an integral component of providing permanent cover in those areas where there is an unsuitable soil surface for plant growth. Use this BMP in conjunction with other BMPs such as BMP C120: Temporary and Permanent Seeding, BMP C121: Mulching, or BMP C124: Sodding. Implementation of this BMP may meet the post-construction requirements of BMP T5.13: Post-Construction Soil Quality and Depth.

Native soils and disturbed soils that have been organically amended not only retain much more stormwater, but also serve as effective biofilters for urban pollutants and, by supporting more vigorous plant growth, reduce the water, fertilizer and pesticides needed to support installed landscapes. Topsoil does not include any subsoils but only the material from the top several inches including organic debris.

Conditions of Use

- Permanent landscaped areas shall contain healthy topsoil that reduces the need for fertilizers, improves overall topsoil quality, provides for better vegetative health and vitality, improves hydrologic characteristics, and reduces the need for irrigation.
- Leave native soils and the duff layer undisturbed to the maximum extent practicable. Stripping of existing, properly functioning soil system and vegetation for the purpose of topsoiling during construction is not acceptable. Preserve existing soil systems in undisturbed and uncompacted conditions if functioning properly.
- Areas that already have good topsoil, such as undisturbed areas, do not require soil amendments.
- Restore, to the maximum extent practical, native soils disturbed during clearing and grading to a condition equal to or better than the original site condition’s moisture-holding capacity. Use on-site native topsoil, incorporate amendments into on-site soil, or import blended topsoil to meet this requirement.
- Topsoiling is a required procedure when establishing vegetation on shallow soils, and soils of critically low pH (high acid) levels.
- Beware of where the topsoil comes from, and what vegetation was on site before disturbance. Invasive plant seeds may be included and could cause problems for establishing native plants, landscaped areas, or grasses.
- Topsoil from the site will contain mycorrhizal bacteria that are necessary for healthy root growth and nutrient transfer. These native mycorrhiza are acclimated to the site and will provide optimum conditions for establishing grasses. Use commercially available mycorrhiza products when using off-site topsoil.

Design and Installation Specifications

Meet the following requirements for disturbed areas that will be developed as lawn or landscaped areas at the completed project site:

- Maximize the depth of the topsoil wherever possible to provide the maximum possible infiltration capacity and beneficial growth medium. Topsoil shall have:
    - A minimum depth of 8-inches. Scarify subsoils below the topsoil layer at least 4-inches with some incorporation of the upper material to avoid stratified layers, where feasible. Ripping or re-structuring the subgrade may also provide additional benefits regarding the overall infiltration and interflow dynamics of the soil system.
    - A minimum organic content of 10% dry weight in planting beds, and 5% organic matter content in turf areas. Incorporate organic amendments to a minimum 8-inch depth except where tree roots or other natural features limit the depth of incorporation.
    - A pH between 6.0 and 8.0 or matching the pH of the undisturbed soil.
    - If blended topsoil is imported, then fines should be limited to 25 percent passing through a 200 sieve.
- Mulch planting beds with 2 inches of organic material
- Accomplish the required organic content, depth, and pH by returning native topsoil to the site, importing topsoil of sufficient organic content, and/or incorporating organic amendments. When using the option of incorporating amendments to meet the organic content requirement, use compost that meets the compost specification for Bioretention (See BMP T7.30: Bioretention), with the exception that the compost may have up to 35% biosolids or manure.
- Sections 3 through 7 of *Building Soil: Guidelines and Resources for Implementing Soil Quality and Depth BMP T5.13 in WDOE Stormwater Management Manual for Western Washington* (Stenn et al., 2016), provides useful guidance for implementing whichever option is chosen. It includes guidance for pre-approved default strategies and guidance for custom strategies. Check with your local jurisdiction concerning its acceptance of this guidance.
- The final composition and construction of the soil system will result in a natural selection or favoring of certain plant species over time. For example, incorporation of topsoil may favor grasses, while layering with mildly acidic, high-carbon amendments may favor more woody vegetation.
- Allow sufficient time in scheduling for topsoil spreading prior to seeding, sodding, or planting.
- Take care when applying top soil to subsoils with contrasting textures. Sandy topsoil over clayey subsoil is a particularly poor combination, as water creeps along the junction between the soil layers and causes the topsoil to slough. If topsoil and subsoil are not properly bonded, water will not infiltrate the soil profile evenly and it will be difficult to establish vegetation. The best method to promote bonding is to actually work the topsoil into the layer below for a depth of at least 6 inches.
- Field exploration of the site shall be made to determine if there is surface soil of sufficient quantity and quality to justify stripping. Topsoil shall be friable and loamy (loam, sandy loam,

silt loam, sandy clay loam, and clay loam). Avoid areas of natural ground water recharge.

- Stripping shall be confined to the immediate construction area. A 4-inch to 6-inch stripping depth is common, but depth may vary depending on the particular soil. All surface runoff control structures shall be in place prior to stripping.
- Do not place topsoil while in a frozen or muddy condition, when the subgrade is excessively wet, or when conditions exist that may otherwise be detrimental to proper grading or proposed sodding or seeding.
- In any areas requiring grading, remove and stockpile the duff layer and topsoil on site in a designated, controlled area, not adjacent to public resources and critical areas. Reapply stockpiled topsoil to other portions of the site where feasible.
- Locate the topsoil stockpile so that it meets specifications and does not interfere with work on the site. It may be possible to locate more than one pile in proximity to areas where topsoil will be used.
- Stockpiling of topsoil shall occur in the following manner:
  - Side slopes of the stockpile shall not exceed 2H:1V.
  - Between October 1 and April 30:
    - An interceptor dike with gravel outlet and silt fence shall surround all topsoil.
    - Within 2 days complete erosion control seeding, or covering stockpiles with clear plastic, or other mulching materials.
  - Between May 1 and September 30:
    - An interceptor dike with gravel outlet and silt fence shall surround all topsoil if the stockpile will remain in place for a longer period of time than active construction grading.
    - Within 7 days complete erosion control seeding, or covering stockpiles with clear plastic, or other mulching materials.
- When native topsoil is to be stockpiled and reused the following should apply to ensure that the mycorrhizal bacterial, earthworms, and other beneficial organisms will not be destroyed:
  - Re-install topsoil within 4 to 6 weeks.
  - Do not allow the saturation of topsoil with water.
  - Do not use plastic covering.

Maintenance Standards

- Inspect stockpiles regularly, especially after large storm events. Stabilize any areas that have eroded.
- Establish soil quality and depth toward the end of construction and once established, protect from compaction, such as from large machinery use, and from erosion.

BMP C154: Concrete Washout Area

Purpose

Prevent or reduce the discharge of pollutants from concrete waste to stormwater by conducting washout off-site, or performing on-site washout in a designated area.

Conditions of Use

Concrete washout areas are implemented on construction projects where:

- Concrete is used as a construction material
- It is not possible to dispose of all concrete wastewater and washout off-site (ready mix plant, etc.).
- Concrete truck drums are washed on-site.

  Note that auxiliary concrete truck components (e.g. chutes and hoses) and small concrete handling equipment (e.g. hand tools, screeds, shovels, rakes, floats, trowels, and wheelbarrows) may be washed into formed areas awaiting concrete pour.

At no time shall concrete be washed off into the footprint of an area where an infiltration feature will be installed.

Design and Installation Specifications

Implementation

- Perform washout of concrete truck drums at an approved off-site location or in designated concrete washout areas only.
- Do not wash out concrete onto non-formed areas, or into storm drains, open ditches, streets, or streams.
- Wash equipment difficult to move, such as concrete paving machines, in areas that do not directly drain to natural or constructed stormwater conveyance or potential infiltration areas.
- Do not allow excess concrete to be dumped on-site, except in designated concrete washout areas as allowed above.
- Concrete washout areas may be prefabricated concrete washout containers, or self-installed structures (above-grade or below-grade).
- Prefabricated containers are most resistant to damage and protect against spills and leaks. Companies may offer delivery service and provide regular maintenance and disposal of solid and liquid waste.
- If self-installed concrete washout areas are used, below-grade structures are preferred over above-grade structures because they are less prone to spills and leaks.
- Self-installed above-grade structures should only be used if excavation is not practical.
- Concrete washout areas shall be constructed and maintained in sufficient quantity and size to contain all liquid and concrete waste generated by washout operations.

Education

- Discuss the concrete management techniques described in this BMP with the ready-mix concrete supplier before any deliveries are made.
- Educate employees and subcontractors on the concrete waste management techniques described in this BMP.
- Arrange for the contractor's superintendent or Certified Erosion and Sediment Control Lead (CESCL) to oversee and enforce concrete waste management procedures.
- A sign should be installed adjacent to each concrete washout area to inform concrete equipment operators to utilize the proper facilities.

Contracts

Incorporate requirements for concrete waste management into concrete supplier and subcontractor agreements.

Location and Placement

- Locate concrete washout areas at least 50 feet from sensitive areas such as storm drains, open ditches, water bodies, or wetlands.
- Allow convenient access to the concrete washout area for concrete trucks, preferably near the area where the concrete is being poured.
- If trucks need to leave a paved area to access the concrete washout area, prevent track-out with a pad of rock or quarry spalls (see BMP C105: Stabilized Construction Access). These areas should be far enough away from other construction traffic to reduce the likelihood of accidental damage and spills.
- The number of concrete washout areas you install should depend on the expected demand for storage capacity.
- On large sites with extensive concrete work, concrete washout areas should be placed in multiple locations for ease of use by concrete truck drivers.

Concrete Truck Washout Procedures

- Washout of concrete truck drums shall be performed in designated concrete washout areas only.
- Concrete washout from concrete pumper bins can be washed into concrete pumper trucks and discharged into designated concrete washout areas or properly disposed of off-site.

Concrete Washout Area Installation

- Concrete washout areas should be constructed as shown in the figures below, with a recommended minimum length and minimum width of 10 ft, but with sufficient quantity and volume to contain all liquid and concrete waste generated by washout operations.
- Plastic lining material should be a minimum of 10 mil polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.
- Lath and flagging should be commercial type.
- Liner seams shall be installed in accordance with manufacturers' recommendations.
- Soil base shall be prepared free of rocks or other debris that may cause tears or holes in the plastic lining material.

Maintenance Standards

Inspection and Maintenance

- Inspect and verify that concrete washout areas are in place prior to the commencement of concrete work.
- Once concrete wastes are washed into the designated washout area and allowed to harden,

the concrete should be broken up, removed, and disposed of per applicable solid waste regulations. Dispose of hardened concrete on a regular basis.

- During periods of concrete work, inspect the concrete washout areas daily to verify continued performance.
  - Check overall condition and performance.
  - Check remaining capacity (% full).
  - If using self-installed concrete washout areas, verify plastic liners are intact and sidewalls are not damaged.
  - If using prefabricated containers, check for leaks.
- Maintain the concrete washout areas to provide adequate holding capacity with a minimum freeboard of 12 inches.
- Concrete washout areas must be cleaned, or new concrete washout areas must be constructed and ready for use once the concrete washout area is 75% full.
- If the concrete washout area is nearing capacity, vacuum and dispose of the waste material in an approved manner.
  - Do not discharge liquid or slurry to waterways, storm drains or directly onto ground.
  - Do not discharge to the sanitary sewer without local approval.
  - Place a secure, non-collapsing, non-water collecting cover over the concrete washout area prior to predicted wet weather to prevent accumulation and overflow of precipitation.
  - Remove and dispose of hardened concrete and return the structure to a functional condition. Concrete may be reused on-site or hauled away for disposal or recycling.
- When you remove materials from a self-installed concrete washout area, build a new structure; or, if the previous structure is still intact, inspect for signs of weakening or damage, and make any necessary repairs. Re-line the structure with new plastic after each cleaning.

Removal of Concrete Washout Areas

- When concrete washout areas are no longer required for the work, the hardened concrete, slurries and liquids shall be removed and properly disposed of.
- Materials used to construct concrete washout areas shall be removed from the site of the work and disposed of or recycled.
- Holes, depressions or other ground disturbance caused by the removal of the concrete washout areas shall be backfilled, repaired, and stabilized to prevent erosion.

