Drainage Design

Evans Vista Housing Development
City of Port Townsend

November 2023

SCJ ALLIANCE
CONSULTING SERVICES

Drainage Design Report

Project Information

Project:	**Evans Vista Housing Development**
Prepared for:	**City of Port Townsend** 250 Madison Street Port Townsend, WA 98368

Reviewing Agency

Jurisdiction:	City of Port Townsend

Project Representative

Prepared by:	**SCJ Alliance** 8730 Tallon Lane NE, Suite 200 Lacey, WA 98516 360.352.1465 scjalliance.com
Contact:	Whitney Holm, PE
Project Reference:	SCJ #22-000827 Path: N:\Projects\1835 Thomas Architecture Studio, Inc\22-000827 Port Townsend Evans Vista Housing Development\Design\Storm\Drainage Report\22-000827 Drainage Report.docx

PROJECT ENGINEER'S CERTIFICATION

I hereby certify that this Drainage Control Plan for the City of Evans Vista Housing Development project has been prepared by me or under my supervision and meets the minimum standards of the City of Port Townsend and normal standards of engineering practice. I hereby acknowledge and agree that the jurisdiction does not and will not assume liability for the sufficiency, suitability, or performance of drainage facilities designed by me.

Enriqueta Martinez 12-26-2023

Prepared By: Rikki Martinez, EIT Date
rikki.martinez@scjalliance.com
360.352.1465

12-26-2023

Approved By: Whitney Holm, PE Date
whitney.holm@scjalliance.com
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LIST OF APPENDICES

DRAINAGE REPORT

The following report was prepared for the proposed Evans Vista Housing Development project in Port Townsend, Washington. This report was prepared to comply with the minimum technical standards and requirements that are set forth in the Department of Ecology 2019 Stormwater Management Manual for Western Washington (SMMWW) and the Port Townsend Engineering Design Standards Manual (Manual).

1. PROPOSED PROJECT DESCRIPTION

Project Proponent: City of Port Townsend

Section, Township Range: Section 9, Township 30N, Range 1W

The proposed housing development includes apartments, townhomes, commercial spaces, daycare, parking lot, sidewalks, landscaping, utilities, and stormwater improvements. The improvements/construction activities for this project include the following:

- **Site preparation, grading, and erosion control activities**
- **Construction of roadways**
- **Construction/installation of water quality and conveyance systems**

A site vicinity map of the proposed project location is enclosed as **Appendix A**.

The roadway improvements include one stormwater basin. Basin map exhibits are enclosed as **Appendix C**.

Table 1. Basin Areas

	Basin 1	
	Existing	**Proposed**
Existing Impervious Area	0.92 Acres	-
Pollution Generating Asphalt Area	-	3.89 Acres
Nonpollution Generating Concrete Area	-	1.08 Acres
Roof Area	-	2.04 Acres
Pervious	10.56 Acres	4.47 Acres
Total	11.48 Acres	11.48 Acres

A worksheet for determining the number of Minimum Requirements for this project has been prepared and is enclosed as **Appendix B**. Minimum Requirements 1-9 are required.

1.1 SUMMARY OF COMPLIANCE ON SITE

The stormwater design complies with all nine minimum requirements as follows:

Minimum Requirement #1 – Preparation of Stormwater Site Plans – This Drainage Design Report will meet all the requirements of the SMMWW and will be included as part of the Stormwater Site Plans.

Minimum Requirement #2 – Construction Stormwater Pollution Prevention Plan (SWPPP) – A pollution prevention plan will be prepared as part of the Stormwater Site Plans.

Minimum Requirement #3 – Source Control of Pollution – BMPs listed below are the minimum required for the site, additional BMPs not listed here may need to be implemented to meet the minimum requirements discussed in the SMMWW.

- **BMP C102: Buffer Zones**
- **BMP C103/C233: High Visibility Fencing/Silt Fence**
- **BMP C120: Temporary and Permanent Seeding**
- **BMP C121: Mulching**
- **BMP C140: Dust Control**
- **BMP C220: Storm Drain Inlet Protection**

Minimum Requirement #4 – Preservation of Natural Drainage Systems and Outfalls – Currently the stormwater is either infiltrating onsite or being collected in catch basins and conveyed to a regional pond to the southwest of the site. The pond is sized to handle the flow control of 122,000 sq. ft. of impervious surface. The proposed improvements will treat and infiltrate the pollution generating hard surfaces in a Contech StormFilter vault and in the regional pond. See Section 9 for more information about the proposed stormwater improvements.

Minimum Requirement #5 – Onsite Stormwater **Management – Drainage Plans are attached as Appendix E.**

Minimum Requirement #6 – Runoff Treatment – Treatment will be provided by a Contech StormFilter. See Section 9 of this report for more information.

Minimum Requirement #7 – Flow Control – The site has an existing regional pond to the southwest of the parcel that was sized to handle the flow control for future development of the site, however the pond was sized to handle 2.8 acres (122,000 sq. ft.) of impervious area. The remaining 4.21 acres of impervious area will be stored in an infiltration vault. See Section 9 of this report for more information.

Minimum Requirement #8 – Wetlands Protection – No wetlands are impacted by this project. **Appendix I** is the Critical Area Study from July 2023.

Minimum Requirement #9 – Operation and Maintenance – A Stormwater Facility Maintenance Program will be completed at a later phase of the project.

2. EXISTING CONDITIONS DESCRIPTION

Currently, Evans Vista road ends at the property line of parcel 001-094-006. The site has some gravel and dirt paths used to access both stormwater ponds and catch basins. The area is densely forested throughout and on the adjacent parcels to the north, south, and west. The parcel to the east is the Department of Social and Health Services (DSHS) building.

Onsite runoff is currently infiltrating onsite or being collected in catch basins and conveyed to a regional pond to the southwest of the site. The east pond is infiltrating runoff from offsite and does not flow with the project sites runoff.
Other than the runoff running to the east side of the parcel into the stormwater pond, no other offsite drainage is anticipated to drain onto the site.

3. INFILTRATION RATES/SOILS REPORTS

A geotechnical report has not been completed for this project. The USDA Web Soil Survey, shown in **Appendix G**, classifies the area into three soil zones. Two of the three have good infiltration rates, however one has poor information rates. The zone with poor infiltration rates covers roughly 62% of the site and consists of Clallam gravelly sandy loam. The zones with good infiltration rates cover 38% of the site, with both soil types having unfactored infiltration rates of 5.95 in/hr to 19.98 in/hr.

The site has an existing regional pond that has been sized to handle 122,000 sq. ft. of impervious surface, therefore additional infiltration will be required. Due to limited open space and steep slopes on site, an underground treatment and detention facility is recommended. See Section 9 for more information.

4. WELLS AND SEPTIC SYSTEMS

There are no known wells or septic systems near the project.

5. FUEL TANKS

After a diligent search of records, no underground fuel tanks (in use or abandoned) were found on site. If an existing underground fuel tank is found during construction, the owner will contact the jurisdiction for specific instructions on how to abandon the fuel tank.

6. SUBBASIN DESCRIPTION

Qualitative Upstream Analysis

Offsite run-on will enter to the east into an existing stormwater pond. The run-on will not flow with the sites runoff therefore the proposed stormwater system shall only be sized for the on-site runoff.

Qualitative Downstream Analysis

All the stormwater generated by the improvements will be collected, treated, and infiltrated or released to an existing stormwater system. The existing stormwater system is a regional pond. Runoff will ultimately be released into Port Townsend Bay.

7. FLOODPLAIN ANALYSIS

The project is not within the 100-year flood plain. A site-specific National Flood Insurance Map (FIRM) has been provided herein as **Appendix D**.

8. AESTHETIC CONSIDERATIONS FOR FACILITIES

All stormwater facilities shall be underground with little to no impact on the aesthetics of the development.

9. FACILITY SELECTION AND SIZING

The water quality treatment consists of a Contech StormFilter Vault that is designed to treat all the new pollution generating impervious surfaces (PGIS). Flow control will be partially covered by a regional pond to the southwest of the site and the remaining runoff shall be stored in an infiltration vault. The proposed treatment facility has been sized to provide basic treatment per the SMMWW Runoff Treatment BMP worksheet shown in **Attachment H**. WWHM 2012 was used to size both the StormFilter vault and infiltration vault, see **Appendix F.** Currently, there is no stormwater treatment occurring. The project includes a single basin, and the proposed stormwater system is designed using equivalent areas. An equivalent area of 7.01 acres will be treated (the new and replaced PGIS for the entire project) in the StormFilter vault. The proposed flow control system is designed using equivalent areas. An equivalent area of 4.21 acres will be handled with an infiltration vault and the remaining 2.8 acres will be handled by the existing regional pond.

A bioinfiltration pond was not a feasible solution for treatment and flow control due to many factors. If a pond were to be used, the pond would need to have a minimum bottom area of 5,625 sq. ft. with a depth of 4-ft and side slopes of 3:1. The site does not have an adequate space that would be able to accommodate a pond of this size due to setbacks set forth by SMMWW, overall steep site, and poor soils in the majority of the open spaces.

Performance Standards and Goals

Minimum requirements one to nine are required for the new and replaced hard surfaces and converted vegetation areas. See **Appendix B** for the Determination of Minimum Requirements Worksheets.

Flow Control System

Flow control is required for this project. The regional pond to the southeast of the site was sized for the future development of our site, however it was only sized to handle 122,000 sq. ft. of impervious surface. The remaining 4.21 acres will be managed by a infiltration vault. The infiltration vault shall be a minimum volume of 22,326 cubic feet. The concrete vault shall be 26'x144'x6' with an overflow structure at 5-feet.

Water Quality System on Site

Treatment shall be provided by a Contech StormFilter 8'x12' vault. There is a total of 7.01 acres of new impervious area that requires treatment. The StormFilter vault has the capacity to hold 20 18-inch cartridges. The WWHM model (**Appendix F**) requires a water quality flow rate of 242 gallons per minute (0.5392 cubic feet per second) to be treated, each cartridge can treat 12.53 gallons per minute therefore a minimum of 20 cartridges are required.

See **Appendix F** for WWHM printouts.

10. CONVEYANCE SYSTEM ANALYSIS AND DESIGN

Basin 1 includes improvements for the entire project area. The 25-year storm for all the runoff from Basin 1 is 4.17 cfs. The proposed system will have 18-inch pipes with a minimum slope of 0.4% can convey 8.64 cfs.

See Appendix F for conveyance design calculations.

11. OFFSITE ANALYSIS AND MITIGATION

All stormwater will be managed and treated onsite; therefore, stormwater runoff will not be received offsite, and no further offsite analysis is required.

12. UTILITIES

Utility crossings will be closely monitored and minimized through design to avoid utility conflicts and maintain proper separation per the City of Port Townsend design requirements.

13. COVENANTS, DEDICATIONS, EASEMENTS, AGREEMENTS

City of Port Townsend will be responsible for inspection, operation, and maintenance of storm drainage facilities and execution of pollution source control programs for all project improvements.