Figure II-3.7: Concrete Washout Area with Wood Planks

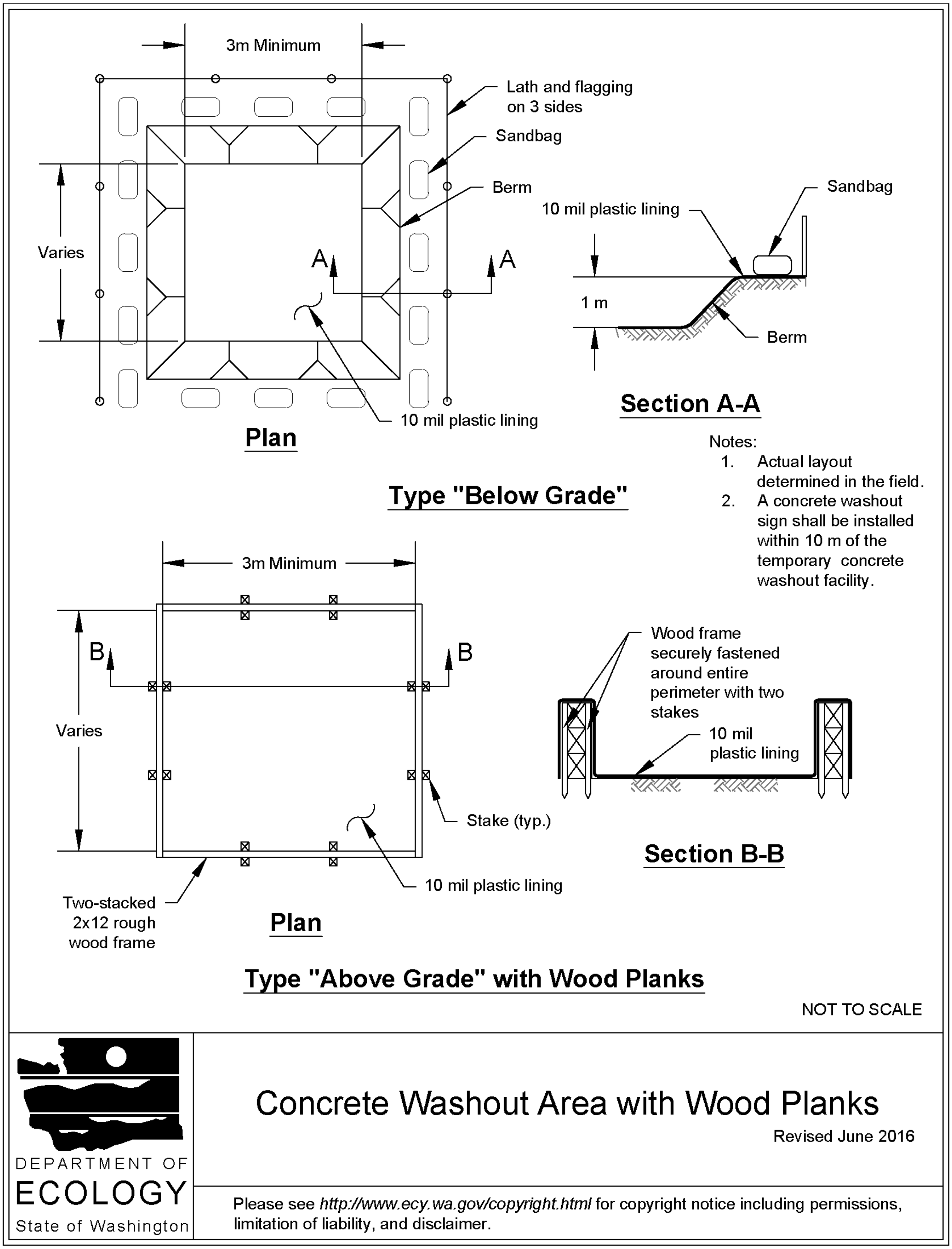


Figure II-3.8: Concrete Washout Area with Straw Bales

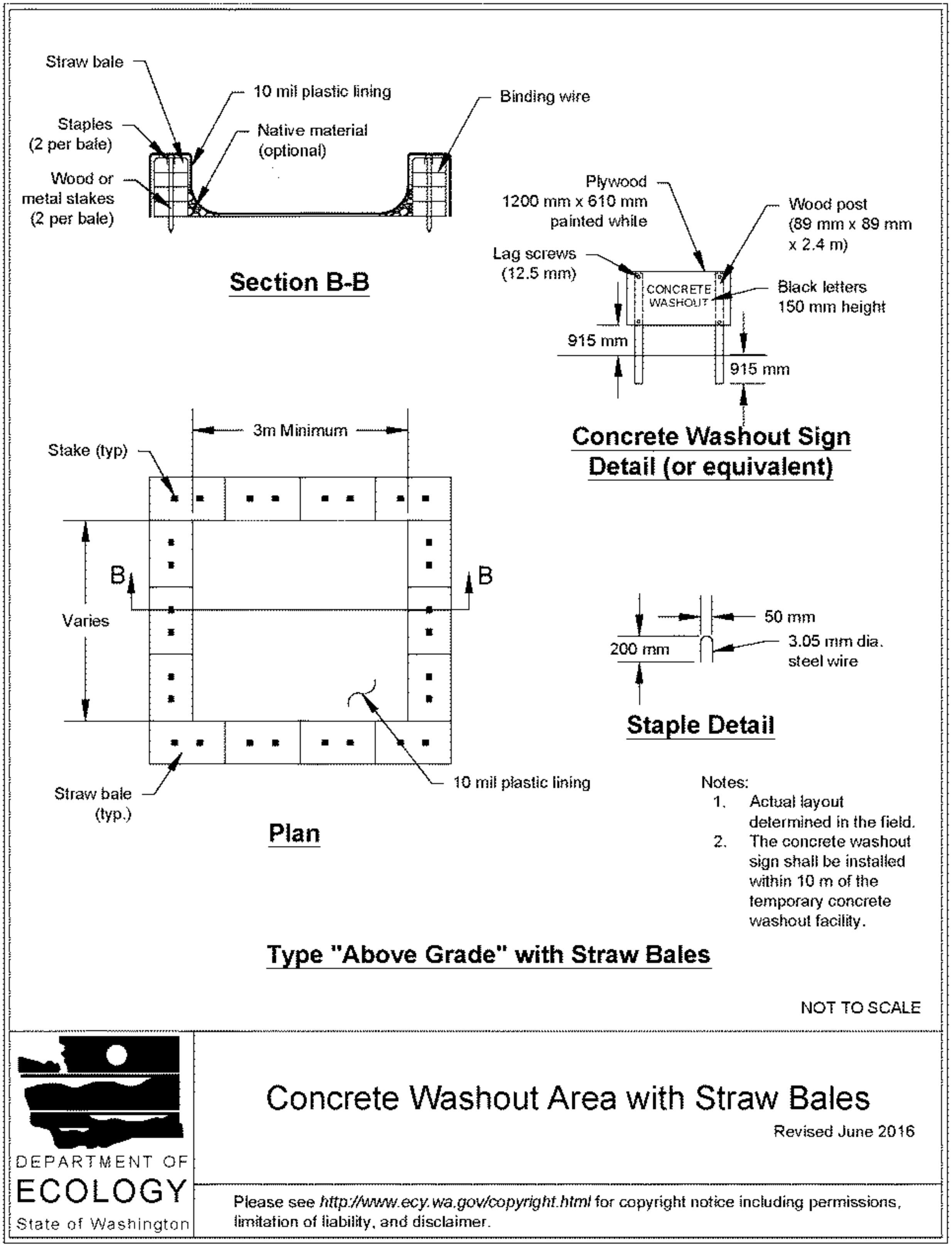
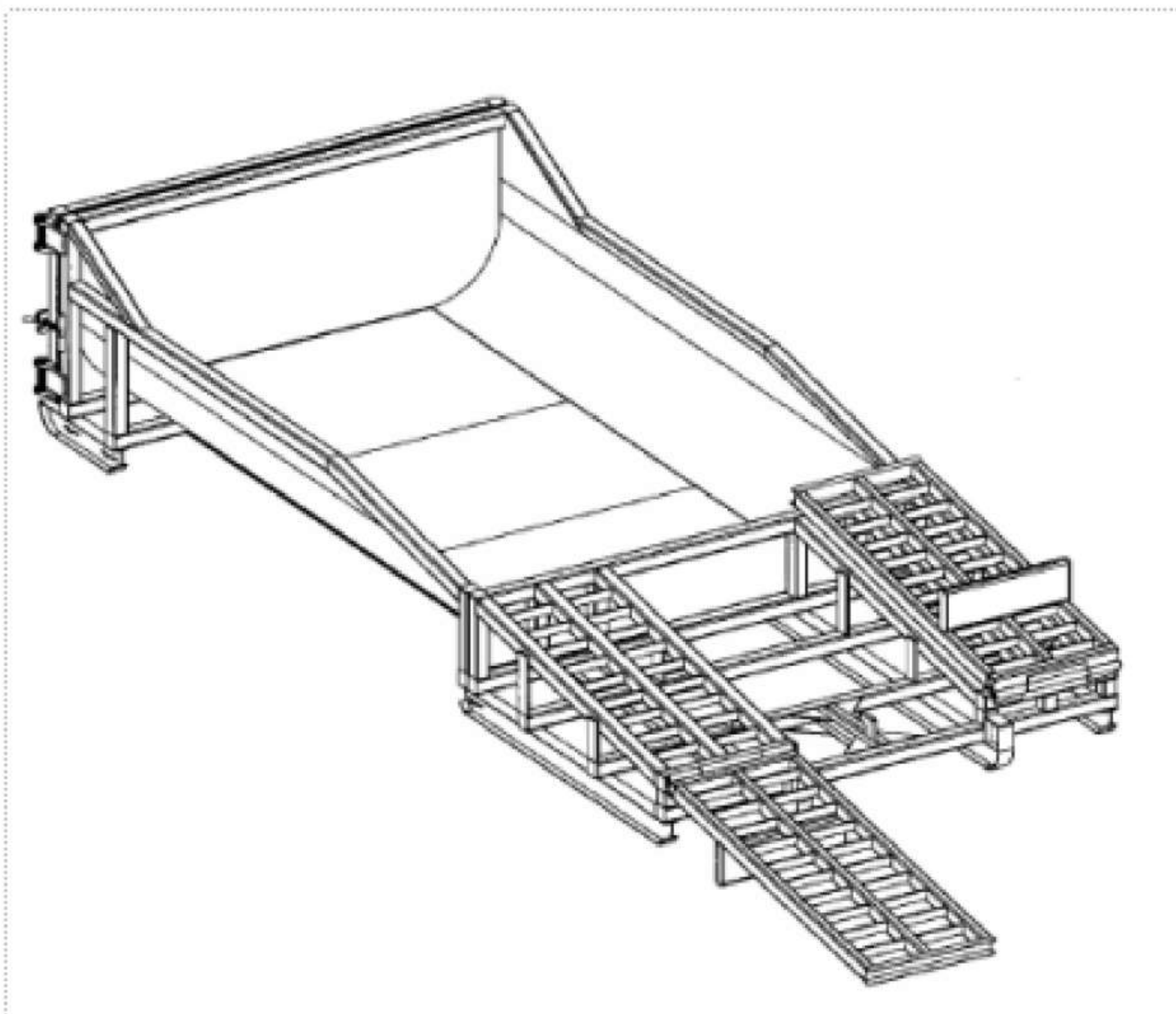


Figure II-3.9: Prefabricated Concrete Washout Container w/Ramp



NOT TO SCALE

DEPARTMENT OF ECOLOGY
State of Washington

Prefabricated Concrete Washout Container w/Ramp

Revised June 2016

BMP C160: Certified Erosion and Sediment Control Lead

Purpose

The project proponent designates at least one person as the responsible representative in charge of erosion and sediment control (ESC), and water quality protection. The designated person shall be responsible for ensuring compliance with all local, state, and federal erosion and sediment control and water quality requirements. Construction sites one acre or larger that discharge to waters of the State must designate a Certified Erosion and Sediment Control Lead (CESCL) as the responsible representative.

Conditions of Use

A CESCL shall be made available on projects one acre or larger that discharge stormwater to surface waters of the state. Sites less than one acre may have a person without CESCL certification conduct inspections.

The CESCL shall:

- Have a current certificate proving attendance in an erosion and sediment control training course that meets the minimum ESC training and certification requirements established by Ecology.

  Ecology has provided the minimum requirements for CESCL course training, as well as a list of ESC training and certification providers at:

  https://ecology.wa.gov/Regulations-Permits/Permits-certifications/Certified-erosion-sediment-control

  OR

- Be a Certified Professional in Erosion and Sediment Control (CPESC). For additional information go to:

  http://www.envirocertintl.org/cpesc/

Specifications

- CESCL certification shall remain valid for three years.
- The CESCL shall have authority to act on behalf of the contractor or project proponent and shall be available, or on-call, 24 hours per day throughout the period of construction.
- The Construction SWPPP shall include the name, telephone number, fax number, and address of the designated CESCL. See II-2 Construction Stormwater Pollution Prevention Plans (Construction SWPPPs).
- A CESCL may provide inspection and compliance services for multiple construction projects in the same geographic region, but must be on site whenever earthwork activities are

occurring that could generate release of turbid water.

- Duties and responsibilities of the CESCL shall include, but are not limited to the following:
    - Maintaining a permit file on site at all times which includes the Construction SWPPP and any associated permits and plans.
    - Directing BMP installation, inspection, maintenance, modification, and removal.
    - Updating all project drawings and the Construction SWPPP with changes made.
    - Completing any sampling requirements including reporting results using electronic Discharge Monitoring Reports (WebDMR).
    - Facilitate, participate in, and take corrective actions resulting from inspections performed by outside agencies or the owner.
    - Keeping daily logs, and inspection reports. Inspection reports should include:
        - Inspection date/time.
        - Weather information; general conditions during inspection and approximate amount of precipitation since the last inspection.
        - Visual monitoring results, including a description of discharged stormwater. The presence of suspended sediment, turbid water, discoloration, and oil sheen shall be noted, as applicable.
        - Any water quality monitoring performed during inspection.
        - General comments and notes, including a brief description of any BMP repairs, maintenance or installations made as a result of the inspection.
        - A summary or list of all BMPs implemented, including observations of all erosion/sediment control structures or practices. The following shall be noted:
            1. Locations of BMPs inspected.
            2. Locations of BMPs that need maintenance.
            3. Locations of BMPs that failed to operate as designed or intended.
            4. Locations of where additional or different BMPs are required.

BMP C162: Scheduling

Purpose

Sequencing a construction project reduces the amount and duration of soil exposed to erosion by wind, rain, runoff, and vehicle tracking.

Conditions of Use

The construction sequence schedule is an orderly listing of all major land-disturbing activities together with the necessary erosion and sedimentation control measures planned for the project. This type of schedule guides the contractor on work to be done before other work is started so that serious erosion and sedimentation problems can be avoided.

Following a specified work schedule that coordinates the timing of land-disturbing activities and the installation of control measures is perhaps the most cost-effective way of controlling erosion during construction. The removal of ground cover leaves a site vulnerable to erosion. Construction sequencing that limits land clearing, provides timely installation of erosion and sedimentation controls, and restores protective cover quickly can significantly reduce the erosion potential of a site.

Design Considerations

- Minimize construction during rainy periods.
- Schedule projects to disturb only small portions of the site at any one time. Complete grading as soon as possible. Immediately stabilize the disturbed portion before grading the next portion. Practice staged seeding in order to revegetate cut and fill slopes as the work progresses.

II-3.3 Construction Runoff BMPs

BMP C200: Interceptor Dike and Swale

Purpose

Provide a dike of compacted soil or a swale at the top or base of a disturbed slope or along the perimeter of a disturbed construction area to convey stormwater. Use the dike and/or swale to intercept the runoff from unprotected areas and direct it to areas where erosion can be controlled. This can prevent storm runoff from entering the work area or sediment-laden runoff from leaving the construction site.

Conditions of Use

Use an interceptor dike or swale where runoff from an exposed site or disturbed slope must be conveyed to an erosion control BMP which can safely convey the stormwater.

- Locate upslope of a construction site to prevent runoff from entering the disturbed area.
- When placed horizontally across a disturbed slope, it reduces the amount and velocity of runoff flowing down the slope.
- Locate downslope to collect runoff from a disturbed area and direct it to a sediment BMP (e.g. BMP C240: Sediment Trap or BMP C241: Sediment Pond (Temporary)).

Design and Installation Specifications

- Dike and/or swale and channel must be stabilized with temporary or permanent vegetation or other channel protection during construction.
- Steep grades require channel protection and check dams.
- Review construction for areas where overtopping may occur.
- Can be used at the top of new fill before vegetation is established.
- May be used as a permanent diversion channel to carry the runoff.
- Contributing area for an individual dike or swale should be one acre or less.
- Design the dike and/or swale to contain flows calculated by one of the following methods:
  - Single Event Hydrograph Method: The peak volumetric flow rate calculated using a 10-minute time step from a Type 1A, 10-year, 24-hour frequency storm for the worst-case land cover condition.

    OR

  - Continuous Simulation Method: The 10-year peak flow rate, as determined by an approved continuous runoff model with a 15-minute time step for the worst-case land cover condition.

  Worst-case land cover conditions (i.e., producing the most runoff) should be used for analysis (in most cases, this would be the land cover conditions just prior to final landscaping).

Interceptor Dikes

Interceptor dikes shall meet the following criteria:

- Top Width: 2 feet minimum.
- Height: 1.5 feet minimum on berm.
- Side Slope: 2H:1V or flatter.
- Grade: Depends on topography, however, dike system minimum is 0.5%, and maximum is 1%.
- Compaction: Minimum of 90 percent ASTM D698 standard proctor.
- Stabilization: Depends on velocity and reach. Inspect regularly to ensure stability.
- Ground Slopes <5%: Seed and mulch applied within 5 days of dike construction (see BMP C121: Mulching).
- Ground Slopes 5 - 40%: Dependent on runoff velocities and dike materials. Stabilization should be done immediately using either sod or riprap, or other measures to avoid erosion.
- The upslope side of the dike shall provide positive drainage to the dike outlet. No erosion shall

occur at the outlet. Provide energy dissipation measures as necessary. Sediment-laden runoff must be released through a sediment trapping facility.

- Minimize construction traffic over temporary dikes. Use temporary cross culverts for channel crossing.
- See Table II-3.8: Horizontal Spacing of Interceptor Dikes Along Ground Slope for recommended horizontal spacing between dikes.

Table II-3.8: Horizontal Spacing of Interceptor Dikes Along Ground Slope

Average Slope	Slope Percent	Flowpath Length
20H:1V or less	3-5%	300 feet
(10 to 20)H:1V	5-10%	200 feet
(4 to 10)H:1V	10-25%	100 feet
(2 to 4)H:1V	25-50%	50 feet

Interceptor Swales

Interceptor swales shall meet the following criteria:

- Bottom Width: 2 feet minimum; the cross-section bottom shall be level.
- Depth: 1-foot minimum.
- Side Slope: 2H:1V or flatter.
- Grade: Maximum 5 percent, with positive drainage to a suitable outlet (such as BMP C241: Sediment Pond (Temporary)).
- Stabilization: Seed as per BMP C120: Temporary and Permanent Seeding, or BMP C202: Riprap Channel Lining, 12 inches thick riprap pressed into the bank and extending at least 8 inches vertical from the bottom.

Maintenance Standards

- Inspect diversion dikes and interceptor swales once a week and after every rainfall. Immediately remove sediment from the flow area.
- Damage caused by construction traffic or other activity must be repaired before the end of each working day.
- Check outlets and make timely repairs as needed to avoid gully formation. When the area below the temporary diversion dike is permanently stabilized, remove the dike and fill and stabilize the channel to blend with the natural surface.

BMP C207: Check Dams

Purpose

Construction of check dams across a swale or ditch reduces the velocity of concentrated flow and dissipates energy at the check dam.

Conditions of Use

Use check dams where temporary or permanent channels are not yet vegetated, channel lining is infeasible, and/or velocity checks are required.