14. OTHER PERMITS OR CONDITIONS PLACED ON THE PROJECT

A grading and paving permit, as well as utility permits, will need to be secured prior to beginning construction activities. Coverage under Washington State Department of Ecology Phase II National Pollutant Discharge Elimination System Stormwater Permit will also need to be secured prior to beginning construction activities.

END OF DRAINAGE REPORT

APPENDIX A
VICINITY MAP

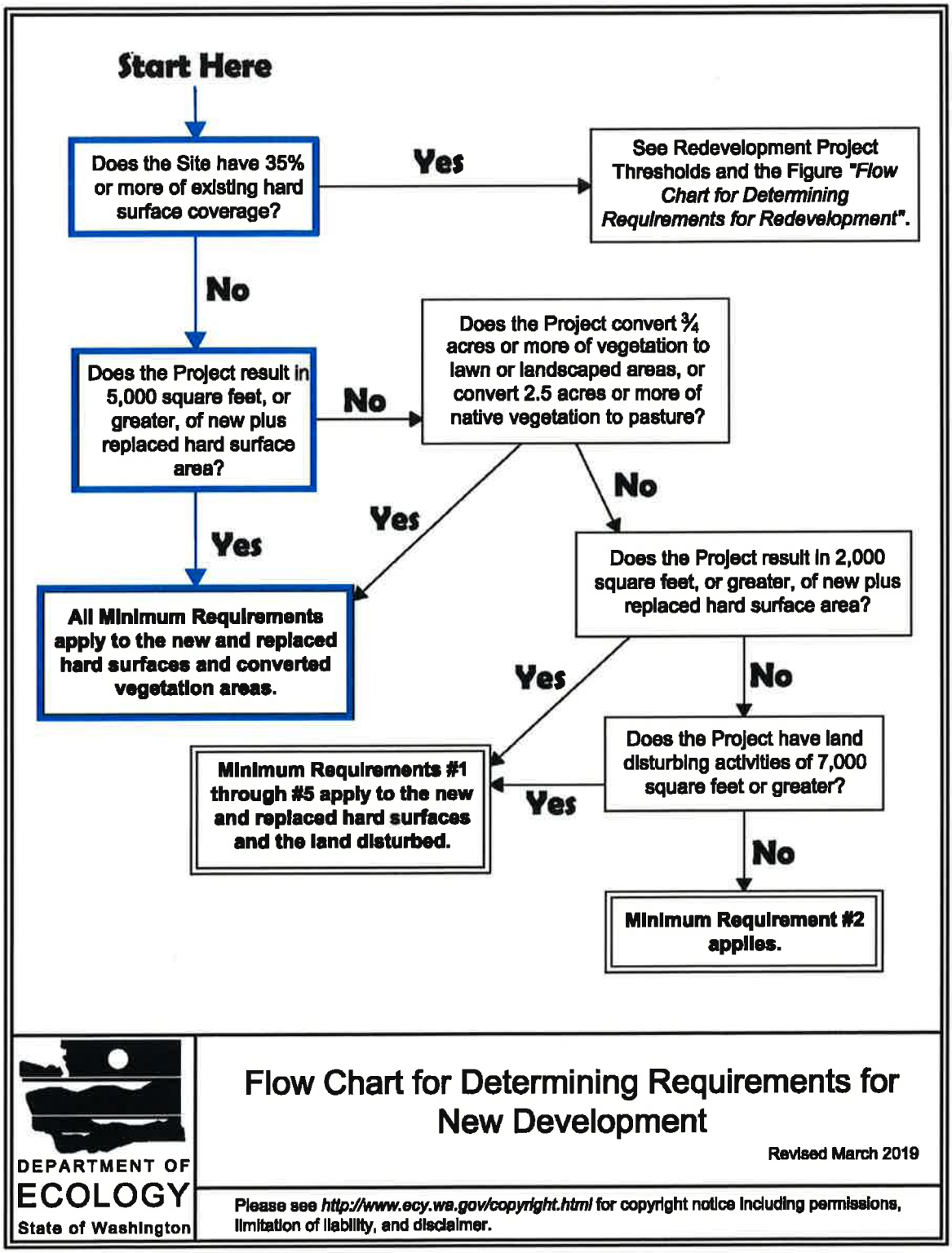
SCJ ALLIANCE
CONSULTING SERVICES

8730 Tallon Lane NE, Suite 200 • Lacey, WA 98516 • Office 360.352.1465 • Fax 360.352.1509 • scjalliance.com

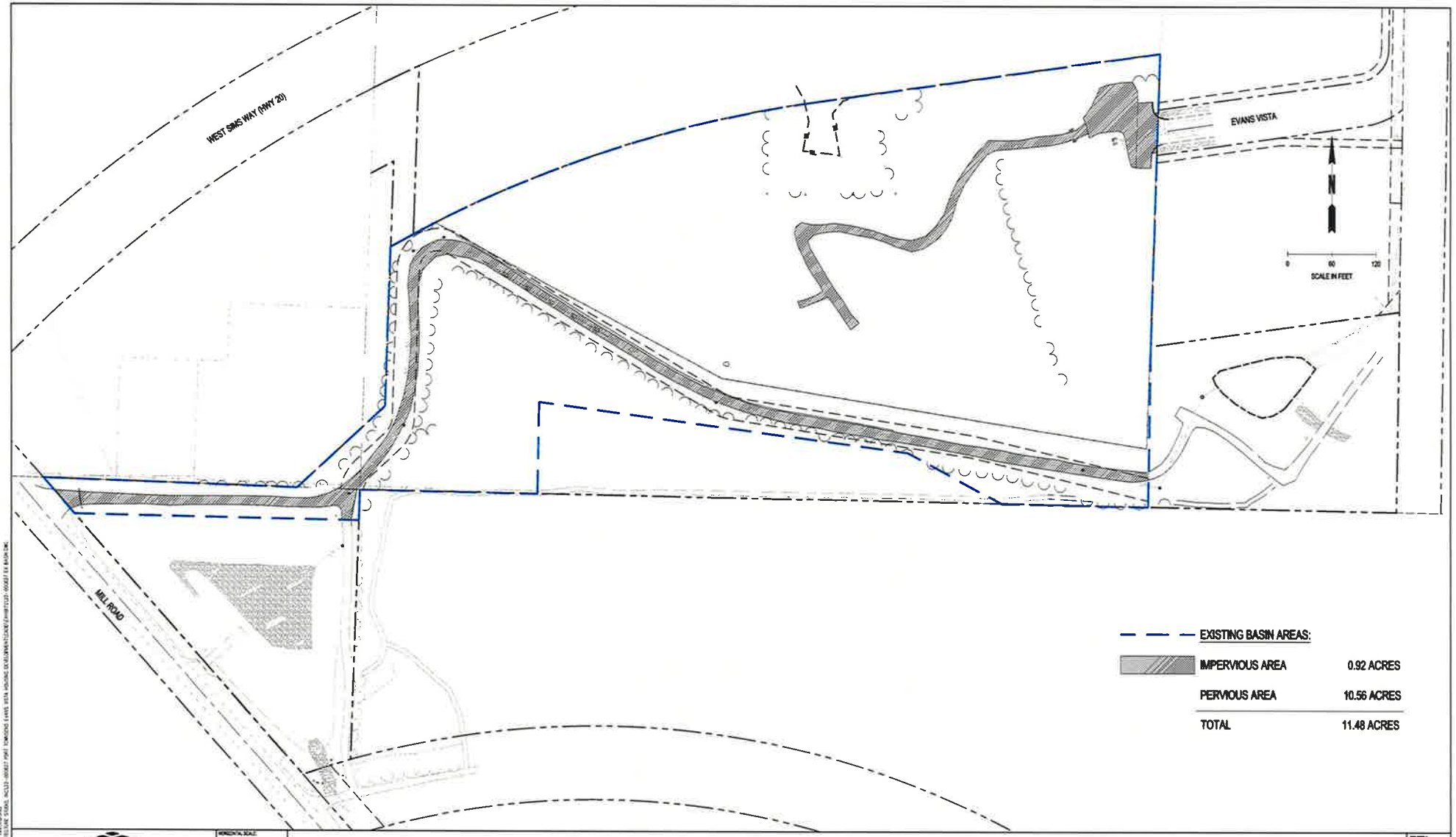
APPENDIX B

DETERMININATION OF MINIMUM REQUIREMENTS WORKSHEET

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



APPENDIX C
BASIN MAP EXHIBITS



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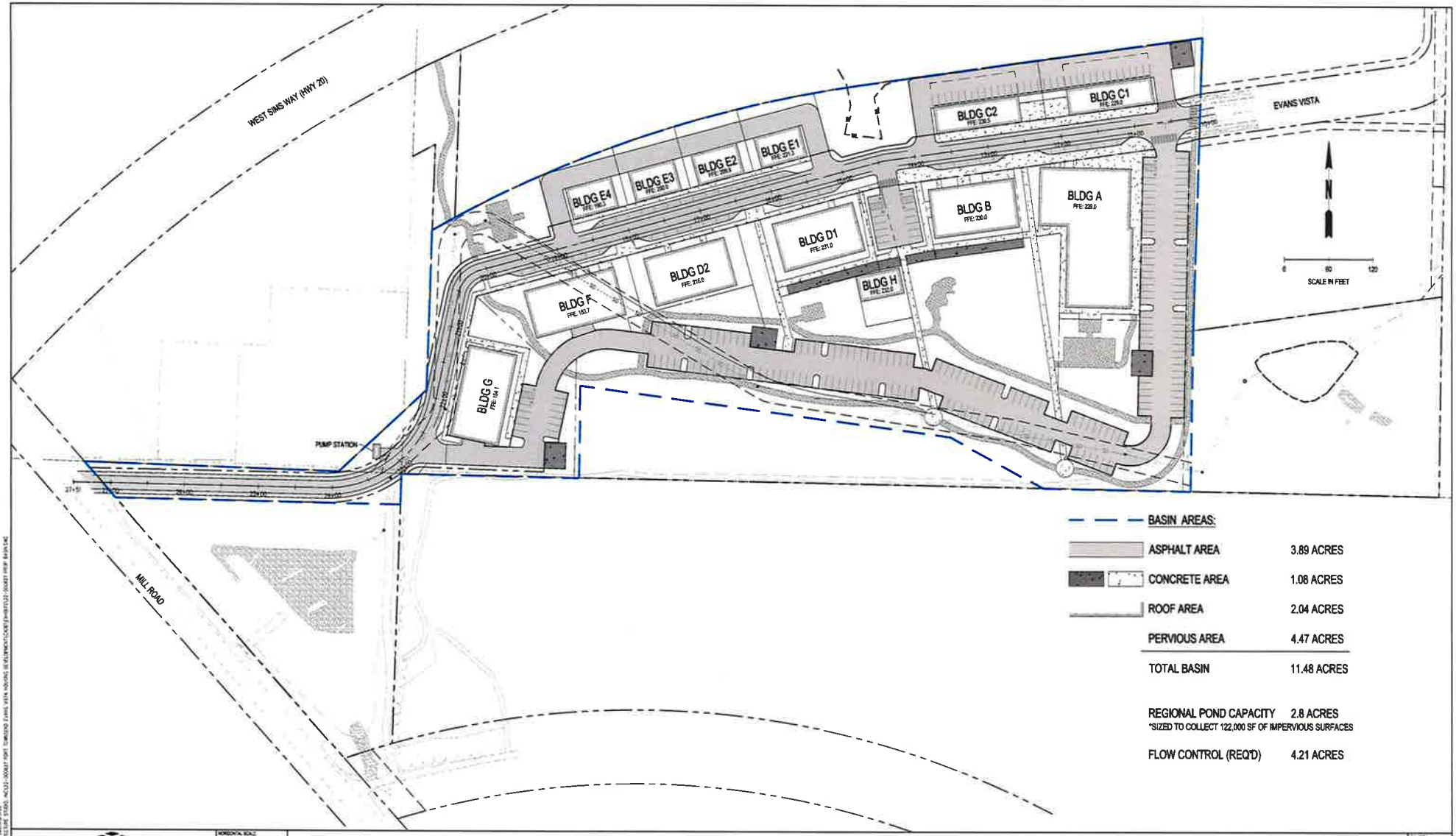
HORIZONTAL SCALE: SEE SCALE BAR
DATE: NOVEMBER 2023
JOB No.: 22-000827
DRAWING FILE No.: 22-000827 EX BASIN.DWG