- Check dams may not be placed in streams unless approved by the State Department of Fish and Wildlife.
- Check dams may not be placed in wetlands without approval from a permitting agency.
- Do not place check dams below the expected backwater from any salmonid bearing water between October 1 and May 31 to ensure that there is no loss of high flow refuge habitat for overwintering juvenile salmonids and emergent salmonid fry.

Design and Installation Specifications

- Construct rock check dams from appropriately sized rock. The rock used must be large enough to stay in place given the expected design flow through the channel. The rock must be placed by hand or by mechanical means (do not dump the rock to form the dam) to achieve complete coverage of the ditch or swale and to ensure that the center of the dam is lower than the edges.
- Check dams may also be constructed of either rock or pea-gravel filled bags. Numerous new products are also available for this purpose. They tend to be re-usable, quick and easy to install, effective, and cost efficient.
- Place check dams perpendicular to the flow of water.
- The check dam should form a triangle when viewed from the side. This prevents undercutting as water flows over the face of the check dam rather than falling directly onto the ditch bottom.
- Before installing check dams, impound and bypass upstream water flow away from the work area. Options for bypassing include pumps, siphons, or temporary channels.
- Check dams combined with sumps work more effectively at slowing flow and retaining sediment than a check dam alone. A deep sump should be provided immediately upstream of the check dam.
- In some cases, if carefully located and designed, check dams can remain as permanent installations with very minor regrading. They may be left as either spillways, in which case accumulated sediment would be graded and seeded, or as check dams to prevent further sediment from leaving the site.
- The maximum spacing between check dams shall be such that the downstream toe of the

upstream dam is at the same elevation as the top of the downstream dam.

- Keep the maximum height at 2 feet at the center of the check dam.
- Keep the center of the check dam at least 12 inches lower than the outer edges at natural ground elevation.
- Keep the side slopes of the check dam at 2H:1V or flatter.
- Key the stone into the ditch banks and extend it beyond the abutments a minimum of 18 inches to avoid washouts from overflow around the dam.
- Use filter fabric foundation under a rock or sand bag check dam. If a blanket ditch liner is used, filter fabric is not necessary. A piece of organic or synthetic blanket cut to fit will also work for this purpose.
- In the case of grass-lined ditches and swales, all check dams and accumulated sediment shall be removed when the grass has matured sufficiently to protect the ditch or swale - unless the slope of the swale is greater than 4 percent. The area beneath the check dams shall be seeded and mulched immediately after dam removal.
- Ensure that channel appurtenances, such as culvert entrances below check dams, are not subject to damage or blockage from displaced stones.
- See Figure II-3.16: Rock Check Dam.

Maintenance Standards

Check dams shall be monitored for performance and sediment accumulation during and after each rainfall that produces runoff. Sediment shall be removed when it reaches one half the sump depth.

- Anticipate submergence and deposition above the check dam and erosion from high flows around the edges of the dam.
- If significant erosion occurs between dams, install a protective riprap liner in that portion of the channel. See BMP C202: Riprap Channel Lining.

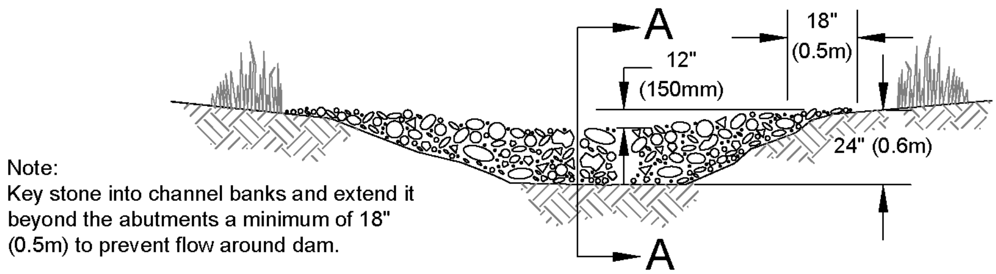
Approved as Functionally Equivalent

Ecology has approved products as able to meet the requirements of this BMP. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept these products, or may require additional testing prior to consideration for local use. Products that Ecology has approved as functionally equivalent are available for review on Ecology's website at:

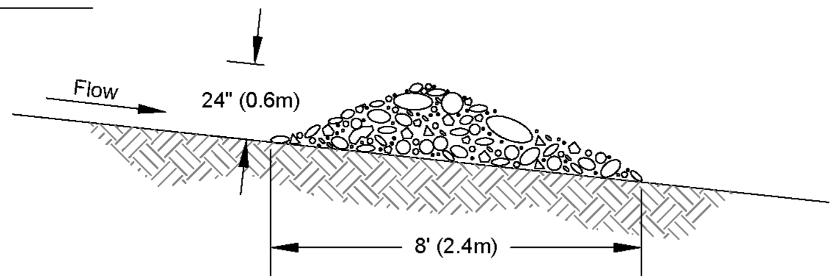
https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies

Figure II-3.16: Rock Check Dam

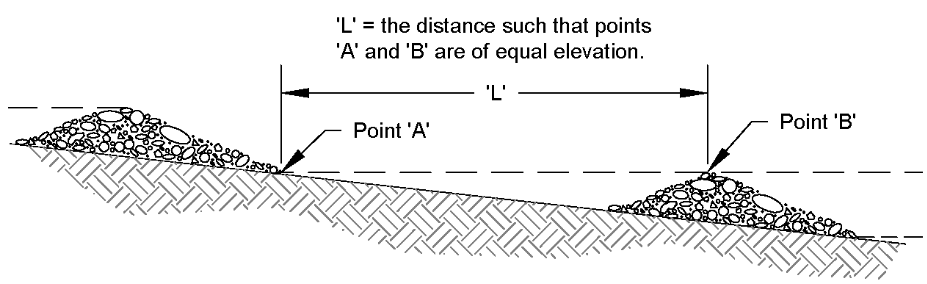
View Looking Upstream



Section A-A



Spacing Between Check Dams



NOT TO SCALE

DEPARTMENT OF
ECOLOGY
State of Washington

Rock Check Dam

Revised June 2016

BMP C209: Outlet Protection

Purpose

Outlet protection prevents scour at conveyance outlets and minimizes the potential for downstream erosion by reducing the velocity of concentrated stormwater flows.

Conditions of Use

Use outlet protection at the outlets of all ponds, pipes, ditches, or other conveyances that discharge to a natural or manmade drainage feature such as a stream, wetland, lake, or ditch.

Design and Installation Specifications

- The receiving channel at the outlet of a pipe shall be protected from erosion by lining a minimum of 6 feet downstream and extending up the channel sides a minimum of 1–foot above the maximum tailwater elevation, or 1-foot above the crown, whichever is higher. For pipes larger than 18 inches in diameter, the outlet protection lining of the channel shall be four times the diameter of the outlet pipe.
- Standard wingwalls, tapered outlets, and paved channels should also be considered when appropriate for permanent culvert outlet protection (WSDOT, 2015).
- BMP C122: Nets and Blankets or BMP C202: Riprap Channel Lining provide suitable options for lining materials.
- With low flows, BMP C201: Grass-Lined Channels can be an effective alternative for lining material.
- The following guidelines shall be used for outlet protection with riprap:
    - If the discharge velocity at the outlet is less than 5 fps, use 2-inch to 8-inch riprap. Minimum thickness is 1-foot.
    - For 5 to 10 fps discharge velocity at the outlet, use 24-inch to 48-inch riprap. Minimum

thickness is 2 feet.

    - For outlets at the base of steep slope pipes (pipe slope greater than 10 percent), use an engineered energy dissipator.
    - Filter fabric or erosion control blankets should always be used under riprap to prevent scour and channel erosion. See BMP C122: Nets and Blankets.

- Bank stabilization, bioengineering, and habitat features may be required for disturbed areas. This work may require a Hydraulic Project Approval (HPA) from the Washington State Department of Fish and Wildlife. See I-2.11 Hydraulic Project Approvals.

Maintenance Standards

- Inspect and repair as needed.
- Add rock as needed to maintain the intended function.
- Clean energy dissipator if sediment builds up.

BMP C220: Inlet Protection

Purpose

Inlet protection prevents coarse sediment from entering drainage systems prior to permanent stabilization of the disturbed area.

Conditions of Use

Use inlet protection at inlets that are operational before permanent stabilization of the disturbed areas that contribute runoff to the inlet. Provide protection for all storm drain inlets downslope and within 500 feet of a disturbed or construction area, unless those inlets are preceded by a sediment trapping BMP.

Also consider inlet protection for lawn and yard drains on new home construction. These small and numerous drains coupled with lack of gutters can add significant amounts of sediment into the roof drain system. If possible, delay installing lawn and yard drains until just before landscaping, or cap these drains to prevent sediment from entering the system until completion of landscaping. Provide 18-inches of sod around each finished lawn and yard drain.

Table II-3.10: Storm Drain Inlet Protection lists several options for inlet protection. All of the methods for inlet protection tend to plug and require a high frequency of maintenance. Limit contributing drainage areas for an individual inlet to one acre or less. If possible, provide emergency overflows with additional end-of-pipe treatment where stormwater ponding would cause a hazard.

Table II-3.10: Storm Drain Inlet Protection

Type of Inlet Protection	Emergency Overflow	Applicable for Paved/ Earthen Surfaces	Conditions of Use
Drop Inlet Protection			
Excavated drop inlet protection	Yes, temporary flooding may occur	Earthen	Applicable for heavy flows. Easy to maintain. Large area requirement: 30'x30'/acre
Block and gravel drop inlet protection	Yes	Paved or Earthen	Applicable for heavy concentrated flows. Will not pond.
Gravel and wire drop inlet protection	No	Paved or Earthen	Applicable for heavy concentrated flows. Will pond. Can withstand traffic.
Catch basin filters	Yes	Paved or Earthen	Frequent maintenance required.
Curb Inlet Protection			
Curb inlet protection with wooden weir	Small capacity overflow	Paved	Used for sturdy, more compact installation.
Block and gravel curb inlet protection	Yes	Paved	Sturdy, but limited filtration.
Culvert Inlet Protection			
Culvert inlet sediment trap	N/A	N/A	18 month expected life.

Design and Installation Specifications

Excavated Drop Inlet Protection

Excavated drop inlet protection consists of an excavated impoundment around the storm drain inlet. Sediment settles out of the stormwater prior to entering the storm drain. Design and installation specifications for excavated drop inlet protection include:

- Provide a depth of 1-2 ft as measured from the crest of the inlet structure.
- Slope sides of excavation should be no steeper than 2H:1V.
- Minimum volume of excavation is 35 cubic yards.
- Shape the excavation to fit the site, with the longest dimension oriented toward the longest inflow area.
- Install provisions for draining to prevent standing water.
- Clear the area of all debris.

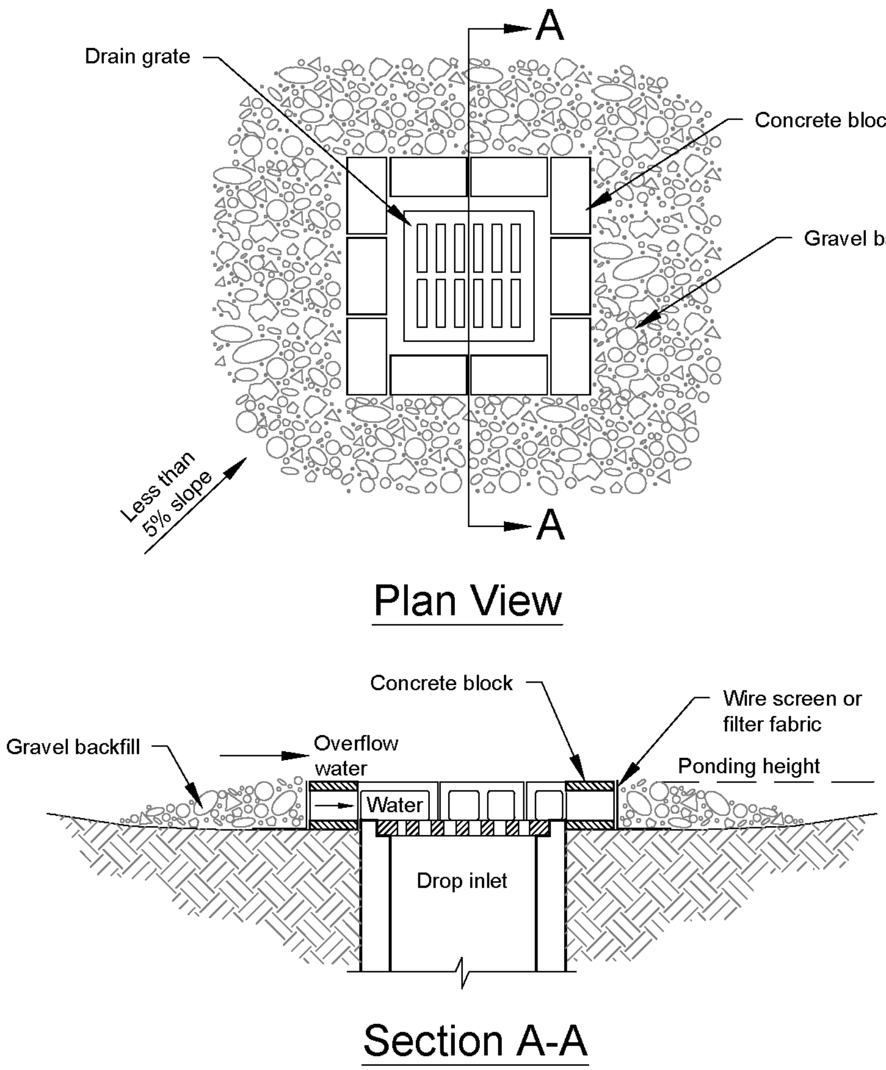
- Grade the approach to the inlet uniformly.
- Drill weep holes into the side of the inlet.
- Protect weep holes with screen wire and washed aggregate.
- Seal weep holes when removing structure and stabilizing area.
- Build a temporary dike, if necessary, to the down slope side of the structure to prevent bypass flow.

Block and Gravel Filter

A block and gravel filter is a barrier formed around the inlet with standard concrete blocks and gravel. See Figure II-3.17: Block and Gravel Filter. Design and installation specifications for block gravel filters include:

- Provide a height of 1 to 2 feet above the inlet.
- Recess the first row of blocks 2-inches into the ground for stability.
- Support subsequent courses by placing a pressure treated wood 2x4 through the block opening.
- Do not use mortar.
- Lay some blocks in the bottom row on their side to allow for dewatering the pool.
- Place hardware cloth or comparable wire mesh with ½-inch openings over all block openings.
- Place gravel to just below the top of blocks on slopes of 2H:1V or flatter.
- An alternative design is a gravel berm surrounding the inlet, as follows:
    - Provide a slope of 3H:1V on the upstream side of the berm.
    - Provide a slope of 2H:1V on the downstream side of the berm.
    - Provide a 1-foot wide level stone area between the gravel berm and the inlet.
    - Use stones 3 inches in diameter or larger on the upstream slope of the berm.
    - Use gravel ½- to ¾-inch at a minimum thickness of 1-foot on the downstream slope of the berm.

Figure II-3.17: Block and Gravel Filter



Notes:

1. Drop inlet sediment barriers are to be used for small, nearly level drainage areas. (less than 5%)
2. Excavate a basin of sufficient size adjacent to the drop inlet.
3. The top of the structure (ponding height) must be well below the ground elevation downslope to prevent runoff from bypassing the inlet. A temporary dike may be necessary on the downslope side of the structure.

NOT TO SCALE

DEPARTMENT OF ECOLOGY
State of Washington

Block and Gravel Filter

Revised June 2016

Gravel and Wire Mesh Filter

Gravel and wire mesh filters are gravel barriers placed over the top of the inlet. This method does not provide an overflow. Design and installation specifications for gravel and wire mesh filters include:

- Use a hardware cloth or comparable wire mesh with ½-inch openings.
    - Place wire mesh over the drop inlet so that the wire extends a minimum of 1-foot beyond each side of the inlet structure.
    - Overlap the strips if more than one strip of mesh is necessary.
- Place coarse aggregate over the wire mesh.
    - Provide at least a 12-inch depth of aggregate over the entire inlet opening and extend at least 18-inches on all sides.