EXISTING CONDITIONS MAP
EVANS VISTA HOUSING DEVELOPMENT

EXHIBIT No: EX-01
SHEET No: 1



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HORIZONTAL SCALE: SEE SCALE BAR
DATE: NOVEMBER 2023
JOB No.: 22-000827
DRAWING FILE No.: 22-000827 PROP BASIN.DWG

PROPOSED CONDITIONS MAP
EVANS VISTA HOUSING DEVELOPMENT

EXHIBIT No. EX-02
SHEET No. 2

APPENDIX D
FIRM

National Flood Hazard Layer FIRMette

FEMA

Basemap Imagery Source: USGS National Map 2023

Legend

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

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

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

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

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

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

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

N

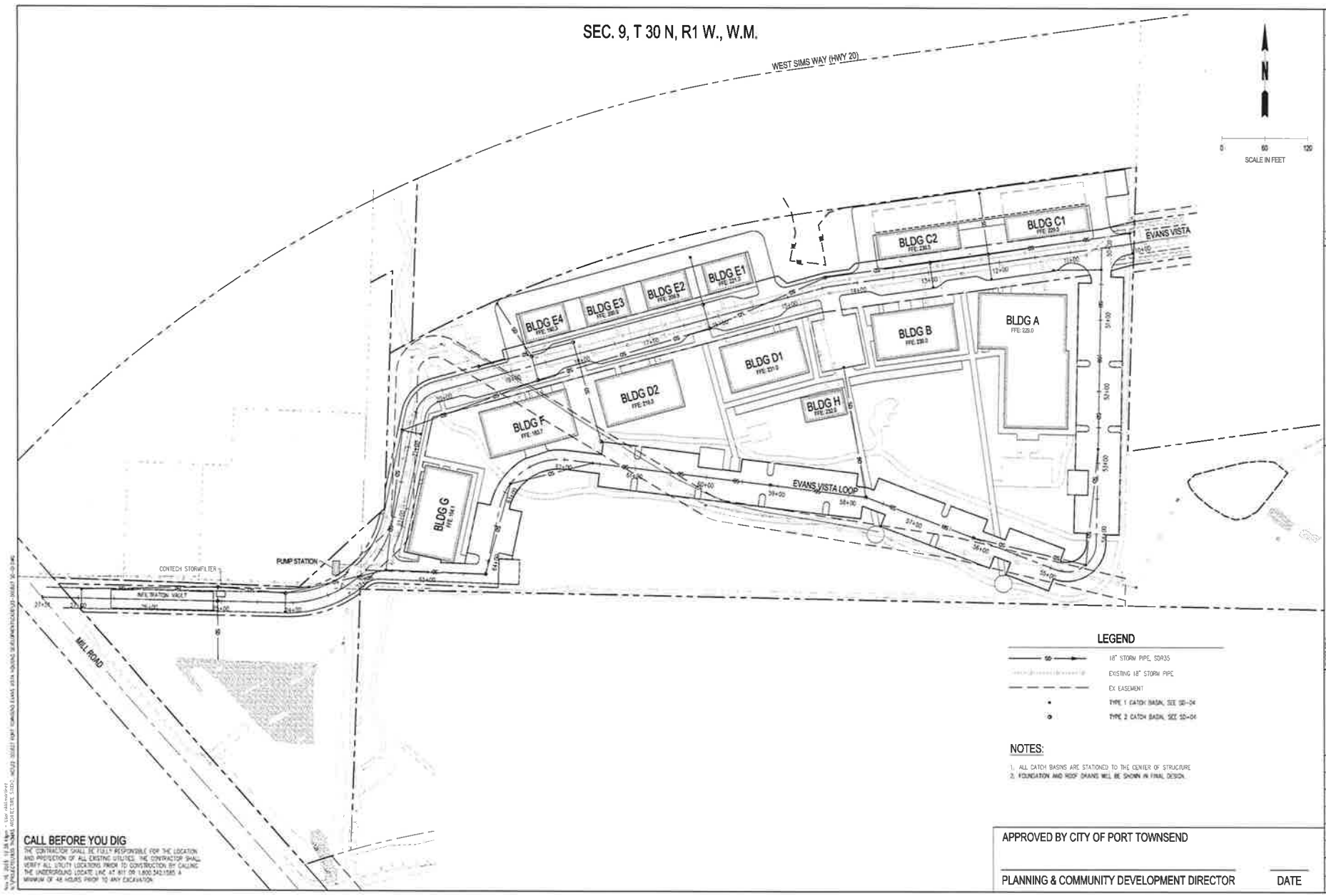
The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 9/21/2023 at 3:57 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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

APPENDIX E
STORMWATER PLANS



CALL BEFORE YOU DIG

THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR THE LOCATION AND PROTECTION OF ALL EXISTING UTILITIES. THE CONTRACTOR SHALL VERIFY ALL UTILITY LOCATIONS PRIOR TO CONSTRUCTION BY CALLING THE UNDERGROUND LOCATE LINE AT 811 OR 1.800.542.1585 A MINIMUM OF 48 HOURS PRIOR TO ANY EXCAVATION.

APPROVED BY CITY OF PORT TOWNSEND

PLANNING & COMMUNITY DEVELOPMENT DIRECTOR — DATE

BY	
DATE	
REVISIONS	

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SHEET TITLE: DRAINAGE PLAN OVERVIEW

PROJECT NAME: EVANS VISTA HOUSING DEVELOPMENT
EVANS VISTA
PORT TOWNSEND

SEAL: WHITNEY G. HOLM, STATE OF WASHINGTON, PROFESSIONAL ENGINEER — 11/20/2023

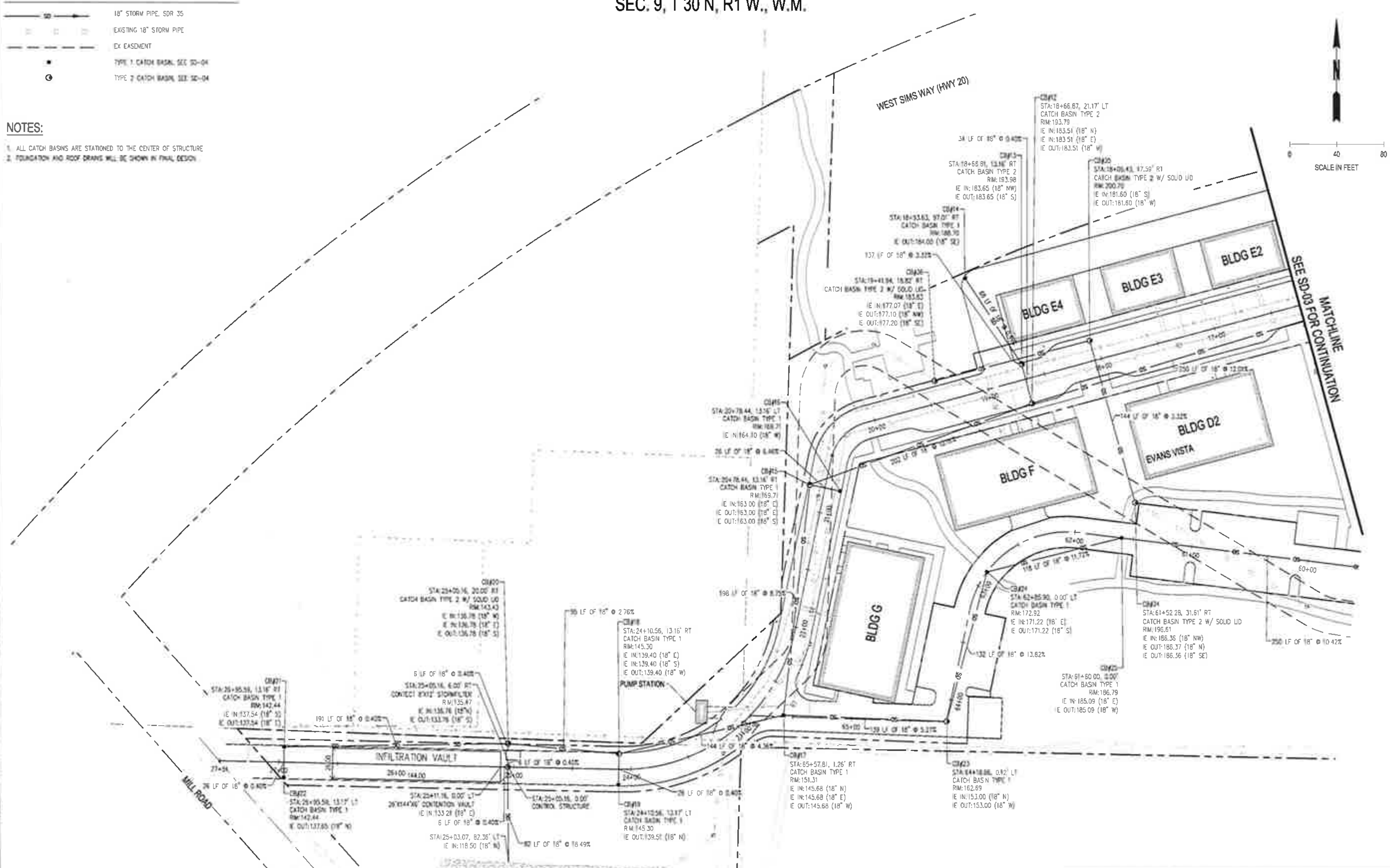
DESIGNER:	R. MARTINEZ
DRAWN BY:	M. LOPEZ
APPROVED BY:	W. HOLM
DATE:	NOVEMBER, 2023
JOB NO:	22-000827
DRAWING FILE NO:	22-000827 SD-01
DRAWING NO:	SD-01
SHEET NO:	19 OF 36

LEGEND

- 18" STORM PIPE, SDR 35
- EXISTING 18" STORM PIPE
- EX EASEMENT
- TYPE 1 CATCH BASIN, SEE SD-04
- TYPE 2 CATCH BASIN, SEE SD-04

NOTES:

1. ALL CATCH BASINS ARE STATIONED TO THE CENTER OF STRUCTURE
2. FOUNDATION AND ROOF DRAINS WILL BE SHOWN IN FINAL DESIGN



CALL BEFORE YOU DIG

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APPROVED BY CITY OF PORT TOWNSEND

PLANNING & COMMUNITY DEVELOPMENT DIRECTOR — DATE

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SHEET TITLE: DRAINAGE PLAN

PROJECT NAME: EVANS VISTA HOUSING DEVELOPMENT
EVANS VISTA
PORT TOWNSEND

DESIGNER:	R. MARTINEZ
DRAWN BY:	M. LOPEZ
APPROVED BY:	W. HOLM
DATE:	NOVEMBER 2021
JOB NO:	22-000827
DRAWING FILE NO:	22-000827 SD-02
DRAWING NO:	SD-02
SHEET NO:	20 OF 36

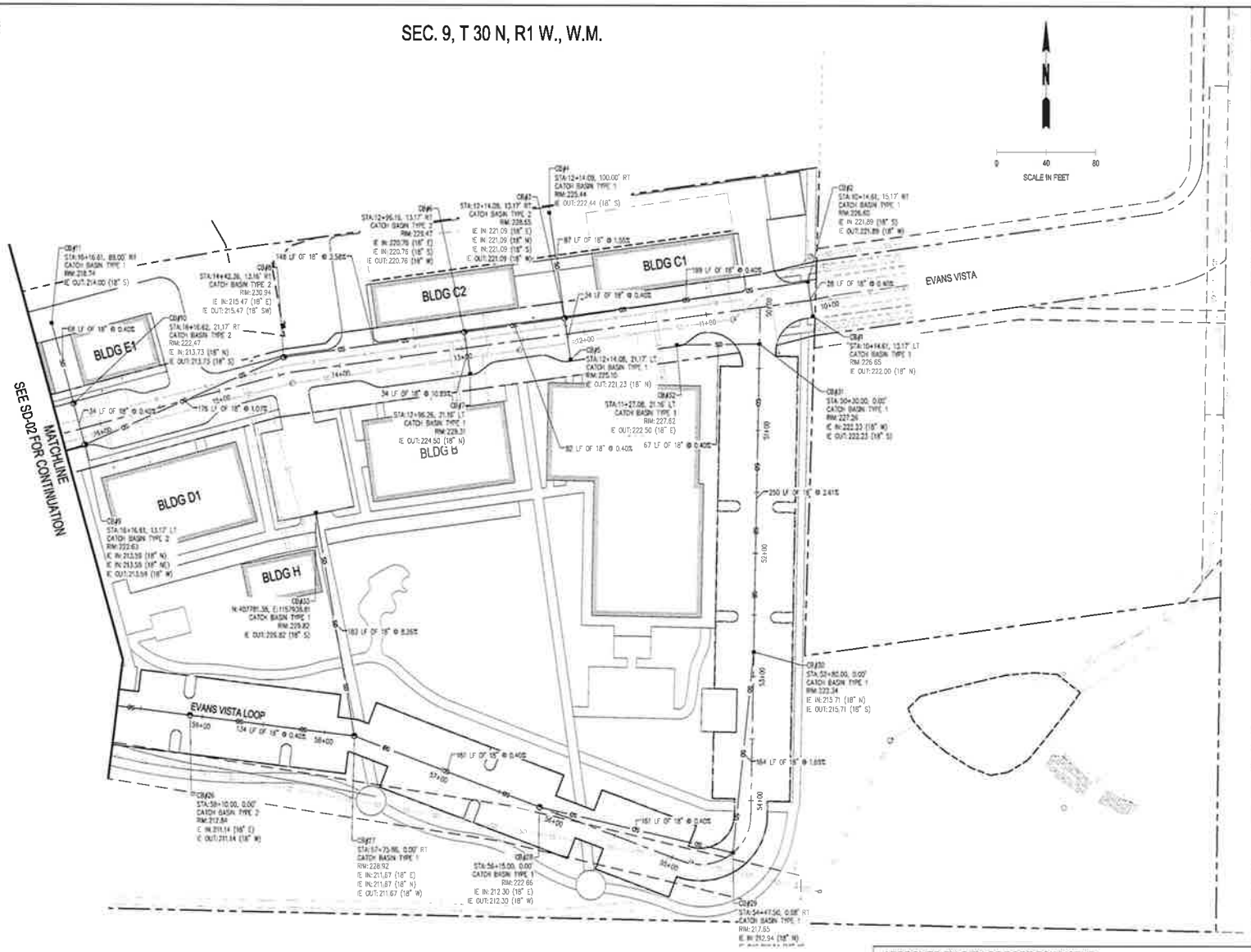
LEGEND

- 8" STORM PIPE, SDR 35
- EXISTING 18" STORM PIPE
- EX EASEMENT
- TYPE 1 CATCH BASIN, SEE SD-04
- TYPE 2 CATCH BASIN, SEE SD-04

NOTES:

1. ALL CATCH BASINS ARE STATIONED TO THE CENTER OF STRUCTURE
2. FOUNDATION AND ROOF DRAINS WILL BE SHOWN IN FINAL DESIGN.

SEC. 9, T 30 N, R1 W., W.M.



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APPROVED BY CITY OF PORT TOWNSEND

PLANNING & COMMUNITY DEVELOPMENT DIRECTOR — DATE

BY	
DATE	
REVISIONS	

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DRAWING TITLE: DRAINAGE PLAN

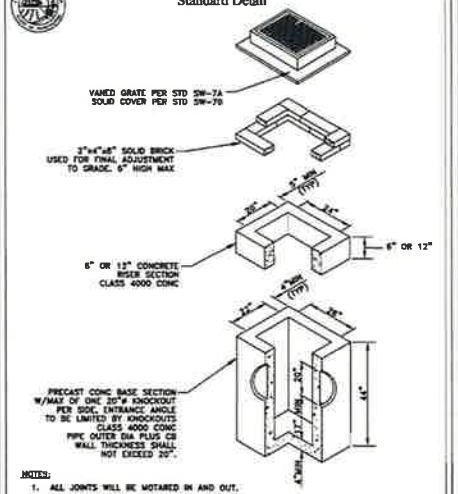
PROJECT TITLE: EVANS VISTA HOUSING DEVELOPMENT
EVANS VISTA
PORT TOWNSEND

SEAL:

11/30/2023

DESIGNER:	R. MARTINEZ
DRAWN BY:	R. MARTINEZ
APPROVED BY:	W. HOLM
DATE:	NOVEMBER, 2023
JOB NO:	22-00827
DRAWING FILE NO:	22-00827 SD-03
DRAWING NO:	SD-03
SHEET NO:	21 OF 36

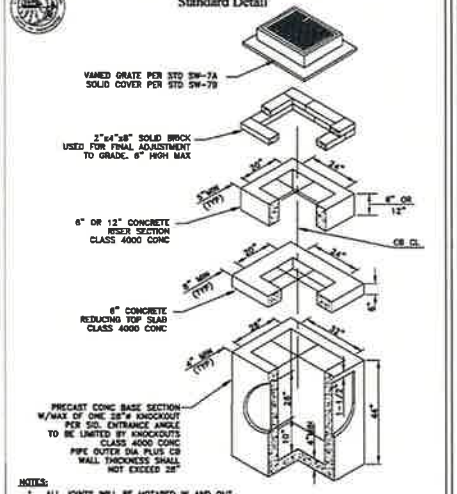
City of Port Townsend - Public Works Department
Standard Detail



NOTES:
1. ALL JOINTS WILL BE MOTARED IN AND OUT.
2. CATCH BASIN TO CONFORM TO WSDOT STANDARD PLAN B-1

Stormwater Catch Basin Type 1	
Detail:	SW-3

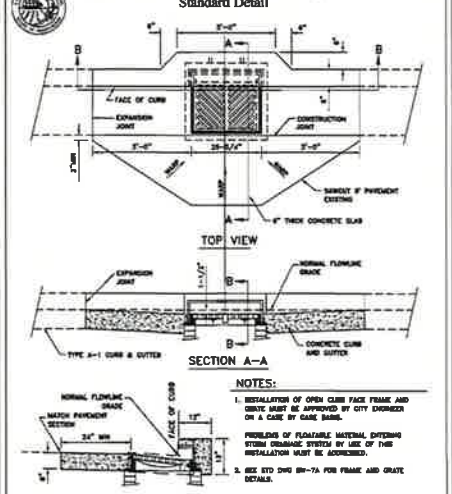
City of Port Townsend - Public Works Department
Standard Detail



NOTES:
1. ALL JOINTS WILL BE MOTARED IN AND OUT.
2. CATCH BASIN TO CONFORM TO WSDOT STANDARD PLAN B-1A

Stormwater Catch Basin Type 2	
Detail:	SW-4A

City of Port Townsend - Public Works Department
Standard Detail



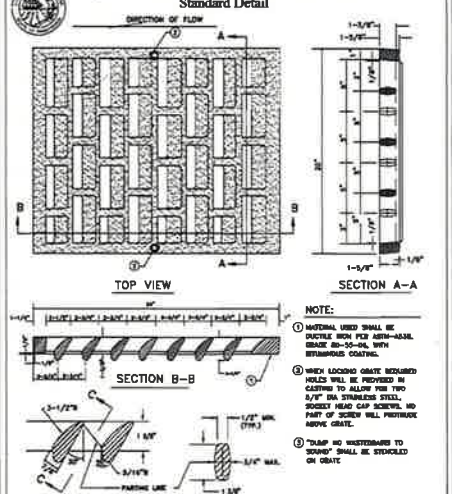
NOTES:
1. INSTALLATION OF OPEN CURB FACE FRAME AND GRATE MUST BE APPROVED BY CITY ENGINEER ON A CASE BY CASE BASIS.

PROBLEMS OF FLOATABLE MATERIAL ENTERING STORM DRAINAGE SYSTEM BY USE OF THIS INSTALLATION MUST BE ADDRESSED.