Catch Basin Filters

Catch basin filters are designed by manufacturers for construction sites. The limited sediment storage capacity increases the amount of inspection and maintenance required, which may be daily for heavy sediment loads. To reduce maintenance requirements, combine a catch basin filter with another type of inlet protection. This type of inlet protection provides flow bypass without overflow and therefore may be a better method for inlets located along active rights-of-way. Design and installation specifications for catch basin filters include:

- Provides 5 cubic feet of storage.
- Requires dewatering provisions.
- Provides a high-flow bypass that will not clog under normal use at a construction site.
- Insert the catch basin filter in the catch basin just below the grating.

Curb Inlet Protection with Wooden Weir

Curb inlet protection with wooden weir is an option that consists of a barrier formed around a curb inlet with a wooden frame and gravel. Design and installation specifications for curb inlet protection with wooden weirs include:

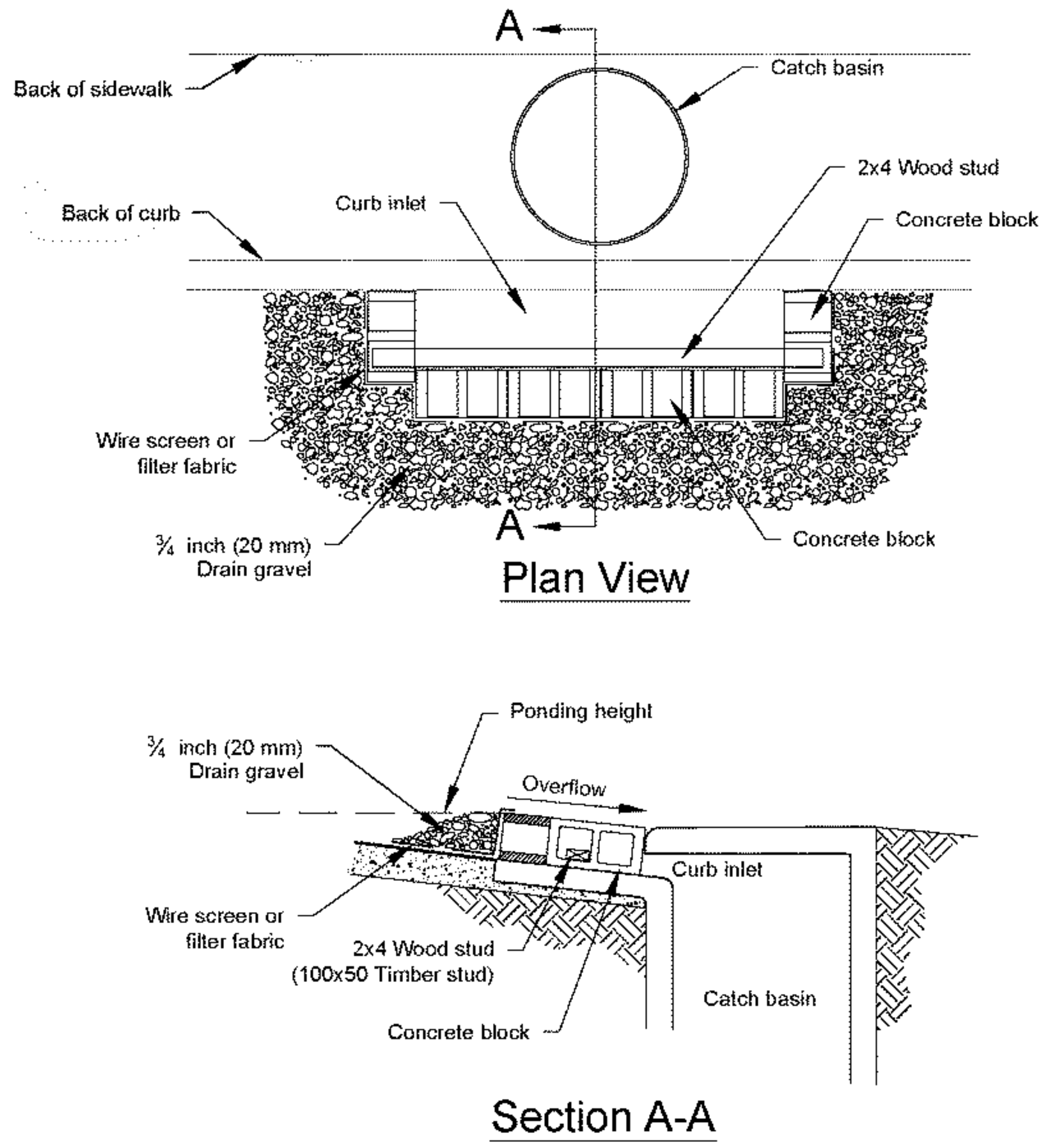
- Use wire mesh with ½-inch openings.
- Use extra strength filter cloth.
- Construct a frame.
- Attach the wire and filter fabric to the frame.
- Pile coarse washed aggregate against the wire and fabric.
- Place weight on the frame anchors.

Block and Gravel Curb Inlet Protection

Block and gravel curb inlet protection is a barrier formed around a curb inlet with concrete blocks and gravel. See Figure II-3.18: Block and Gravel Curb Inlet Protection. Design and installation specifications for block and gravel curb inlet protection include:

- Use wire mesh with ½-inch openings.
- Place two concrete blocks on their sides abutting the curb at either side of the inlet opening. These are spacer blocks.
- Place a 2x4 stud through the outer holes of each spacer block to align the front blocks.
- Place blocks on their sides across the front of the inlet and abutting the spacer blocks.
- Place wire mesh over the outside vertical face.
- Pile coarse aggregate against the wire to the top of the barrier.

Figure II-3.18: Block and Gravel Curb Inlet Protection



Notes:

1. Use block and gravel type sediment barrier when curb inlet is located in gently sloping street segment, where water can pond and allow sediment to separate from runoff.
2. Barrier shall allow for overflow from severe storm event.
3. Inspect barriers and remove sediment after each storm event. Sediment and gravel must be removed from the traveled way immediately.

NOT TO SCALE

DEPARTMENT OF ECOLOGY
State of Washington

Block and Gravel Curb Inlet Protection

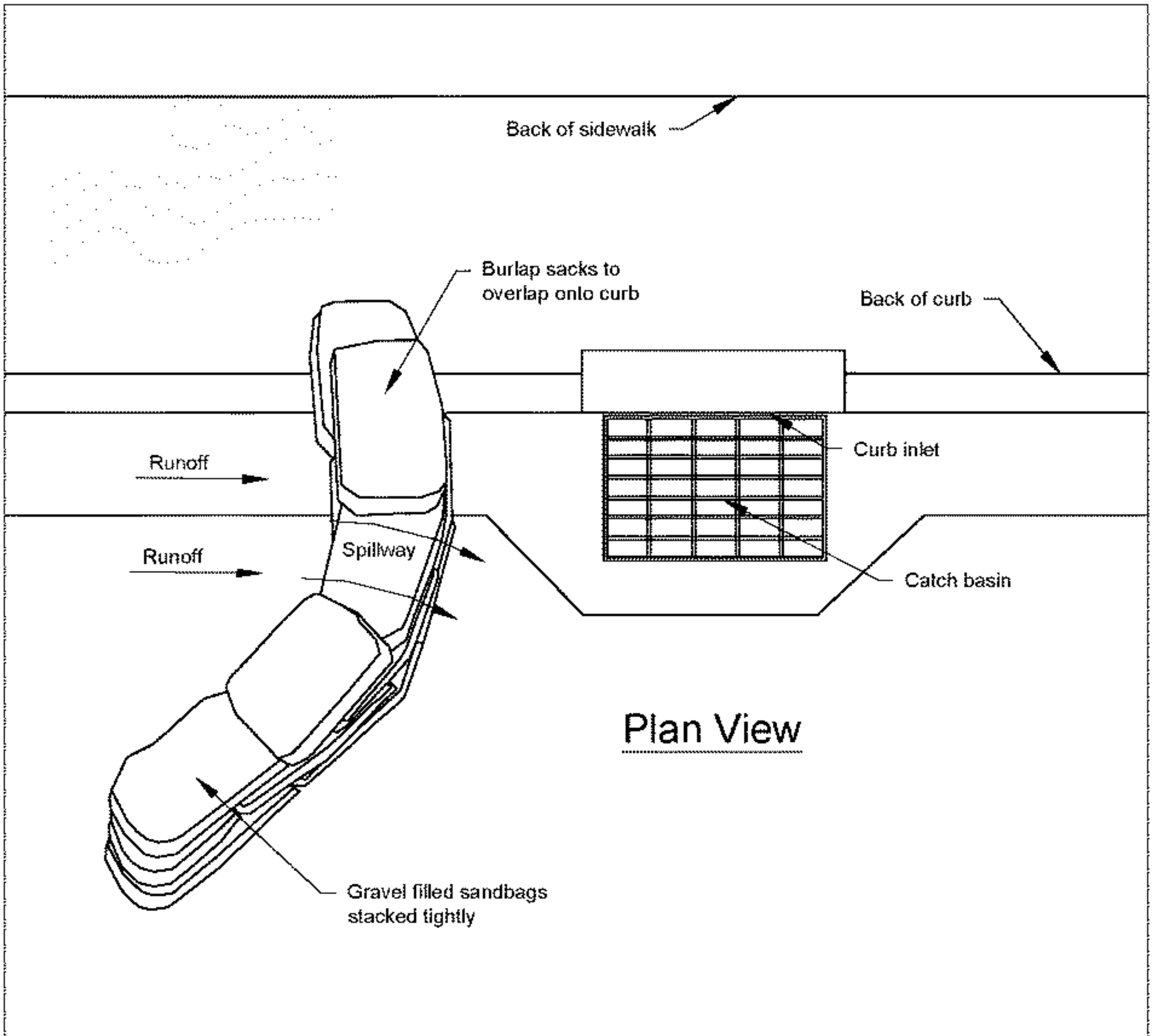
Revised June 2016

Curb and Gutter Sediment Barrier

Curb and gutter sediment barrier is a sandbag or rock berm (riprap and aggregate) 3 feet high and 3 feet wide in a horseshoe shape. See Figure II-3.19: Curb and Gutter Barrier. Design and installation specifications for curb and gutter sediment barrier include:

- Construct a horseshoe shaped berm, faced with coarse aggregate if using riprap, 3 feet high and 3 feet wide, at least 2 feet from the inlet.
- Construct a horseshoe shaped sedimentation trap on the upstream side of the berm. Size the trap to sediment trap standards for protecting a culvert inlet.

Figure II-3.19: Curb and Gutter Barrier



Notes:

1. Place curb type sediment barriers on gently sloping street segments, where water can pond and allow sediment to separate from runoff.
2. Sandbags of either burlap or woven 'geotextile' fabric, are filled with gravel, layered and packed tightly.
3. Leave a one sandbag gap in the top row to provide a spillway for overflow.
4. Inspect barriers and remove sediment after each storm event. Sediment and gravel must be removed from the traveled way immediately.

NOT TO SCALE

DEPARTMENT OF ECOLOGY
State of Washington

Curb and Gutter Barrier

Revised June 2016

Maintenance Standards

- Inspect all forms of inlet protection frequently, especially after storm events. Clean and replace clogged catch basin filters. For rock and gravel filters, pull away the rocks from the inlet and clean or replace. An alternative approach would be to use the clogged rock as fill and put fresh rock around the inlet.
- Do not wash sediment into storm drains while cleaning. Spread all excavated material evenly over the surrounding land area or stockpile and stabilize as appropriate.

Approved as Functionally Equivalent

Ecology has approved products as able to meet the requirements of this BMP. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept these products, or may require additional testing prior to consideration for local use. Products that Ecology has approved as functionally equivalent are available for review on Ecology's website at:

https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies

BMP C233: Silt Fence

Purpose

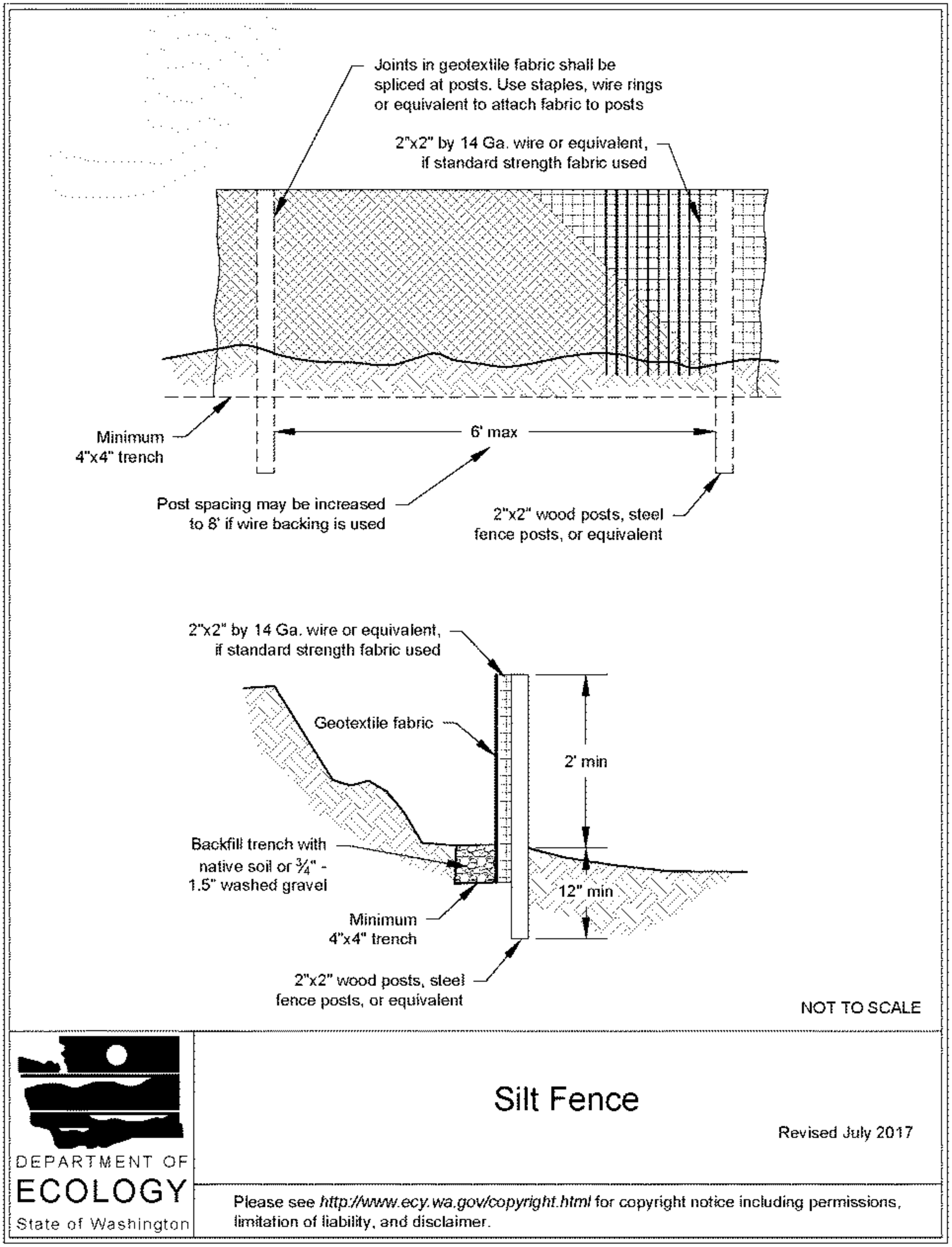
Silt fence reduces the transport of coarse sediment from a construction site by providing a temporary physical barrier to sediment and reducing the runoff velocities of overland flow.

Conditions of Use

Silt fence may be used downslope of all disturbed areas.

- Silt fence shall prevent sediment carried by runoff from going beneath, through, or over the top of the silt fence, but shall allow the water to pass through the fence.
- Silt fence is not intended to treat concentrated flows, nor is it intended to treat substantial amounts of overland flow. Convey any concentrated flows through the drainage system to a sediment trapping BMP.
- Do not construct silt fences in streams or use in V-shaped ditches. Silt fences do not provide an adequate method of silt control for anything deeper than sheet or overland flow.