2. SEE STD DWG SW-7A FOR FRAME AND GRATE DETAILS.

Open Curb Face Frame and Grate Installation	
Detail:	SW-6

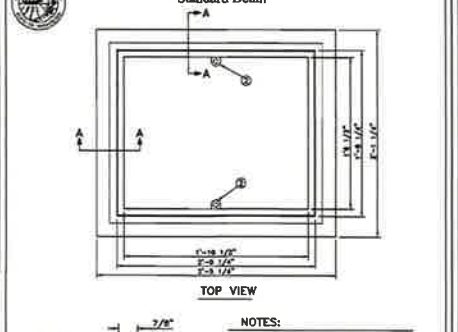
City of Port Townsend - Public Works Department
Standard Detail



NOTE:
1. MATERIAL USED SHALL BE DUCTILE IRON PER ASTM-A536, GRADE 65-45-05, WITH BITUMINOUS COATING.
2. WHEN LOCKING GRATE REQUIRED HOLES WILL BE PROVIDED IN CASTING TO ALLOW FOR TWO 5/8" DIA. STAINLESS STEEL, SOCKET HEAD CAP SCREWS. NO PART OF SCREW WILL PROTRUDE ABOVE GRATE.
3. "DUMP NO OBSTRUCTIONS TO SOUND" SHALL BE STENCILED ON GRATE

Grate Detail For Catch Basin of Inlet	
Detail:	SW-7A

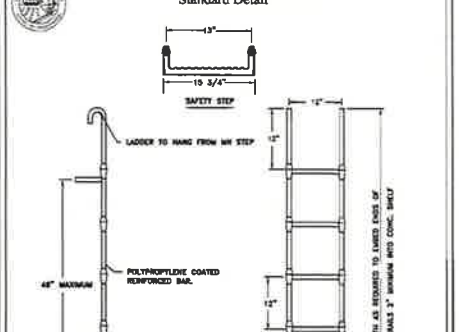
City of Port Townsend - Public Works Department
Standard Detail



NOTES:
1. MATERIAL USED SHALL BE CAST IRON PER ASTM-A48, CLASS 35. FRAME SHALL HAVE A BITUMINOUS COATING APPLIED.
2. WHEN A LOCKING GRATE OR COVER IS REQUIRED THE FRAME SHALL BE FABRICATED SO AS TO ACCEPT TWO (2) 5/8" STAINLESS STEEL SOCKET HEAD CAP SCREWS OF GRATE OR COVER.

Frame for Grate of Solid Cover	
Detail:	SW-7B

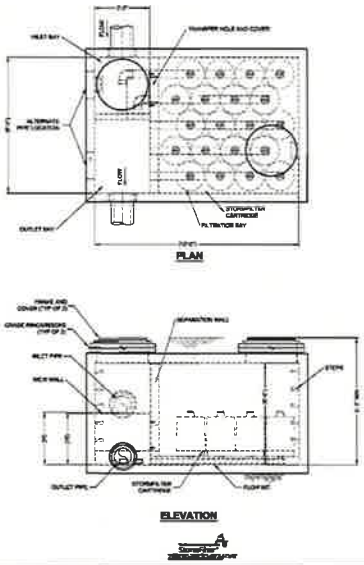
City of Port Townsend - Public Works Department
Standard Detail



NOTES:
1. ALL STEP SHOULD MEET ASTM C-478 AND AASHTO M-199
2. POLYPROPYLENE SHALL CONFORM TO ASTM D-6101.
3. 1/2" GRADE 60 REINFORCING BAR SHALL CONFORM TO ASTM A-615.

RAIL 0.16" ROUND BAR
RUNG 1/2" GRADE 60

Polypropylene Ladder and Maintenance Step	
Detail:	SW-8



STORMFILTER DESIGN NOTES

SITE SPECIFIC DATA REQUIREMENTS

FRAME AND COVER
(DIAMETER VARIES)
NOT TO SCALE

PERFORMANCE SPECIFICATION

INSTALLATION NOTES

CONTECH STORMWATER SOLUTIONS

THE STORMWATER MANAGEMENT STORMFILTER
8' x 12' PEAK DIVERSION STORMFILTER
STANDARD DETAIL

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DRAINAGE DETAILS

EVANS VISTA HOUSING DEVELOPMENT
EVANS VISTA
PORT TOWNSEND

WHITNEY G. HOLM
STATE OF WASHINGTON
REGISTERED
PROFESSIONAL ENGINEER
11/30/2023

DESIGNER: R. MARTINEZ
DRAWN BY: M. LOPEZ
APPROVED BY: W. HOLM
DATE: NOVEMBER, 2023
JOB NO.: 23-008827
DRAWING FILE NO.: 23-008827 SD-04
DRAWING NO.: SD-04
SHEET NO.: 22 OF 36

APPENDIX F

DESIGN CALCUALTIONS & COMPUTATIONS

WWHM2012

PROJECT REPORT

General Model Information

WWHM2012 Project Name: 22-000827_Evans Vista WWHM Model_Flow Control_V2

Site Name:	Evans Vista
Site Address:	
City:	Port Townsend
Report Date:	11/9/2023
Gage:	Port Angeles
Data Start:	1948/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	0.800
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
SAT, Forest, Steep	8.68
Pervious Total	8.68
Impervious Land Use	acre
Impervious Total	0
Basin Total	8.68

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
SAT, Forest, Steep	4.47
Pervious Total	4.47
Impervious Land Use	acre
ROADS MOD	4.21
Impervious Total	4.21
Basin Total	8.68

Routing Elements
Predeveloped Routing

Mitigated Routing

Vault_1

Width:	61 ft.
Length:	61 ft.
Depth:	6 ft.

minimum vault size

Infiltration On	
Infiltration rate:	3
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft.):	312.941
Total Volume Through Riser (ac-ft.):	1.148
Total Volume Through Facility (ac-ft.):	314.089
Percent Infiltrated:	99.63
Total Precip Applied to Facility:	0
Total Evap From Facility:	0
Discharge Structure	
Riser Height:	5 ft.
Riser Diameter:	18 in.
Notch Type:	Rectangular
Notch Width:	0.010 ft.
Notch Height:	1.139 ft.
Orifice 1 Diameter:	0.247 in. Elevation:0 ft.
Element Flows To:	
Outlet 1	Outlet 2

Vault Hydraulic Table

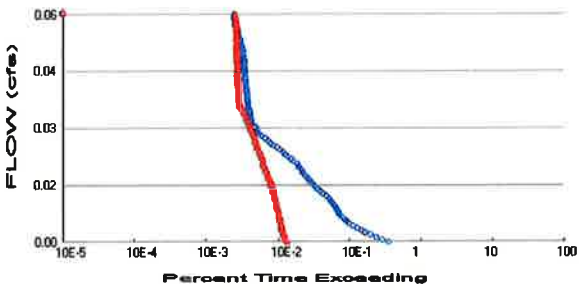
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.085	0.000	0.000	0.000
0.0667	0.085	0.005	0.000	0.258
0.1333	0.085	0.011	0.000	0.258
0.2000	0.085	0.017	0.000	0.258
0.2667	0.085	0.022	0.000	0.258
0.3333	0.085	0.028	0.001	0.258
0.4000	0.085	0.034	0.001	0.258
0.4667	0.085	0.039	0.001	0.258
0.5333	0.085	0.045	0.001	0.258
0.6000	0.085	0.051	0.001	0.258
0.6667	0.085	0.056	0.001	0.258
0.7333	0.085	0.062	0.001	0.258
0.8000	0.085	0.068	0.001	0.258
0.8667	0.085	0.074	0.001	0.258
0.9333	0.085	0.079	0.001	0.258
1.0000	0.085	0.085	0.001	0.258
1.0667	0.085	0.091	0.001	0.258
1.1333	0.085	0.096	0.001	0.258
1.2000	0.085	0.102	0.001	0.258
1.2667	0.085	0.108	0.001	0.258
1.3333	0.085	0.113	0.001	0.258
1.4000	0.085	0.119	0.002	0.258
1.4667	0.085	0.125	0.002	0.258
1.5333	0.085	0.131	0.002	0.258
1.6000	0.085	0.136	0.002	0.258
1.6667	0.085	0.142	0.002	0.258
1.7333	0.085	0.148	0.002	0.258
1.8000	0.085	0.153	0.002	0.258

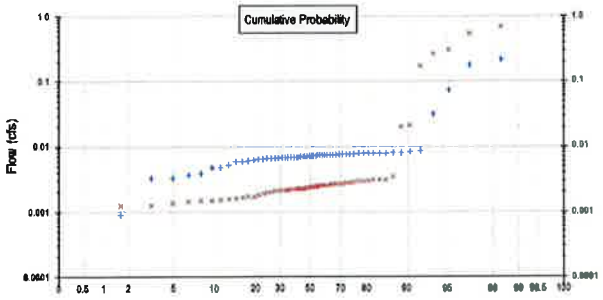
1.8667	0.085	0.159	0.002	0.258
1.9333	0.085	0.165	0.002	0.258
2.0000	0.085	0.170	0.002	0.258
2.0667	0.085	0.176	0.002	0.258
2.1333	0.085	0.182	0.002	0.258
2.2000	0.085	0.187	0.002	0.258
2.2667	0.085	0.193	0.002	0.258
2.3333	0.085	0.199	0.002	0.258
2.4000	0.085	0.205	0.002	0.258
2.4667	0.085	0.210	0.002	0.258
2.5333	0.085	0.216	0.002	0.258
2.6000	0.085	0.222	0.002	0.258
2.6667	0.085	0.227	0.002	0.258
2.7333	0.085	0.233	0.002	0.258
2.8000	0.085	0.239	0.002	0.258
2.8667	0.085	0.244	0.002	0.258
2.9333	0.085	0.250	0.002	0.258
3.0000	0.085	0.256	0.002	0.258
3.0667	0.085	0.262	0.002	0.258
3.1333	0.085	0.267	0.002	0.258
3.2000	0.085	0.273	0.003	0.258
3.2667	0.085	0.279	0.003	0.258
3.3333	0.085	0.284	0.003	0.258
3.4000	0.085	0.290	0.003	0.258
3.4667	0.085	0.296	0.003	0.258
3.5333	0.085	0.301	0.003	0.258
3.6000	0.085	0.307	0.003	0.258
3.6667	0.085	0.313	0.003	0.258
3.7333	0.085	0.318	0.003	0.258
3.8000	0.085	0.324	0.003	0.258
3.8667	0.085	0.330	0.003	0.258
3.9333	0.085	0.336	0.003	0.258
4.0000	0.085	0.341	0.005	0.258
4.0667	0.085	0.347	0.006	0.258
4.1333	0.085	0.353	0.007	0.258
4.2000	0.085	0.358	0.009	0.258
4.2667	0.085	0.364	0.011	0.258
4.3333	0.085	0.370	0.013	0.258
4.4000	0.085	0.375	0.015	0.258
4.4667	0.085	0.381	0.017	0.258
4.5333	0.085	0.387	0.019	0.258
4.6000	0.085	0.392	0.021	0.258
4.6667	0.085	0.398	0.023	0.258
4.7333	0.085	0.404	0.026	0.258
4.8000	0.085	0.410	0.028	0.258
4.8667	0.085	0.415	0.030	0.258
4.9333	0.085	0.421	0.033	0.258
5.0000	0.085	0.427	0.036	0.258
5.0667	0.085	0.432	0.309	0.258
5.1333	0.085	0.438	0.807	0.258
5.2000	0.085	0.444	1.440	0.258
5.2667	0.085	0.449	2.160	0.258
5.3333	0.085	0.455	2.918	0.258
5.4000	0.085	0.461	3.668	0.258
5.4667	0.085	0.467	4.362	0.258
5.5333	0.085	0.472	4.960	0.258
5.6000	0.085	0.478	5.437	0.258
5.6667	0.085	0.484	5.790	0.258