Figure II-3.22: Silt Fence



Design and Installation Specifications

- Use in combination with other construction stormwater BMPs.
- Maximum slope steepness (perpendicular to the silt fence line) 1H:1V.
- Maximum sheet or overland flow path length to the silt fence of 100 feet.
- Do not allow flows greater than 0.5 cfs.
- Use geotextile fabric that meets the following standards. All geotextile properties listed below are minimum average roll values (i.e., the test result for any sampled roll in a lot shall meet or exceed the values shown in Table II-3.11: Geotextile Fabric Standards for Silt Fence):

Table II-3.11: Geotextile Fabric Standards for Silt Fence

Geotextile Property	Minimum Average Roll Value
Polymeric Mesh AOS (ASTM D4751)	0.60 mm maximum for slit film woven (#30 sieve). 0.30 mm maximum for all other geotextile types (#50 sieve). 0.15 mm minimum for all fabric types (#100 sieve).
Water Permittivity (ASTM D4491)	0.02 sec^{-1} minimum
Grab Tensile Strength (ASTM D4632)	180 lbs. Minimum for extra strength fabric. 100 lbs minimum for standard strength fabric.
Grab Tensile Strength (ASTM D4632)	30% maximum
Ultraviolet Resistance (ASTM D4355)	70% minimum

- Support standard strength geotextiles with wire mesh, chicken wire, 2-inch x 2-inch wire, safety fence, or jute mesh to increase the strength of the geotextile. Silt fence materials are available that have synthetic mesh backing attached.
- Silt fence material shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0°F to 120°F.
- One-hundred percent biodegradable silt fence is available that is strong, long lasting, and can be left in place after the project is completed, if permitted by the local jurisdiction.
- Refer to Figure II-3.22: Silt Fence for standard silt fence details. Include the following Standard Notes for silt fence on construction plans and specifications:
    1. The Contractor shall install and maintain temporary silt fences at the locations shown in the Plans.
    2. Construct silt fences in areas of clearing, grading, or drainage prior to starting those activities.

3. The silt fence shall have a 2-feet min. and a 2½-feet max. height above the original ground surface.
4. The geotextile fabric shall be sewn together at the point of manufacture to form fabric lengths as required. Locate all sewn seams at support posts. Alternatively, two sections of silt fence can be overlapped, provided that the overlap is long enough and that the adjacent silt fence sections are close enough together to prevent silt laden water from escaping through the fence at the overlap.
5. Attach the geotextile fabric on the up-slope side of the posts and secure with staples, wire, or in accordance with the manufacturer's recommendations. Attach the geotextile fabric to the posts in a manner that reduces the potential for tearing.
6. Support the geotextile fabric with wire or plastic mesh, dependent on the properties of the geotextile selected for use. If wire or plastic mesh is used, fasten the mesh securely to the up-slope side of the posts with the geotextile fabric up-slope of the mesh.
7. Mesh support, if used, shall consist of steel wire with a maximum mesh spacing of 2-inches, or a prefabricated polymeric mesh. The strength of the wire or polymeric mesh shall be equivalent to or greater than 180 lbs. grab tensile strength. The polymeric mesh must be as resistant to the same level of ultraviolet radiation as the geotextile fabric it supports.
8. Bury the bottom of the geotextile fabric 4-inches min. below the ground surface. Backfill and tamp soil in place over the buried portion of the geotextile fabric, so that no flow can pass beneath the silt fence and scouring cannot occur. When wire or polymeric back-up support mesh is used, the wire or polymeric mesh shall extend into the ground 3-inches min.
9. Drive or place the silt fence posts into the ground 18-inches min. A 12–inch min. depth is allowed if topsoil or other soft subgrade soil is not present and 18-inches cannot be reached. Increase fence post min. depths by 6 inches if the fence is located on slopes of 3H:1V or steeper and the slope is perpendicular to the fence. If required post depths cannot be obtained, the posts shall be adequately secured by bracing or guying to prevent overturning of the fence due to sediment loading.
10. Use wood, steel or equivalent posts. The spacing of the support posts shall be a maximum of 6-feet. Posts shall consist of either:
    - Wood with minimum dimensions of 2 inches by 2 inches by 3 feet. Wood shall be free of defects such as knots, splits, or gouges.
    - No. 6 steel rebar or larger.
    - ASTM A 120 steel pipe with a minimum diameter of 1-inch.
    - U, T, L, or C shape steel posts with a minimum weight of 1.35 lbs./ft.
    - Other steel posts having equivalent strength and bending resistance to the post sizes listed above.
11. Locate silt fences on contour as much as possible, except at the ends of the fence,

where the fence shall be turned uphill such that the silt fence captures the runoff water and prevents water from flowing around the end of the fence.

12. If the fence must cross contours, with the exception of the ends of the fence, place check dams perpendicular to the back of the fence to minimize concentrated flow and erosion. The slope of the fence line where contours must be crossed shall not be steeper than 3H:1V.

    - Check dams shall be approximately 1-foot deep at the back of the fence. Check dams shall be continued perpendicular to the fence at the same elevation until the top of the check dam intercepts the ground surface behind the fence.

    - Check dams shall consist of crushed surfacing base course, gravel backfill for walls, or shoulder ballast. Check dams shall be located every 10 feet along the fence where the fence must cross contours.

- Refer to Figure II-3.23: Silt Fence Installation by Slicing Method for slicing method details. The following are specifications for silt fence installation using the slicing method:

    1. The base of both end posts must be at least 2- to 4-inches above the top of the geotextile fabric on the middle posts for ditch checks to drain properly. Use a hand level or string level, if necessary, to mark base points before installation.

    2. Install posts 3- to 4-feet apart in critical retention areas and 6- to 7-feet apart in standard applications.

    3. Install posts 24-inches deep on the downstream side of the silt fence, and as close as possible to the geotextile fabric, enabling posts to support the geotextile fabric from upstream water pressure.

    4. Install posts with the nipples facing away from the geotextile fabric.

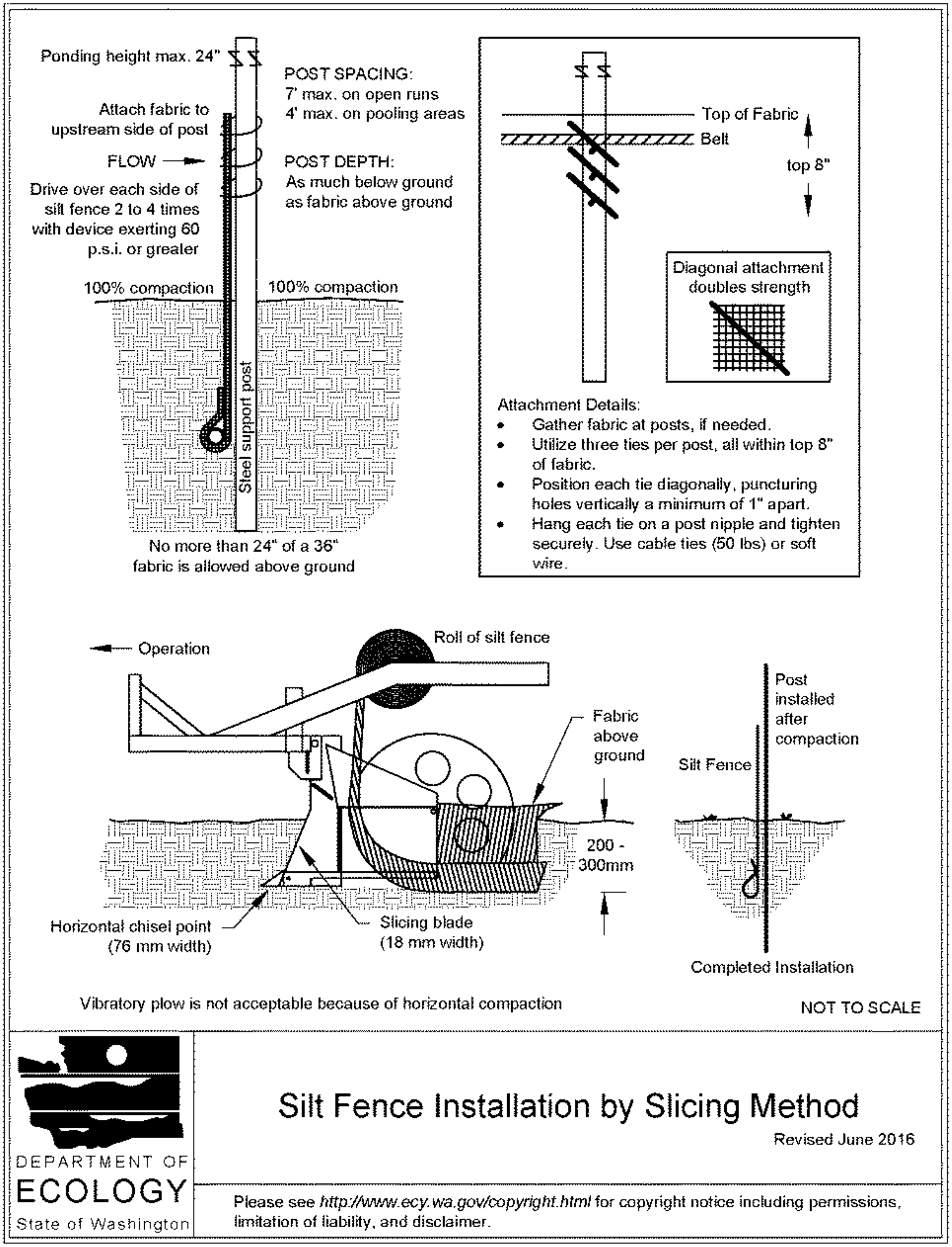
    5. Attach the geotextile fabric to each post with three ties, all spaced within the top 8-inches of the fabric. Attach each tie diagonally 45 degrees through the fabric, with each puncture at least 1-inch vertically apart. Each tie should be positioned to hang on a post nipple when tightening to prevent sagging.

    6. Wrap approximately 6-inches of the geotextile fabric around the end posts and secure with 3 ties.

    7. No more than 24-inches of a 36-inch geotextile fabric is allowed above ground level.

    8. Compact the soil immediately next to the geotextile fabric with the front wheel of the tractor, skid steer, or roller exerting at least 60 pounds per square inch. Compact the upstream side first and then each side twice for a total of four trips. Check and correct the silt fence installation for any deviation before compaction. Use a flat-bladed shovel to tuck the fabric deeper into the ground if necessary.

Figure II-3.23: Silt Fence Installation by Slicing Method



Maintenance Standards

- Repair any damage immediately.
- Intercept and convey all evident concentrated flows uphill of the silt fence to a sediment trapping BMP.
- Check the uphill side of the silt fence for signs of the fence clogging and acting as a barrier to flow and then causing channelization of flows parallel to the fence. If this occurs, replace the fence and remove the trapped sediment.
- Remove sediment deposits when the deposit reaches approximately one-third the height of the silt fence, or install a second silt fence.
- Replace geotextile fabric that has deteriorated due to ultraviolet breakdown.

BMP C235: Wattles

Purpose

Wattles are temporary erosion and sediment control barriers consisting of straw, compost, or other material that is wrapped in netting made of natural plant fiber or similar encasing material. They reduce the velocity and can spread the flow of rill and sheet runoff, and can capture and retain sediment.

Conditions of Use

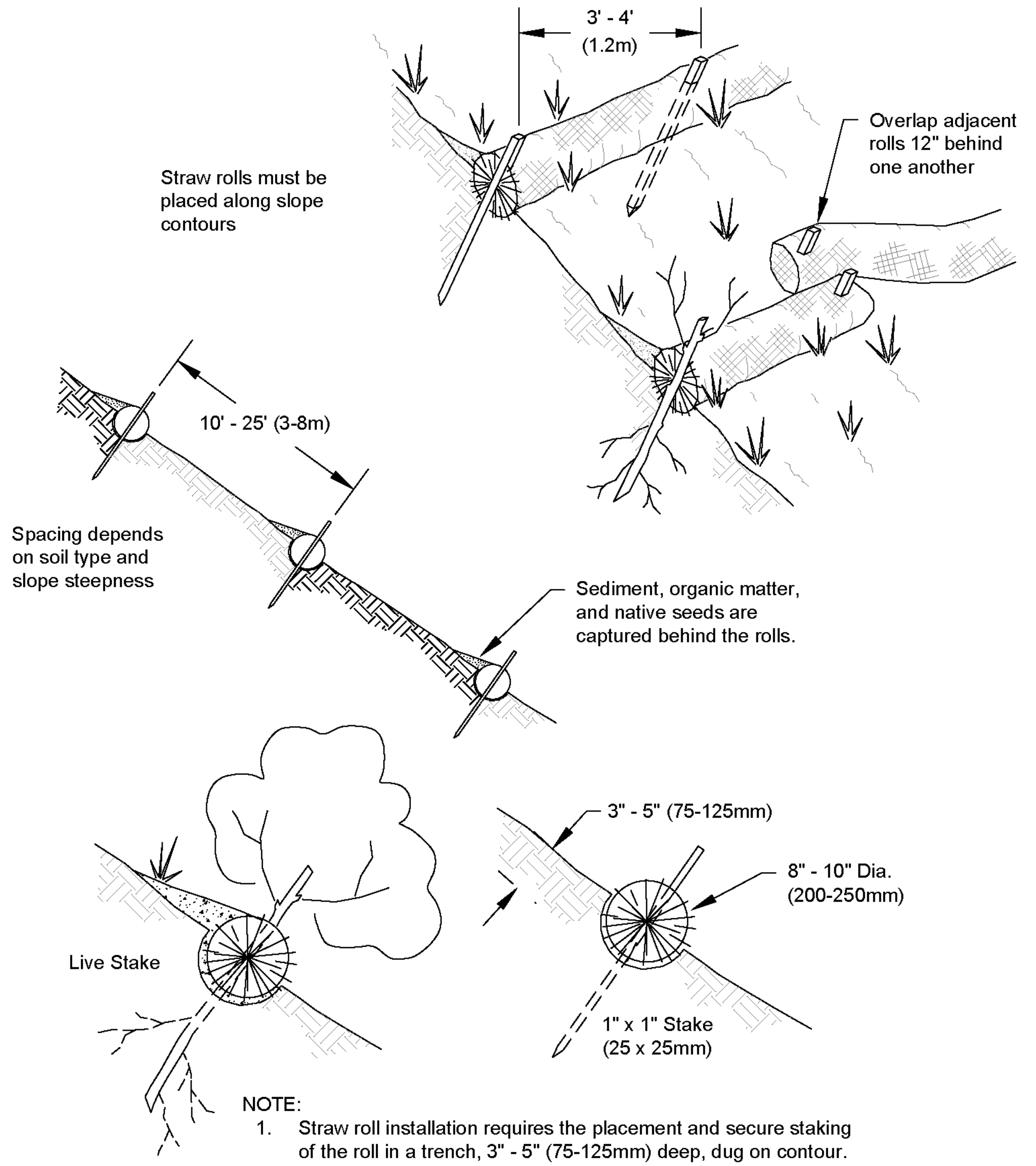
- Wattles shall consist of cylinders of plant material such as weed-free straw, coir, wood chips, excelsior, or wood fiber or shavings encased within netting made of natural plant fibers unaltered by synthetic materials.
- Use wattles:
  - In disturbed areas that require immediate erosion protection.
  - On exposed soils during the period of short construction delays, or over winter months.
  - On slopes requiring stabilization until permanent vegetation can be established.
- The material used dictates the effectiveness period of the wattle. Generally, wattles are effective for one to two seasons.

- Prevent rilling beneath wattles by entrenching and overlapping wattles to prevent water from passing between them.

Design Criteria

- See Figure II-3.24: Wattles for typical construction details.
- Wattles are typically 8 to 10 inches in diameter and 25 to 30 feet in length.
- Install wattles perpendicular to the flow direction and parallel to the slope contour.
- Place wattles in shallow trenches, staked along the contour of disturbed or newly constructed slopes. Dig narrow trenches across the slope (on contour) to a depth of 3- to 5-inches on clay soils and soils with gradual slopes. On loose soils, steep slopes, and areas with high rainfall, the trenches should be dug to a depth of 5- to 7- inches, or 1/2 to 2/3 of the thickness of the wattle.
- Start building trenches and installing wattles from the base of the slope and work up. Spread excavated material evenly along the uphill slope and compact it using hand tamping or other methods.
- Construct trenches at intervals of 10- to 25-feet depending on the steepness of the slope, soil type, and rainfall. The steeper the slope the closer together the trenches.
- Install the wattles snugly into the trenches and overlap the ends of adjacent wattles 12 inches behind one another.
- Install stakes at each end of the wattle, and at 4-foot centers along entire length of wattle.
- If required, install pilot holes for the stakes using a straight bar to drive holes through the wattle and into the soil.
- Wooden stakes should be approximately 0.75 x 0.75 x 24 inches min. Willow cuttings or 3/8-inch rebar can also be used for stakes.
- Stakes should be driven through the middle of the wattle, leaving 2 to 3 inches of the stake protruding above the wattle.

Figure II-3.24: Wattles



NOTE:
1. Straw roll installation requires the placement and secure staking of the roll in a trench, 3" - 5" (75-125mm) deep, dug on contour. Runoff must not be allowed to run under or around roll.

NOT TO SCALE

DEPARTMENT OF ECOLOGY
State of Washington

Wattles

Revised December 2016

Maintenance Standards

- Wattles may require maintenance to ensure they are in contact with soil and thoroughly entrenched, especially after significant rainfall on steep sandy soils.
- Inspect the slope after significant storms and repair any areas where wattles are not tightly abutted or water has scoured beneath the wattles.

Approved as Functionally Equivalent

Ecology has approved products as able to meet the requirements of this BMP. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept these products, or may require additional testing prior to consideration for local use. Products that Ecology has approved as functionally equivalent are available for review on Ecology's website at:

https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies

BMP C241: Sediment Pond (Temporary)

Purpose

Sediment ponds are temporary ponds used during construction to remove sediment from runoff originating from disturbed areas of the project site. Sediment ponds are typically designed to remove sediment no smaller than medium silt (0.02 mm). Consequently, they usually reduce turbidity only slightly.

Conditions of Use

- Use a sediment pond where the contributing drainage area to the pond is 3 acres or more. Ponds must be used in conjunction with other Construction Stormwater BMPs to reduce the amount of sediment flowing into the pond.

- Do not install sediment ponds on sites where failure of the BMP would result in loss of life, damage to homes or buildings, or interruption of use or service of public roads or utilities. Also, sediment ponds are attractive to children and can be dangerous. Compliance with local ordinances regarding health and safety must be addressed. If fencing of the pond is required, show the type of fence and its location on the drawings in the Construction SWPPP.

- Sediment ponds that can impound 10 acre-ft (435,600 cu-ft, or 3.26 million gallons) or more, or have an embankment of more than 6 feet, are subject to the Washington Dam Safety Regulations (Chapter 173-175 WAC). See BMP D.1: Detention Ponds for more information regarding dam safety considerations for detention ponds.

- Projects that are constructing permanent Flow Control BMPs or Runoff Treatment BMPs that use ponding for treatment may use the rough-graded or final-graded permanent BMP footprint for the temporary sediment pond. When permanent BMP footprints are used as temporary sediment ponds, the surface area requirement of the temporary sediment pond must be met. If the surface area requirement of the sediment pond is larger than the surface area of the permanent BMP, then the sediment pond shall be enlarged beyond the permanent BMP footprint to comply with the surface area requirement.

  The permanent control structure must be temporarily replaced with a control structure that only allows water to leave the temporary sediment pond from the surface or by pumping. Alternatively, the permanent control structure may used if it is temporarily modified by plugging any outlet holes below the riser. The permanent control structure must be installed as part of the permanent BMP after the site is fully stabilized.

Design and Installation Specifications

General

- See Figure II-3.28: Sediment Pond Plan View, Figure II-3.29: Sediment Pond Cross Section, and Figure II-3.30: Sediment Pond Riser Detail for details.

- Use of permanent infiltration BMP footprints for temporary sediment ponds during construction tends to clog the soils and reduce their capacity to infiltrate. If permanent infiltration BMP footprints are used, the sides and bottom of the temporary sediment pond must only be rough excavated to a minimum of 2 feet above final grade of the permanent infiltration BMP. Final grading of the permanent infiltration BMP shall occur only when all contributing drainage areas are fully stabilized. Any proposed permanent pretreatment BMP prior to the infiltration BMP should be fully constructed and used with the temporary sediment pond to help prevent clogging of the soils. See Element 13: Protect Low Impact Development BMPs for more information about protecting permanent infiltration BMPs.

- The pond shall be divided into two roughly equal volume cells by a permeable divider that will reduce turbulence while allowing movement of water between the cells. The divider shall be at least one-half the height of the riser, and at least one foot below the top of the riser. Wire-backed, 2- to 3-foot high, high strength geotextile fabric supported by treated 4"x4"s can be used as a divider. Alternatively, staked straw bales wrapped with geotextile fabric may be used. If the pond is more than 6 feet deep, a different divider design must be proposed. A riprap embankment is one acceptable method of separation for deeper ponds. Other designs that satisfy the intent of this provision are allowed as long as the divider is permeable, structurally sound, and designed to prevent erosion under and around the divider.
- The most common structural failure of sediment ponds is caused by piping. Piping refers to two phenomena: (1) water seeping through fine-grained soil, eroding the soil grain by grain and forming pipes or tunnels; and, (2) water under pressure flowing upward through a granular soil with a head of sufficient magnitude to cause soil grains to lose contact and capability for support.

  The most critical construction practices to prevent piping are:

  - Tight connections between the riser and outlet pipe, and other pipe connections.
  - Adequate anchoring of the riser.
  - Proper soil compaction of the embankment and riser footing.
  - Proper construction of anti-seep devices.

Sediment Pond Geometry

To determine the sediment pond geometry, first calculate the design surface area (SA) of the pond, measured at the top of the riser pipe. Use the following equation:

$$SA = 2 \times Q_2/0.00096$$

or

2080 square feet per cfs of inflow

See BMP C240: Sediment Trap for more information on the above equation.

The basic geometry of the pond can now be determined using the following design criteria:

- Required surface area SA (from the equation above) at the top of the riser.
- Minimum 3.5-foot depth from the top of the riser to the bottom of the pond.

- Maximum 3H:1V interior side slopes and maximum 2H:1V exterior slopes. The interior slopes can be increased to a maximum of 2H:1V if fencing is provided at or above the maximum water surface.
- One foot of freeboard between the top of the riser and the crest of the emergency spillway.
- Flat bottom.
- Minimum 1-foot deep spillway.
- Length-to-width ratio between 3:1 and 6:1.

Sediment Pond Discharge

The outlet for the pond consists of a combination of principal and emergency spillways. These outlets must pass the peak runoff expected from the contributing drainage area for a 100-year storm. If, due to site conditions and basin geometry, a separate emergency spillway is not feasible, the principal spillway must pass the entire peak runoff expected from the 100-year storm. However, an attempt to provide a separate emergency spillway should always be made. Base the runoff calculations on the site conditions during construction. The flow through the dewatering orifice cannot be utilized when calculating the 100-year storm elevation because of its potential to become clogged; therefore, available spillway storage must begin at the principal spillway riser crest.

The principal spillway designed by the procedures described below will result in some reduction in the peak rate of runoff. However, the design will not control the discharge flow rates to the extent required to comply with I-3.4.7 MR7: Flow Control. The size of the contributing basin, the expected life of the construction project, the anticipated downstream effects, and the anticipated weather conditions during construction should be considered to determine the need for additional discharge control.

Principal Spillway: Determine the required diameter for the principal spillway (riser pipe). The diameter shall be the minimum necessary to pass the peak volumetric flow rate using a 15-minute time step from a Type 1A, 10-year, 24-hour frequency storm for the developed condition. Use Figure II-3.31: Riser Inflow Curves to determine the riser diameter.

To aid in determining sediment depth, one-foot intervals shall be prominently marked on the riser.

Emergency Overflow Spillway: Size the emergency overflow spillway for the peak volumetric flow rate using a 10-minute time step from a Type 1A, 100-year, 24-hour frequency storm for the developed condition. See BMP D.1: Detention Ponds for additional guidance for Emergency Overflow Spillway design

Dewatering Orifice: Size of the dewatering orifice(s) (minimum 1-inch diameter) using a modified version of the discharge equation for a vertical orifice and a basic equation for the area of a circular orifice. Determine the required area of the orifice with the following equation:

$$A_o = \frac{A_S(2h)^{0.5}}{0.6 \times 3600 T g^{0.5}}$$

where

A_o = orifice area (square feet)

A_S = pond surface area (square feet)

h = head of water above orifice (height of riser in feet)

T = dewatering time (24 hours)

g = acceleration of gravity (32.2 feet/second^2)

Convert the orifice area (in square feet) to the orifice diameter D (in inches):

$$D = 24 \times \sqrt{\frac{A_o}{\pi}} = 13.54 \times \sqrt{A_o}$$

The vertical, perforated tubing connected to the dewatering orifice must be at least 2 inches larger in diameter than the orifice to improve flow characteristics. The size and number of perforations in the tubing should be large enough so that the tubing does not restrict flow. The orifice should control the flow rate.

Figure II-3.28: Sediment Pond Plan View

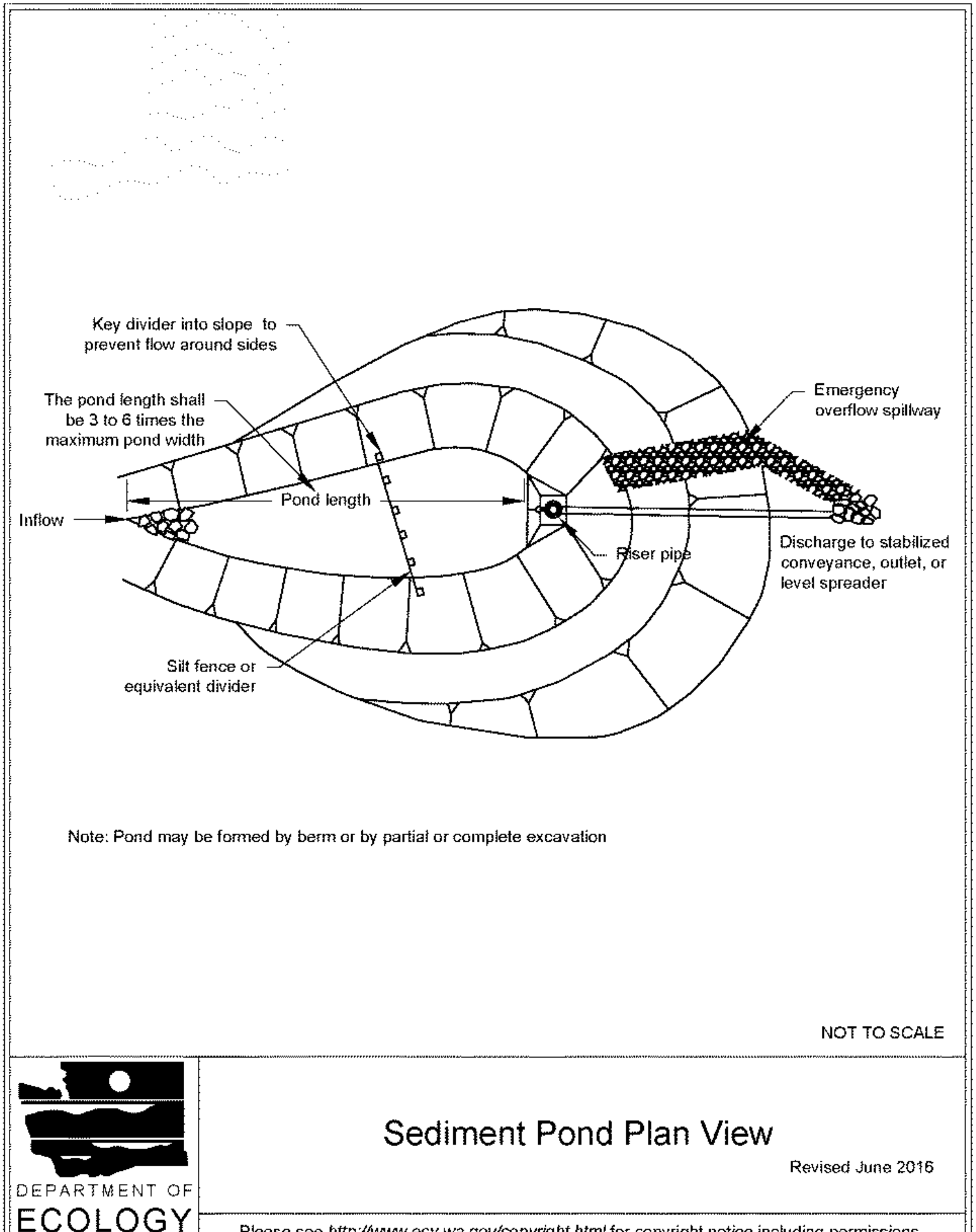
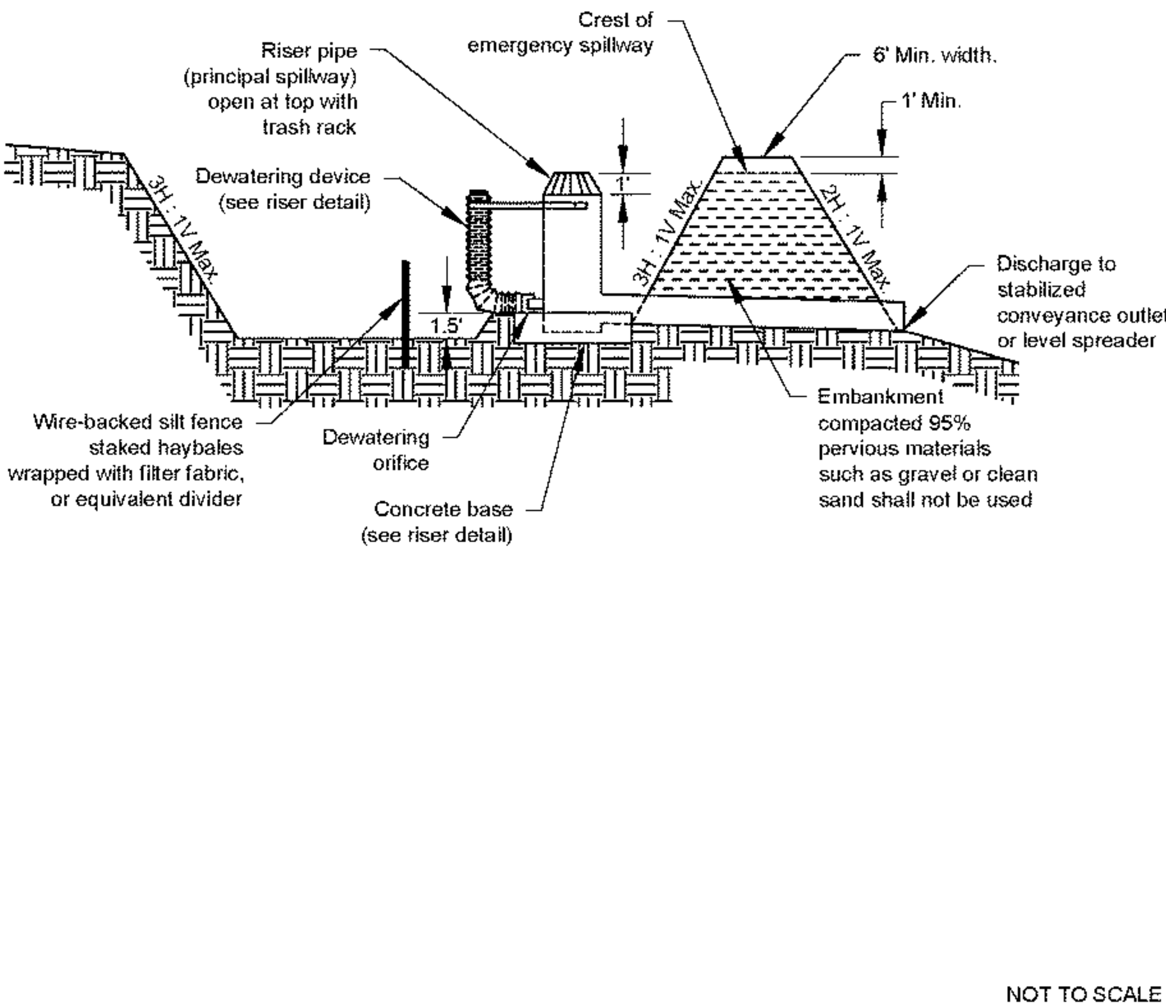