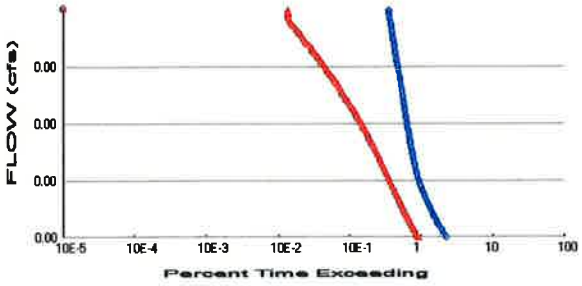
5.7333	0.085	0.489	6.050	0.258
5.8000	0.085	0.495	6.374	0.258
5.8667	0.085	0.501	6.633	0.258
5.9333	0.085	0.506	6.882	0.258
6.0000	0.085	0.512	7.123	0.258
6.0667	0.085	0.518	7.355	0.258
6.1333	0.000	0.000	7.580	0.000

Analysis Results

POC 1







\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 8.68
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 4.47
Total Impervious Area: 4.21

Flow Frequency Method: Log Pearson Type III 17B

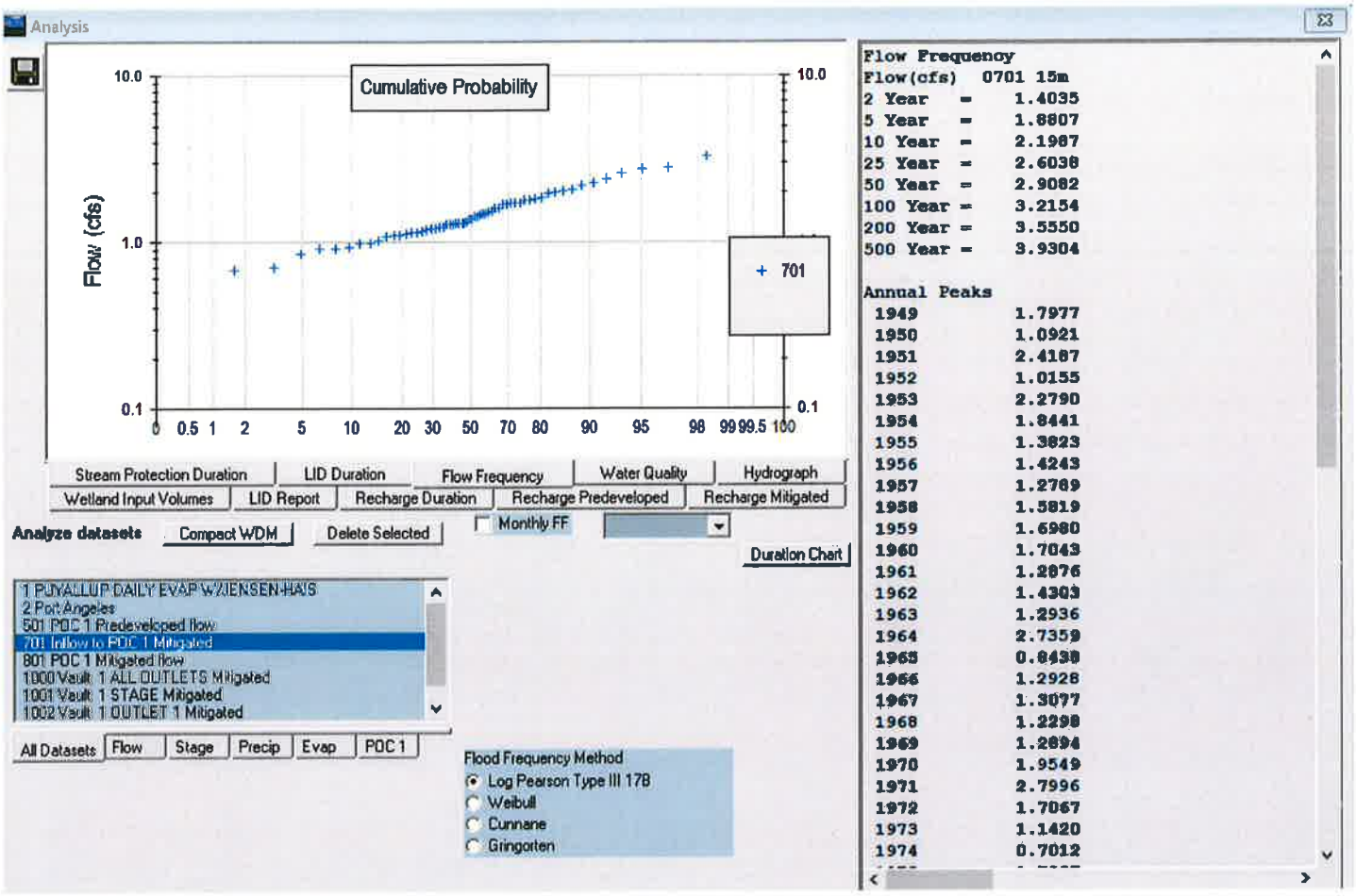
Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.006691
5 year	0.014474
10 year	0.022983
25 year	0.039428
50 year	0.057359
100 year	0.081812

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.002889
5 year	0.011086
10 year	0.025193
25 year	0.066361
50 year	0.130759
100 year	0.249484

Annual Peaks




```
Flow Frequency
Flow(cfs)  0701 15m
2 Year   =    1.4035
5 Year   =    1.8807
10 Year  =    2.1987
25 Year  =    2.6038
50 Year  =    2.9082
100 Year =    3.2154
200 Year =    3.5550
500 Year =    3.9304

Annual Peaks
 1949         1.7977
 1950         1.0921
 1951         2.4187
 1952         1.0155
 1953         2.2790
 1954         1.8441
 1955         1.3823
 1956         1.4243
 1957         1.2769
 1958         1.5819
 1959         1.6980
 1960         1.7043
 1961         1.2876
 1962         1.4303
 1963         1.2936
 1964         2.7359
 1965         0.8438
 1966         1.2928
 1967         1.3077
 1968         1.2298
 1969         1.2894
 1970         1.9549
 1971         2.7996
 1972         1.7067
 1973         1.1420
 1974         0.7012
```

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1949	0.007	0.263
1950	0.008	0.003
1951	0.007	0.002
1952	0.005	0.001
1953	0.007	0.002
1954	0.074	0.003
1955	0.008	0.021
1956	0.007	0.003
1957	0.007	0.003
1958	0.006	0.002
1959	0.008	0.003
1960	0.007	0.003
1961	0.008	0.020
1962	0.007	0.001
1963	0.006	0.002
1964	0.007	0.003
1965	0.007	0.002
1966	0.007	0.002
1967	0.008	0.003
1968	0.007	0.002
1969	0.007	0.001
1970	0.006	0.002
1971	0.007	0.002
1972	0.007	0.003
1973	0.005	0.002
1974	0.006	0.001
1975	0.007	0.002
1976	0.008	0.002
1977	0.001	0.002
1978	0.003	0.002
1979	0.003	0.540
1980	0.008	0.003
1981	0.008	0.173
1982	0.032	0.002
1983	0.008	0.003
1984	0.007	0.001
1985	0.007	0.003
1986	0.007	0.695
1987	0.007	0.002
1988	0.007	0.002
1989	0.007	0.002
1990	0.008	0.002
1991	0.176	0.002
1992	0.008	0.003
1993	0.005	0.002
1994	0.001	0.002
1995	0.006	0.001
1996	0.008	0.001
1997	0.008	0.002
1998	0.004	0.002
1999	0.217	0.305
2000	0.007	0.002
2001	0.004	0.002
2002	0.009	0.002
2003	0.007	0.002
2004	0.007	0.003

2005	0.008	0.002
2006	0.007	0.003
2007	0.007	0.003
2008	0.007	0.003
2009	0.007	0.002

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.2173	0.6953
2	0.1758	0.5402
3	0.0740	0.3052
4	0.0316	0.2631
5	0.0086	0.1727
6	0.0084	0.0213
7	0.0080	0.0201
8	0.0080	0.0034
9	0.0079	0.0031
10	0.0079	0.0031
11	0.0078	0.0031
12	0.0078	0.0030
13	0.0078	0.0030
14	0.0078	0.0030
15	0.0077	0.0028
16	0.0077	0.0028
17	0.0077	0.0027
18	0.0076	0.0027
19	0.0076	0.0027
20	0.0075	0.0027
21	0.0075	0.0026
22	0.0074	0.0026
23	0.0073	0.0025
24	0.0073	0.0025
25	0.0073	0.0025
26	0.0073	0.0025
27	0.0073	0.0024
28	0.0073	0.0024
29	0.0073	0.0024
30	0.0072	0.0024
31	0.0071	0.0023
32	0.0071	0.0023
33	0.0070	0.0023
34	0.0070	0.0023
35	0.0070	0.0022
36	0.0069	0.0022
37	0.0068	0.0022
38	0.0068	0.0022
39	0.0068	0.0022
40	0.0068	0.0021
41	0.0068	0.0021
42	0.0067	0.0021
43	0.0067	0.0021
44	0.0066	0.0021
45	0.0066	0.0020
46	0.0066	0.0020
47	0.0065	0.0019
48	0.0064	0.0018
49	0.0063	0.0017

50	0.0062	0.0017
51	0.0059	0.0017
52	0.0059	0.0016
53	0.0053	0.0015
54	0.0049	0.0015
55	0.0047	0.0015
56	0.0039	0.0015
57	0.0036	0.0014
58	0.0033	0.0013
59	0.0033	0.0012
60	0.0009	0.0012
61	0.0005	0.0009

LID Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0005	48553	19235	39	Pass
0.0006	46157	18514	40	Pass
0.0006	43868	17828	40	Pass
0.0006	41901	17156	40	Pass
0.0006	40083	16484	41	Pass
0.0007	38243	15843	41	Pass
0.0007	36703	15291	41	Pass
0.0007	35249	14726	41	Pass
0.0008	33837	14153	41	Pass
0.0008	32511	13620	41	Pass
0.0008	31292	13105	41	Pass
0.0008	30158	12609	41	Pass
0.0009	29153	12168	41	Pass
0.0009	28126	11749	41	Pass
0.0009	27185	11342	41	Pass
0.0010	26244	10930	41	Pass
0.0010	25389	10530	41	Pass
0.0010	24661	10183	41	Pass
0.0010	23827	9805	41	Pass
0.0011	23121	9462	40	Pass
0.0011	22415	9120	40	Pass
0.0011	21731	8816	40	Pass
0.0012	21104	8513	40	Pass
0.0012	20497	8228	40	Pass
0.0012	19960	7963	39	Pass
0.0012	19492	7709	39	Pass
0.0013	19060	7439	39	Pass
0.0013	18677	7159	38	Pass
0.0013	18324	6909	37	Pass
0.0014	18009	6678	37	Pass
0.0014	17714	6479	36	Pass
0.0014	17421	6252	35	Pass
0.0014	17150	6036	35	Pass
0.0015	16869	5833	34	Pass
0.0015	16615	5636	33	Pass
0.0015	16362	5454	33	Pass
0.0016	16108	5266	32	Pass
0.0016	15883	5080	31	Pass
0.0016	15657	4904	31	Pass
0.0016	15426	4729	30	Pass
0.0017	15212	4545	29	Pass
0.0017	14991	4344	28	Pass
0.0017	14784	4171	28	Pass
0.0018	14609	4028	27	Pass
0.0018	14427	3874	26	Pass
0.0018	14243	3728	26	Pass
0.0018	14061	3574	25	Pass
0.0019	13892	3456	24	Pass
0.0019	13714	3309	24	Pass
0.0019	13546	3157	23	Pass
0.0020	13387	3022	22	Pass
0.0020	13235	2907	21	Pass
0.0020	13084	2787	21	Pass

0.0020	12930	2676	20	Pass
0.0021	12767	2571	20	Pass
0.0021	12611	2447	19	Pass
0.0021	12457	2344	18	Pass
0.0022	12320	2218	18	Pass
0.0022	12170	2115	17	Pass
0.0022	12025	2015	16	Pass
0.0022	11877	1915	16	Pass
0.0023	11730	1825	15	Pass
0.0023	11580	1743	15	Pass
0.0023	11439	1665	14	Pass
0.0024	11304	1592	14	Pass
0.0024	11163	1526	13	Pass
0.0024	11017	1458	13	Pass
0.0024	10876	1386	12	Pass
0.0025	10739	1307	12	Pass
0.0025	10622	1253	11	Pass
0.0025	10500	1188	11	Pass
0.0026	10359	1117	10	Pass
0.0026	10220	1051	10	Pass
0.0026	10087	1000	9	Pass
0.0026	9959	961	9	Pass
0.0027	9826	908	9	Pass
0.0027	9706	863	8	Pass
0.0027	9580	816	8	Pass
0.0027	9471	774	8	Pass
0.0028	9353	731	7	Pass
0.0028	9244	694	7	Pass
0.0028	9124	654	7	Pass
0.0029	9013	624	6	Pass
0.0029	8908	593	6	Pass
0.0029	8797	550	6	Pass
0.0029	8680	510	5	Pass
0.0030	8590	483	5	Pass
0.0030	8493	466	5	Pass
0.0030	8389	444	5	Pass
0.0031	8299	417	5	Pass
0.0031	8209	395	4	Pass
0.0031	8119	366	4	Pass
0.0031	8021	337	4	Pass
0.0032	7922	319	4	Pass
0.0032	7811	308	3	Pass
0.0032	7715	297	3	Pass
0.0033	7623	287	3	Pass
0.0033	7542	286	3	Pass
0.0033	7465	286	3	Pass
0.0033	7379	283	3	Pass

Duration Flows

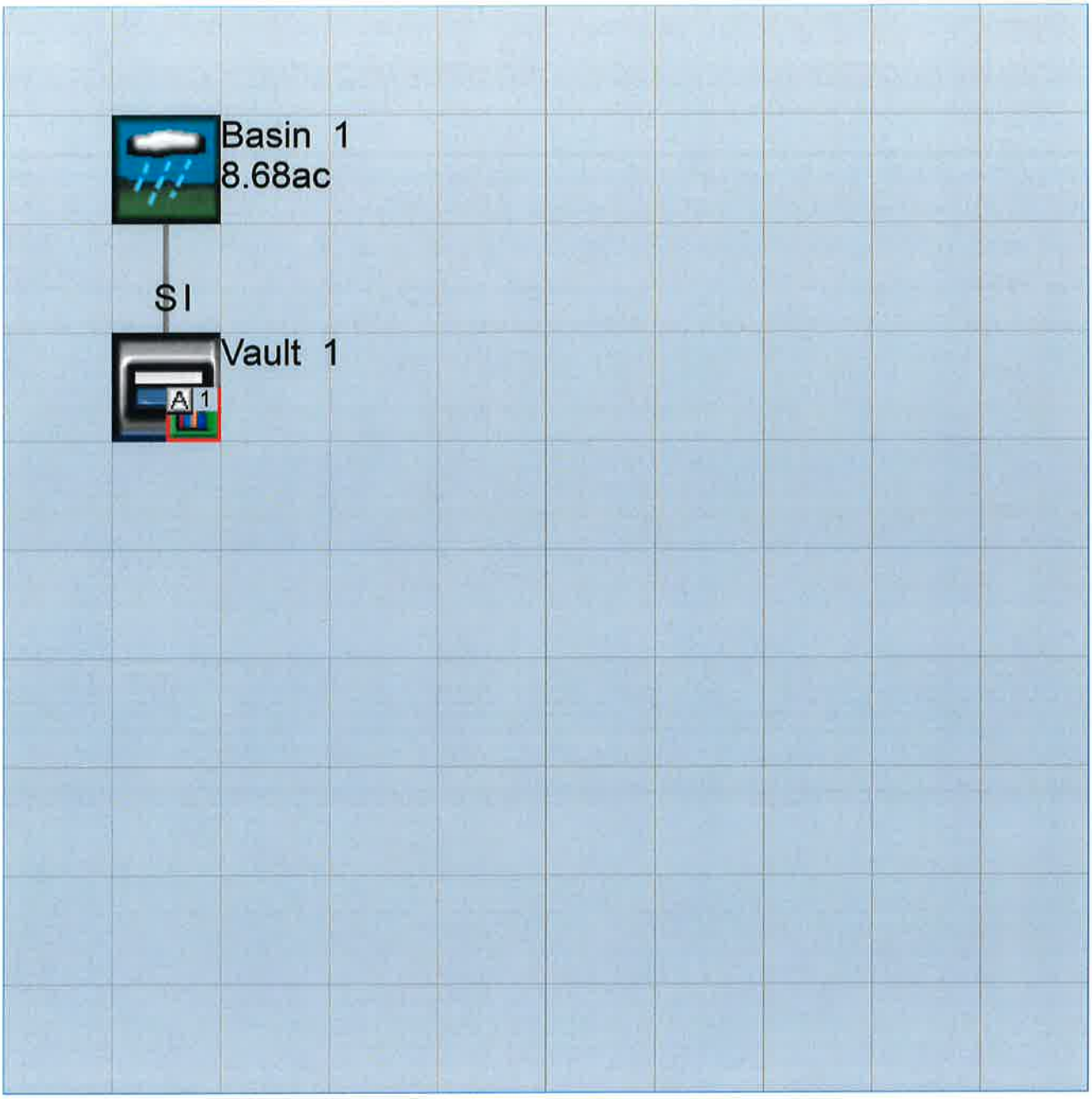
The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0033	7379	283	3	Pass
0.0039	6010	269	4	Pass
0.0044	5024	262	5	Pass
0.0050	4169	257	6	Pass
0.0055	3523	249	7	Pass
0.0061	3076	245	7	Pass
0.0066	2693	239	8	Pass
0.0072	2344	236	10	Pass
0.0077	2082	233	11	Pass
0.0083	1910	228	11	Pass
0.0088	1774	225	12	Pass
0.0093	1634	222	13	Pass
0.0099	1521	216	14	Pass
0.0104	1457	214	14	Pass
0.0110	1404	212	15	Pass
0.0115	1349	205	15	Pass
0.0121	1287	202	15	Pass
0.0126	1209	199	16	Pass
0.0132	1136	197	17	Pass
0.0137	1072	191	17	Pass
0.0143	993	188	18	Pass
0.0148	896	184	20	Pass
0.0153	818	180	22	Pass
0.0159	749	178	23	Pass
0.0164	691	176	25	Pass
0.0170	654	170	25	Pass
0.0175	613	169	27	Pass
0.0181	571	165	28	Pass
0.0186	541	158	29	Pass
0.0192	506	155	30	Pass
0.0197	475	152	32	Pass
0.0203	450	143	31	Pass
0.0208	426	140	32	Pass
0.0214	405	137	33	Pass
0.0219	388	133	34	Pass
0.0224	346	131	37	Pass
0.0230	325	130	40	Pass
0.0235	289	127	43	Pass
0.0241	265	123	46	Pass
0.0246	247	120	48	Pass
0.0252	228	117	51	Pass
0.0257	206	110	53	Pass
0.0263	182	109	59	Pass
0.0268	168	107	63	Pass
0.0274	154	104	67	Pass
0.0279	142	101	71	Pass
0.0284	126	99	78	Pass
0.0290	115	97	84	Pass
0.0295	109	95	87	Pass
0.0301	108	89	82	Pass
0.0306	103	88	85	Pass
0.0312	93	86	92	Pass
0.0317	91	85	93	Pass

0.0323	90	81	90	Pass
0.0328	89	79	88	Pass
0.0334	88	77	87	Pass
0.0339	87	73	83	Pass
0.0344	86	72	83	Pass
0.0350	84	69	82	Pass
0.0355	82	63	76	Pass
0.0361	82	63	76	Pass
0.0366	81	63	77	Pass
0.0372	81	62	76	Pass
0.0377	80	61	76	Pass
0.0383	80	61	76	Pass
0.0388	79	61	77	Pass
0.0394	79	61	77	Pass
0.0399	78	61	78	Pass
0.0404	77	61	79	Pass
0.0410	77	60	77	Pass
0.0415	76	60	78	Pass
0.0421	76	60	78	Pass
0.0426	75	60	80	Pass
0.0432	74	59	79	Pass
0.0437	73	59	80	Pass
0.0443	73	59	80	Pass
0.0448	73	59	80	Pass
0.0454	73	59	80	Pass
0.0459	73	59	80	Pass
0.0464	73	58	79	Pass
0.0470	72	58	80	Pass
0.0475	70	58	82	Pass
0.0481	70	57	81	Pass
0.0486	70	57	81	Pass
0.0492	69	57	82	Pass
0.0497	67	57	85	Pass
0.0503	66	57	86	Pass
0.0508	64	57	89	Pass
0.0514	63	57	90	Pass
0.0519	60	57	95	Pass
0.0524	59	57	96	Pass
0.0530	59	57	96	Pass
0.0535	59	57	96	Pass
0.0541	58	57	98	Pass
0.0546	55	57	103	Pass
0.0552	55	57	103	Pass
0.0557	55	56	101	Pass
0.0563	54	55	101	Pass
0.0568	54	55	101	Pass
0.0574	54	55	101	Pass