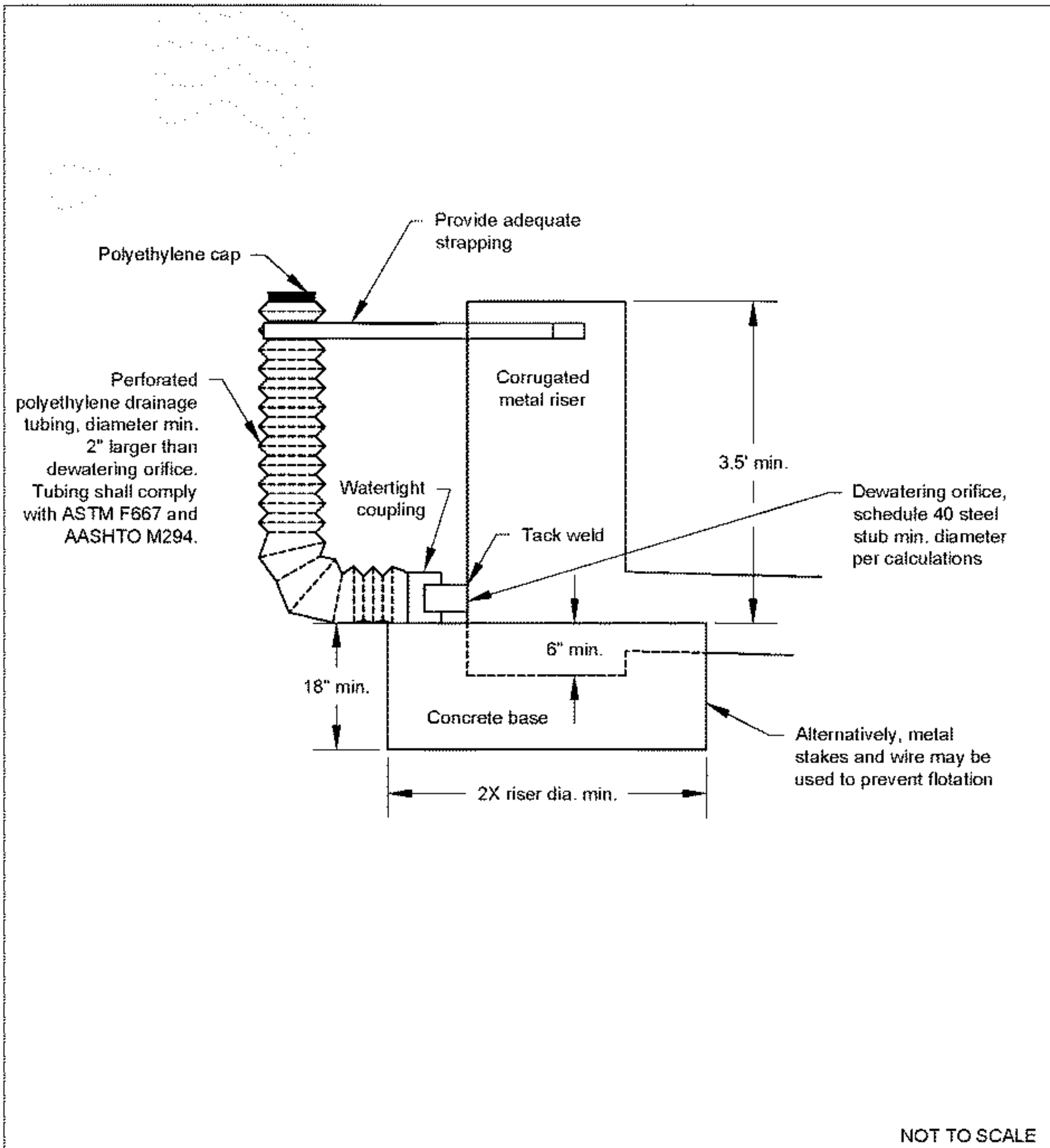
Figure II-3.29: Sediment Pond Cross Section



Sediment Pond Cross Section

Revised June 2016

Figure II-3.30: Sediment Pond Riser Detail

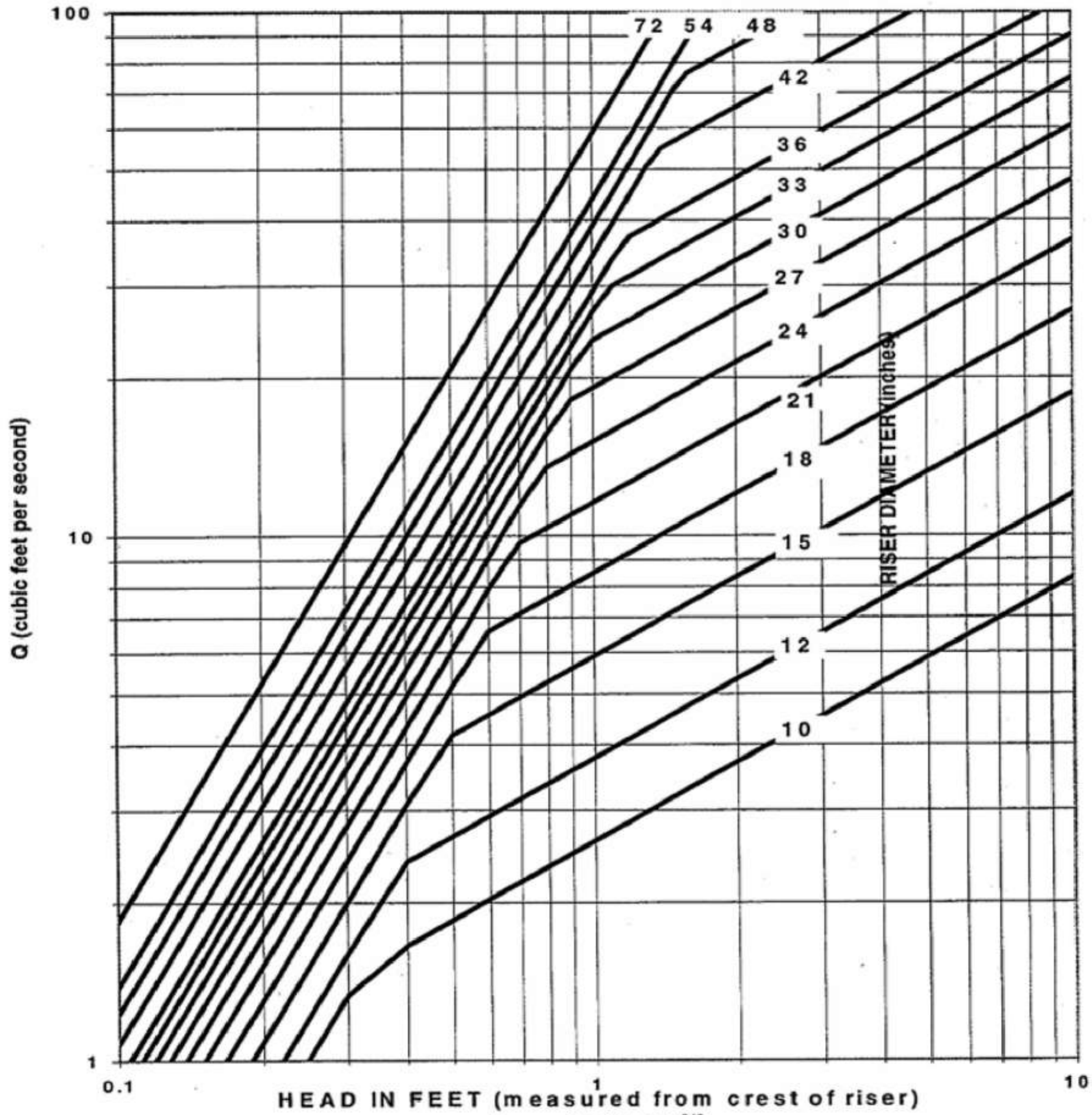


DEPARTMENT OF ECOLOGY State of Washington

Sediment Pond Riser Detail

Revised June 2016

Figure II-3.31: Riser Inflow Curves



$Q_{weir} = 9.739\ DH^{3/2}$

$Q_{orifice} = 3.782\ D^2 H^{1/2}$

Q in cfs, D and H in feet

Slope change occurs at weir-orifice transition

DEPARTMENT OF ECOLOGY
State of Washington

Riser Inflow Curves

Revised June 2016

Maintenance Standards

- Remove sediment from the pond when it reaches 1 foot in depth.
- Repair any damage to the pond embankments or slopes.

APPENDIX C

APPENDIX D

Construction Stormwater Site Inspection Form

Project Name ___________________ Permit # ____________ Inspection Date __________ Time _______

Name of Certified Erosion Sediment Control Lead (CESCL) or qualified inspector if *less than one acre*
Print Name: ____

Approximate rainfall amount since the last inspection (in inches): ______________________

Approximate rainfall amount in the last 24 hours (in inches): ______________________

Current Weather Clear ☐ Cloudy ☐ Mist ☐ Rain ☐ Wind ☐ Fog ☐

A. Type of inspection: Weekly ☐ Post Storm Event ☐ Other ☐

B. Phase of Active Construction (*check all that apply*):

Pre Construction/installation of erosion/sediment controls	☐	Clearing/Demo/Grading	☐	Infrastructure/storm/roads	☐
Concrete pours	☐	Vertical Construction/buildings	☐	Utilities	☐
Offsite improvements	☐	Site temporary stabilized	☐	Final stabilization	☐

C. Questions:

1. Were all areas of construction and discharge points inspected? Yes ___ No ___
2. Did you observe the presence of suspended sediment, turbidity, discoloration, or oil sheen Yes ___ No ___
3. Was a water quality sample taken during inspection? (*refer to permit conditions S4 & S5*) Yes ___ No ___
4. Was there a turbid discharge 250 NTU or greater, or Transparency 6 cm or less?* Yes ___ No ___
5. If yes to #4 was it reported to Ecology? Yes ___ No ___
6. Is pH sampling required? pH range required is 6.5 to 8.5. Yes ___ No ___

If answering yes to a discharge, describe the event. Include when, where, and why it happened; what action was taken, and when.

____

____

____

____

*If answering yes to # 4 record NTU/Transparency with continual sampling daily until turbidity is 25 NTU or less/ transparency is 33 cm or greater.

Sampling Results: Date: ______________________

Parameter	Method (circle one)	Result			Other/Note
		NTU	cm	pH	
Turbidity	tube, meter, laboratory				
pH	Paper, kit, meter				

D. Check the observed status of all items. Provide "Action Required "details and dates.

Element #	Inspection	BMPs Inspected			BMP needs maintenance	BMP failed	Action required (describe in section F)
		yes	no	n/a			
1 Clearing Limits	Before beginning land disturbing activities are all clearing limits, natural resource areas (streams, wetlands, buffers, trees) protected with barriers or similar BMPs? (high visibility recommended)						
2 Construction Access	Construction access is stabilized with quarry spalls or equivalent BMP to prevent sediment from being tracked onto roads?						
	Sediment tracked onto the road way was cleaned thoroughly at the end of the day or more frequent as necessary.						
3 Control Flow Rates	Are flow control measures installed to control stormwater volumes and velocity during construction and do they protect downstream properties and waterways from erosion?						
	If permanent infiltration ponds are used for flow control during construction, are they protected from siltation?						
4 Sediment Controls	All perimeter sediment controls (e.g. silt fence, wattles, compost socks, berms, etc.) installed, and maintained in accordance with the Stormwater Pollution Prevention Plan (SWPPP).						
	Sediment control BMPs (sediment ponds, traps, filters etc.) have been constructed and functional as the first step of grading.						
	Stormwater runoff from disturbed areas is directed to sediment removal BMP.						
5 Stabilize Soils	Have exposed un-worked soils been stabilized with effective BMP to prevent erosion and sediment deposition?						

Construction Stormwater Site Inspection Form

Element #	Inspection	BMPs Inspected			BMP needs maintenance	BMP failed	Action required (describe in section F)
		yes	no	n/a			
5 Stabilize Soils Cont.	Are stockpiles stabilized from erosion, protected with sediment trapping measures and located away from drain inlet, waterways, and drainage channels?						
	Have soils been stabilized at the end of the shift, before a holiday or weekend if needed based on the weather forecast?						
6 Protect Slopes	Has stormwater and ground water been diverted away from slopes and disturbed areas with interceptor dikes, pipes and or swales?						
	Is off-site storm water managed separately from stormwater generated on the site?						
	Is excavated material placed on uphill side of trenches consistent with safety and space considerations?						
	Have check dams been placed at regular intervals within constructed channels that are cut down a slope?						
7 Drain Inlets	Storm drain inlets made operable during construction are protected.						
	Are existing storm drains within the influence of the project protected?						
8 Stabilize Channel and Outlets	Have all on-site conveyance channels been designed, constructed and stabilized to prevent erosion from expected peak flows?						
	Is stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent stream banks, slopes and downstream conveyance systems?						
9 Control Pollutants	Are waste materials and demolition debris handled and disposed of to prevent contamination of stormwater?						
	Has cover been provided for all chemicals, liquid products, petroleum products, and other material?						
	Has secondary containment been provided capable of containing 110% of the volume?						
	Were contaminated surfaces cleaned immediately after a spill incident?						
	Were BMPs used to prevent contamination of stormwater by a pH modifying sources?						

Construction Stormwater Site Inspection Form

Element #	Inspection	BMPs Inspected yes	no	n/a	BMP needs maintenance	BMP failed	Action required (describe in section F)
9 Cont.	Wheel wash wastewater is handled and disposed of properly.						
10 Control Dewatering	Concrete washout in designated areas. No washout or excess concrete on the ground.						
	Dewatering has been done to an approved source and in compliance with the SWPPP.						
	Were there any clean non turbid dewatering discharges?						
11 Maintain BMP	Are all temporary and permanent erosion and sediment control BMPs maintained to perform as intended?						
12 Manage the Project	Has the project been phased to the maximum degree practicable?						
	Has regular inspection, monitoring and maintenance been performed as required by the permit?						
	Has the SWPPP been updated, implemented and records maintained?						

E. Check all areas that have been inspected. ✔

All in place BMPs ☐ All disturbed soils ☐ All concrete wash out area ☐ All material storage areas ☐
All discharge locations ☐ All equipment storage areas ☐ All construction entrances/exits ☐

F. Elements checked "Action Required" (section D) describe corrective action to be taken. List the element number; be specific on location and work needed. Document, initial, and date when the corrective action has been completed and inspected.

Element #	Description and Location	Action Required	Completion Date	Initials

Attach additional page if needed

<u>**Sign the following certification:**</u>

"I certify that this report is true, accurate, and complete, to the best of my knowledge and belief"

Inspected by: (print) ____________________ (Signature) ____________________________ Date: ________________

Title/Qualification of Inspector: ____

APPENDIX E

APPENDIX F

APPENDIX G

APPENDIX H

Tab 9.0

9.0 OPERATIONS AND MAINTENANCE MANUAL

9.0 OPERATION AND MAINTENANCE MANUAL

See below for operation and maintenance requirements for flow control facilities, water quality facilities, and conveyance systems from the DOE SWMM. This section shall be updated as needed to reflect all chosen BMPs.

-

NO. 3 – DETENTION TANKS AND VAULTS

Maintenance Component	Defect or Problem	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
Site	Trash and debris	Any trash and debris which exceed 1 cubic foot per 1,000 square feet (this is about equal to the amount of trash it would take to fill up one standard size office garbage can). In general, there should be no visual evidence of dumping.	Trash and debris cleared from site.
	Noxious weeds	Any noxious or nuisance vegetation which may constitute a hazard to County personnel or the public.	Noxious and nuisance vegetation removed according to applicable regulations. No danger of noxious vegetation where County personnel or the public might normally be.
	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
	Grass/groundcover	Grass or groundcover exceeds 18 inches in height.	Grass or groundcover mowed to a height no greater than 6 inches.
Tank or Vault Storage Area	Trash and debris	Any trash and debris accumulated in vault or tank (includes floatables and non-floatables).	No trash or debris in vault.
	Sediment accumulation	Accumulated sediment depth exceeds 10% of the diameter of the storage area for ½ length of storage vault or any point depth exceeds 15% of diameter. Example: 72-inch storage tank would require cleaning when sediment reaches depth of 7 inches for more than ½ length of tank.	All sediment removed from storage area.
Tank Structure	Plugged air vent	Any blockage of the vent.	Tank or vault freely vents.
	Tank bent out of shape	Any part of tank/pipe is bent out of shape more than 10% of its design shape.	Tank repaired or replaced to design.
	Gaps between sections, damaged joints or cracks or tears in wall	A gap wider than ½-inch at the joint of any tank sections or any evidence of soil particles entering the tank at a joint or through a wall.	No water or soil entering tank through joints or walls.
Vault Structure	Damage to wall, frame, bottom, and/or top slab	Cracks wider than ½-inch, any evidence of soil entering the structure through cracks or qualified inspection personnel determines that the vault is not structurally sound.	Vault is sealed and structurally sound.
Inlet/Outlet Pipes	Sediment accumulation	Sediment filling 20% or more of the pipe.	Inlet/outlet pipes clear of sediment.
	Trash and debris	Trash and debris accumulated in inlet/outlet pipes (includes floatables and non-floatables).	No trash or debris in pipes.
	Damaged	Cracks wider than ½-inch at the joint of the inlet/outlet pipes or any evidence of soil entering at the joints of the inlet/outlet pipes.	No cracks more than ¼-inch wide at the joint of the inlet/outlet pipe.

NO. 3 – DETENTION TANKS AND VAULTS

Maintenance Component	Defect or Problem	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
Access Manhole	Cover/lid not in place	Cover/lid is missing or only partially in place. **Any open manhole requires immediate maintenance.**	Manhole access covered.
	Locking mechanism not working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts cannot be seated. Self-locking cover/lid does not work.	Mechanism opens with proper tools.
	Cover/lid difficult to remove	One maintenance person cannot remove cover/lid after applying 80 lbs of lift.	Cover/lid can be removed and reinstalled by one maintenance person.
	Ladder rungs unsafe	Missing rungs, misalignment, rust, or cracks.	Ladder meets design standards. Allows maintenance person safe access.
Large access doors/plate	Damaged or difficult to open	Large access doors or plates cannot be opened/removed using normal equipment.	Replace or repair access door so it can opened as designed.
	Gaps, doesn't cover completely	Large access doors not flat and/or access opening not completely covered.	Doors close flat; covers access opening completely.
	Lifting Rings missing, rusted	Lifting rings not capable of lifting weight of door or plate.	Lifting rings sufficient to lift or remove door or plate.

-

NO. 5 – CATCH BASINS AND MANHOLES

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Structure	Sediment	Sediment exceeds 60% of the depth from the bottom of the catch basin to the invert of the lowest pipe into or out of the catch basin or is within 6 inches of the invert of the lowest pipe into or out of the catch basin.	Sump of catch basin contains no sediment.
	Trash and debris	Trash or debris of more than ½ cubic foot which is located immediately in front of the catch basin opening or is blocking capacity of the catch basin by more than 10%.	No Trash or debris blocking or potentially blocking entrance to catch basin.
		Trash or debris in the catch basin that exceeds $^1/_3$ the depth from the bottom of basin to invert the lowest pipe into or out of the basin.	No trash or debris in the catch basin.
		Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No dead animals or vegetation present within catch basin.
		Deposits of garbage exceeding 1 cubic foot in volume.	No condition present which would attract or support the breeding of insects or rodents.
	Damage to frame and/or top slab	Corner of frame extends more than ¾ inch past curb face into the street (If applicable).	Frame is even with curb.
		Top slab has holes larger than 2 square inches or cracks wider than ¼ inch.	Top slab is free of holes and cracks.
		Frame not sitting flush on top slab, i.e., separation of more than ¾ inch of the frame from the top slab.	Frame is sitting flush on top slab.
	Cracks in walls or bottom	Cracks wider than ½ inch and longer than 3 feet, any evidence of soil particles entering catch basin through cracks, or maintenance person judges that catch basin is unsound.	Catch basin is sealed and is structurally sound.
		Cracks wider than ½ inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	No cracks more than $^1/_4$ inch wide at the joint of inlet/outlet pipe.
	Settlement/ misalignment	Catch basin has settled more than 1 inch or has rotated more than 2 inches out of alignment.	Basin replaced or repaired to design standards.
	Damaged pipe joints	Cracks wider than ½-inch at the joint of the inlet/outlet pipes or any evidence of soil entering the catch basin at the joint of the inlet/outlet pipes.	No cracks more than ¼-inch wide at the joint of inlet/outlet pipes.
	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
Inlet/Outlet Pipe	Sediment accumulation	Sediment filling 20% or more of the pipe.	Inlet/outlet pipes clear of sediment.
	Trash and debris	Trash and debris accumulated in inlet/outlet pipes (includes floatables and non-floatables).	No trash or debris in pipes.

	Damaged	Cracks wider than ½-inch at the joint of the inlet/outlet pipes or any evidence of soil entering at the joints of the inlet/outlet pipes.	No cracks more than ¼-inch wide at the joint of the inlet/outlet pipe.

NO. 5 – CATCH BASINS AND MANHOLES

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Metal Grates (Catch Basins)	Unsafe grate opening	Grate with opening wider than $^7/_8$ inch.	Grate opening meets design standards.
	Trash and debris	Trash and debris that is blocking more than 20% of grate surface.	Grate free of trash and debris. footnote to guidelines for disposal
	Damaged or missing	Grate missing or broken member(s) of the grate. **Any open structure requires urgent maintenance**.	Grate is in place and meets design standards.
Manhole Cover/Lid	Cover/lid not in place	Cover/lid is missing or only partially in place. **Any open structure requires urgent maintenance**.	Cover/lid protects opening to structure.
	Locking mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts cannot be seated. Self-locking cover/lid does not work.	Mechanism opens with proper tools.
	Cover/lid difficult to Remove	One maintenance person cannot remove cover/lid after applying 80 lbs. of lift.	Cover/lid can be removed and reinstalled by one maintenance person.

-

NO. 6 – CONVEYANCE PIPES AND DITCHES

Maintenance Component	Defect or Problem	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
Pipes	Sediment & debris accumulation	Accumulated sediment or debris that exceeds 20% of the diameter of the pipe.	Water flows freely through pipes.
	Vegetation/roots	Vegetation/roots that reduce free movement of water through pipes.	Water flows freely through pipes.
	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
	Damage to protective coating or corrosion	Protective coating is damaged; rust or corrosion is weakening the structural integrity of any part of pipe.	Pipe repaired or replaced.
	Damaged	Any dent that decreases the cross section area of pipe by more than 20% or is determined to have weakened structural integrity of the pipe.	Pipe repaired or replaced.
Ditches	Trash and debris	Trash and debris exceeds 1 cubic foot per 1,000 square feet of ditch and slopes.	Trash and debris cleared from ditches.
	Sediment accumulation	Accumulated sediment that exceeds 20% of the design depth.	Ditch cleaned/flushed of all sediment and debris so that it matches design.
	Noxious weeds	Any noxious or nuisance vegetation which may constitute a hazard to County personnel or the public.	Noxious and nuisance vegetation removed according to applicable regulations. No danger of noxious vegetation where County personnel or the public might normally be.
	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
	Vegetation	Vegetation that reduces free movement of water through ditches.	Water flows freely through ditches.
	Erosion damage to slopes	Any erosion observed on a ditch slope.	Slopes are not eroding.
	Rock lining out of place or missing (If Applicable)	One layer or less of rock exists above native soil area 5 square feet or more, any exposed native soil.	Replace rocks to design standards.

-

NO. 8 – ENERGY DISSIPATERS

Maintenance Component	Defect or Problem	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed.
Site	Trash and debris	Trash and/or debris accumulation.	Dissipater clear of trash and/or debris.
	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
Rock Pad	Missing or moved Rock	Only one layer of rock exists above native soil in area five square feet or larger or any exposure of native soil.	Rock pad prevents erosion.
Dispersion Trench	Pipe plugged with sediment	Accumulated sediment that exceeds 20% of the design depth.	Pipe cleaned/flushed so that it matches design.
	Not discharging water properly	Visual evidence of water discharging at concentrated points along trench (normal condition is a “sheet flow” of water along trench).	Water discharges from feature by sheet flow.
	Perforations plugged.	Over 1/4 of perforations in pipe are plugged with debris or sediment.	Perforations freely discharge flow.
	Water flows out top of “distributor” catch basin.	Water flows out of distributor catch basin during any storm less than the design storm.	No flow discharges from distributor catch basin.
	Receiving area over-saturated	Water in receiving area is causing or has potential of causing landslide problems.	No danger of landslides.
Gabions	Damaged mesh	Mesh of gabion broken, twisted or deformed so structure is weakened or rock may fall out.	Mesh is intact, no rock missing.
	Corrosion	Gabion mesh shows corrosion through more than ¼ of its gage.	All gabion mesh capable of containing rock and retaining designed form.
	Collapsed or deformed baskets	Gabion basket shape deformed due to any cause.	All gabion baskets intact, structure stands as designed.
	Missing rock	Any rock missing that could cause gabion to loose structural integrity.	No rock missing.
Manhole/Chamber	Worn or damaged post, baffles or side of chamber	Structure dissipating flow deteriorates to ½ or original size or any concentrated worn spot exceeding one square foot which would make structure unsound.	Structure is in no danger of failing.
	Damage to wall, frame, bottom, and/or top slab	Cracks wider than ½-inch or any evidence of soil entering the structure through cracks, or maintenance inspection personnel determines that the structure is not structurally sound.	Manhole/chamber is sealed and structurally sound.
	Damaged pipe joints	Cracks wider than ½-inch at the joint of the inlet/outlet pipes or any evidence of soil entering the structure at the joint of the inlet/outlet pipes.	No soil or water enters and no water discharges at the joint of inlet/outlet pipes.

NO. 9 – FENCING

Maintenance Component	Defect or Problem	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
Site	Erosion or holes under fence	Erosion or holes more than 4 inches high and 12-18 inches wide permitting access through an opening under a fence.	No access under the fence.
Wood Posts, Boards and Cross Members	Missing or damaged parts	Missing or broken boards, post out of plumb by more than 6 inches or cross members broken	No gaps on fence due to missing or broken boards, post plumb to within 1½ inches, cross members sound.
	Weakened by rotting or insects	Any part showing structural deterioration due to rotting or insect damage	All parts of fence are structurally sound.
	Damaged or failed post foundation	Concrete or metal attachments deteriorated or unable to support posts.	Post foundation capable of supporting posts even in strong wind.
Metal Posts, Rails and Fabric	Damaged parts	Post out of plumb more than 6 inches.	Post plumb to within 1½ inches.
		Top rails bent more than 6 inches.	Top rail free of bends greater than 1 inch.
		Any part of fence (including post, top rails, and fabric) more than 1 foot out of design alignment.	Fence is aligned and meets design standards.
		Missing or loose tension wire.	Tension wire in place and holding fabric.
	Deteriorated paint or protective coating	Part or parts that have a rusting or scaling condition that has affected structural adequacy.	Structurally adequate posts or parts with a uniform protective coating.
	Openings in fabric	Openings in fabric are such that an 8-inch diameter ball could fit through.	Fabric mesh openings within 50% of grid size.

-

NO. 10 – GATES/BOLLARDS/ACCESS BARRIERS

Maintenance Component	Defect or Problem	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
Chain Link Fencing Gate	Damaged or missing members	Missing gate.	Gates in place.
		Broken or missing hinges such that gate cannot be easily opened and closed by a maintenance person.	Hinges intact and lubed. Gate is working freely.
		Gate is out of plumb more than 6 inches and more than 1 foot out of design alignment.	Gate is aligned and vertical.
		Missing stretcher bar, stretcher bands, and ties.	Stretcher bar, bands, and ties in place.
	Locking mechanism does not lock gate	Locking device missing, no-functioning or does not link to all parts.	Locking mechanism prevents opening of gate.
	Openings in fabric	Openings in fabric are such that an 8-inch diameter ball could fit through.	Fabric mesh openings within 50% of grid size.
Bar Gate	Damaged or missing cross bar	Cross bar does not swing open or closed, is missing or is bent to where it does not prevent vehicle access.	Cross bar swings fully open and closed and prevents vehicle access.
	Locking mechanism does not lock gate	Locking device missing, no-functioning or does not link to all parts.	Locking mechanism prevents opening of gate.
	Support post damaged	Support post does not hold cross bar up.	Cross bar held up preventing vehicle access into facility.
Bollards	Damaged or missing	Bollard broken, missing, does not fit into support hole or hinge broken or missing.	No access for motorized vehicles to get into facility.
	Does not lock	Locking assembly or lock missing or cannot be attached to lock bollard in place.	No access for motorized vehicles to get into facility.
Boulders	Dislodged	Boulders not located to prevent motorized vehicle access.	No access for motorized vehicles to get into facility.
	Circumvented	Motorized vehicles going around or between boulders.	No access for motorized vehicles to get into facility.

NO. 11 – GROUNDS (LANDSCAPING)

Maintenance Component	Defect or Problem	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
Site	Trash or litter	Any trash and debris which exceed 1 cubic foot per 1,000 square feet (this is about equal to the amount of trash it would take to fill up one standard size office garbage can). In general, there should be no visual evidence of dumping.	Trash and debris cleared from site.
	Noxious weeds	Any noxious or nuisance vegetation which may constitute a hazard to County personnel or the public.	Noxious and nuisance vegetation removed according to applicable regulations. No danger of noxious vegetation where County personnel or the public might normally be.
	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
	Grass/groundcover	Grass or groundcover exceeds 18 inches in height.	Grass or groundcover mowed to a height no greater than 6 inches.
Trees and Shrubs	Hazard	Any tree or limb of a tree identified as having a potential to fall and cause property damage or threaten human life. **A hazard tree identified by a qualified arborist must be removed as soon as possible.**	No hazard trees in facility.
	Damaged	Limbs or parts of trees or shrubs that are split or broken which affect more than 25% of the total foliage of the tree or shrub.	Trees and shrubs with less than 5% of total foliage with split or broken limbs.
		Trees or shrubs that have been blown down or knocked over.	No blown down vegetation or knocked over vegetation. Trees or shrubs free of injury.
		Trees or shrubs which are not adequately supported or are leaning over, causing exposure of the roots.	Tree or shrub in place and adequately supported; dead or diseased trees removed.

-

NO. 12 – ACCESS ROADS

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Site	Trash and debris	Trash and debris exceeds 1 cubic foot per 1,000 square feet (i.e., trash and debris would fill up one standards size garbage can).	Roadway drivable by maintenance vehicles.
		Debris which could damage vehicle tires or prohibit use of road.	Roadway drivable by maintenance vehicles.
	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
	Blocked roadway	Any obstruction which reduces clearance above road surface to less than 14 feet.	Roadway overhead clear to 14 feet high.
		Any obstruction restricting the access to a 10- to 12 foot width for a distance of more than 12 feet or any point restricting access to less than a 10 foot width.	At least 12-foot of width on access road.
Road Surface	Erosion, settlement, potholes, soft spots, ruts	Any surface defect which hinders or prevents maintenance access.	Road drivable by maintenance vehicles.
	Vegetation on road surface	Trees or other vegetation prevent access to facility by maintenance vehicles.	Maintenance vehicles can access facility.
Shoulders and Ditches	Erosion	Erosion within 1 foot of the roadway more than 8 inches wide and 6 inches deep.	Shoulder free of erosion and matching the surrounding road.
	Weeds and brush	Weeds and brush exceed 18 inches in height or hinder maintenance access.	Weeds and brush cut to 2 inches in height or cleared in such a way as to allow maintenance access.
Modular Grid Pavement	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
	Damaged or missing	Access surface compacted because of broken on missing modular block.	Access road surface restored so road infiltrates.