Appendix
Predeveloped Schematic

Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01         END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   22-000827_Evans Vista WWHM Model_Flow Control_V2.wdm
MESSU       25   Pre22-000827_Evans Vista WWHM Model_Flow Control_V2.MES
            27   Pre22-000827_Evans Vista WWHM Model_Flow Control_V2.L61
            28   Pre22-000827_Evans Vista WWHM Model_Flow Control_V2.L62
            30   POC22-000827_Evans Vista WWHM Model_Flow Control_V21.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:15
      PERLND      21
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  1                   MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1          1    1
  501          1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #          K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                        in  out           ***
   21     SAT, Forest, Steep      1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   21         0    0    1    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   21         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO
```

```
  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   21         0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2          ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR      KVARY      AGWRC
   21              0         4         2       100       0.1        0.5      0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3          ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   21              0         0        10         2         0         0       0.7
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   21          0.2         3       0.5         1       0.7       0.8
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS       GWVS
   21              0         0         0         0       4.2         1          0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                  in  out           ***
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2          ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3          ***
    # -  # ***PETMAX    PETMIN
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
  END IWAT-STATE1
```

```
END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  21                       8.68     COPY   501     12
PERLND  21                       8.68     COPY   501     13

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                       in  out                              ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                  ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN      DELTH     STCOR        KS       DB50       ***
  <------><--------><--------><--------><--------><--------><--------><------>  ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                     ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    0.8            PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    0.8            IMPLND   1 999 EXTNL  PREC
```

```
WDM      1 EVAP     ENGL    0.76           PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76           IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    501 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   22-000827_Evans Vista WWHM Model_Flow Control_V2.wdm
MESSU       25   Mit22-000827_Evans Vista WWHM Model_Flow Control_V2.MES
            27   Mit22-000827_Evans Vista WWHM Model_Flow Control_V2.L61
            28   Mit22-000827_Evans Vista WWHM Model_Flow Control_V2.L62
            30   POC22-000827_Evans Vista WWHM Model_Flow Control_V21.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:15
      PERLND       21
      IMPLND        2
      RCHRES        1
      COPY          1
      COPY        501
      DISPLY        1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Vault  1                   MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1          1    1
  501          1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #          K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                        in  out              ***
   21     SAT, Forest, Steep      1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   21         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
```

```
 21          0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
 21          0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR      SLSUR      KVARY      AGWRC
 21               0         4         2       100        0.1        0.5      0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
 21               0         0        10         2         0         0       0.7
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
 21            0.2         3       0.5         1       0.7       0.8
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS       GWVS
 21               0         0         0         0       4.2         1          0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
    2      ROADS/MOD              1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    2          0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    2          0    0    4    0    0    4    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    2          0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    2           400      0.05       0.1      0.08
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
```

```
    # -  # ***PETMAX    PETMIN
    2              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    2              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  21                       4.47     RCHRES   1      2
PERLND  21                       4.47     RCHRES   1      3
IMPLND   2                       4.21     RCHRES   1      5

******Routing******
PERLND  21                       4.47     COPY     1     12
IMPLND   2                       4.21     COPY     1     15
PERLND  21                       4.47     COPY     1     13
RCHRES   1                          1     COPY   501     17
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1


<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                       in  out                              ***
    1     Vault  1                2    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                  ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *      *  *  *  *  *        ***
    1        0  1  0  0    4  5  0  0  0      0  0  0  0  0        2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN      DELTH     STCOR       KS       DB50       ***
    <------><--------><--------><--------><--------><--------><--------->      ***
```

```
    1              1      0.01       0.0       0.0       0.5       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                   ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
         *** ac-ft     for each possible exit       for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1          0          4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      1
   92    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)     (cfs)     (cfs)  (ft/sec)    (Minutes)***
  0.000000  0.085422  0.000000  0.000000  0.000000
  0.066667  0.085422  0.005695  0.000427  0.258403
  0.133333  0.085422  0.011390  0.000605  0.258403
  0.200000  0.085422  0.017084  0.000740  0.258403
  0.266667  0.085422  0.022779  0.000855  0.258403
  0.333333  0.085422  0.028474  0.000956  0.258403
  0.400000  0.085422  0.034169  0.001047  0.258403
  0.466667  0.085422  0.039864  0.001131  0.258403
  0.533333  0.085422  0.045559  0.001209  0.258403
  0.600000  0.085422  0.051253  0.001282  0.258403
  0.666667  0.085422  0.056948  0.001352  0.258403
  0.733333  0.085422  0.062643  0.001418  0.258403
  0.800000  0.085422  0.068338  0.001481  0.258403
  0.866667  0.085422  0.074033  0.001541  0.258403
  0.933333  0.085422  0.079728  0.001599  0.258403
  1.000000  0.085422  0.085422  0.001656  0.258403
  1.066667  0.085422  0.091117  0.001710  0.258403
  1.133333  0.085422  0.096812  0.001763  0.258403
  1.200000  0.085422  0.102507  0.001814  0.258403
  1.266667  0.085422  0.108202  0.001863  0.258403
  1.333333  0.085422  0.113897  0.001912  0.258403
  1.400000  0.085422  0.119591  0.001959  0.258403
  1.466667  0.085422  0.125286  0.002005  0.258403
  1.533333  0.085422  0.130981  0.002050  0.258403
  1.600000  0.085422  0.136676  0.002094  0.258403
  1.666667  0.085422  0.142371  0.002137  0.258403
  1.733333  0.085422  0.148066  0.002180  0.258403
  1.800000  0.085422  0.153760  0.002221  0.258403
  1.866667  0.085422  0.159455  0.002262  0.258403
  1.933333  0.085422  0.165150  0.002302  0.258403
  2.000000  0.085422  0.170845  0.002341  0.258403
  2.066667  0.085422  0.176540  0.002380  0.258403
  2.133333  0.085422  0.182234  0.002418  0.258403
  2.200000  0.085422  0.187929  0.002456  0.258403
  2.266667  0.085422  0.193624  0.002493  0.258403
  2.333333  0.085422  0.199319  0.002529  0.258403
  2.400000  0.085422  0.205014  0.002565  0.258403
  2.466667  0.085422  0.210709  0.002600  0.258403
  2.533333  0.085422  0.216403  0.002635  0.258403
  2.600000  0.085422  0.222098  0.002670  0.258403
  2.666667  0.085422  0.227793  0.002704  0.258403
  2.733333  0.085422  0.233488  0.002737  0.258403
  2.800000  0.085422  0.239183  0.002770  0.258403
  2.866667  0.085422  0.244878  0.002803  0.258403
  2.933333  0.085422  0.250572  0.002836  0.258403
  3.000000  0.085422  0.256267  0.002868  0.258403
  3.066667  0.085422  0.261962  0.002899  0.258403
  3.133333  0.085422  0.267657  0.002931  0.258403
  3.200000  0.085422  0.273352  0.002962  0.258403
  3.266667  0.085422  0.279047  0.002992  0.258403
  3.333333  0.085422  0.284741  0.003023  0.258403
  3.400000  0.085422  0.290436  0.003053  0.258403
```

```
  3.466667  0.085422  0.296131  0.003083  0.258403
  3.533333  0.085422  0.301826  0.003112  0.258403
  3.600000  0.085422  0.307521  0.003141  0.258403
  3.666667  0.085422  0.313215  0.003170  0.258403
  3.733333  0.085422  0.318910  0.003199  0.258403
  3.800000  0.085422  0.324605  0.003227  0.258403
  3.866667  0.085422  0.330300  0.003270  0.258403
  3.933333  0.085422  0.335995  0.003923  0.258403
  4.000000  0.085422  0.341690  0.004990  0.258403
  4.066667  0.085422  0.347384  0.006318  0.258403
  4.133333  0.085422  0.353079  0.007842  0.258403
  4.200000  0.085422  0.358774  0.009522  0.258403
  4.266667  0.085422  0.364469  0.011327  0.258403
  4.333333  0.085422  0.370164  0.013237  0.258403
  4.400000  0.085422  0.375859  0.015231  0.258403
  4.466667  0.085422  0.381553  0.017296  0.258403
  4.533333  0.085422  0.387248  0.019416  0.258403
  4.600000  0.085422  0.392943  0.021581  0.258403
  4.666667  0.085422  0.398638  0.023779  0.258403
  4.733333  0.085422  0.404333  0.026002  0.258403
  4.800000  0.085422  0.410028  0.028239  0.258403
  4.866667  0.085422  0.415722  0.030521  0.258403
  4.933333  0.085422  0.421417  0.033262  0.258403
  5.000000  0.085422  0.427112  0.036088  0.258403
  5.066667  0.085422  0.432807  0.309808  0.258403
  5.133333  0.085422  0.438502  0.807602  0.258403
  5.200000  0.085422  0.444197  1.440625  0.258403
  5.266667  0.085422  0.449891  2.160009  0.258403
  5.333333  0.085422  0.455586  2.918729  0.258403
  5.400000  0.085422  0.461281  3.668434  0.258403
  5.466667  0.085422  0.466976  4.362283  0.258403
  5.533333  0.085422  0.472671  4.960477  0.258403
  5.600000  0.085422  0.478365  5.437524  0.258403
  5.666667  0.085422  0.484060  5.790821  0.258403
  5.733333  0.085422  0.489755  6.050339  0.258403
  5.800000  0.085422  0.495450  6.374881  0.258403
  5.866667  0.085422  0.501145  6.633724  0.258403
  5.933333  0.085422  0.506840  6.882790  0.258403
  6.000000  0.085422  0.512534  7.123109  0.258403
  6.066667  0.085422  0.518229  7.355542  0.258403
  END FTABLE  1
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    0.8             PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    0.8             IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.76            PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76            IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   1 HYDR   RO      1 1         1      WDM   1000 FLOW     ENGL      REPL
RCHRES   1 HYDR   O       1 1         1      WDM   1002 FLOW     ENGL      REPL
RCHRES   1 HYDR   O       2 1         1      WDM   1003 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE   1 1         1      WDM   1001 STAG     ENGL      REPL
COPY     1 OUTPUT MEAN    1 1      48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN    1 1      48.4      WDM    801 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>             <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    2
```

```
  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES          INFLOW IVOL
  END MASS-LINK    3

  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES          INFLOW IVOL
  END MASS-LINK    5

  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY            INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY            INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY            INPUT  MEAN
  END MASS-LINK   15

  MASS-LINK       17
RCHRES     OFLOW  OVOL   1                 COPY            INPUT  MEAN
  END MASS-LINK   17


END MASS-LINK

END RUN
```

Disclaimer

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Local (360)943-0304

www.clearcreeksolutions.com

WWHM2012

PROJECT REPORT

General Model Information

WWHM2012 Project Name: 22-000827_Evans Vista WWHM Model-MechTreatment

Site Name:	Evans Vista
Site Address:	
City:	Port Townsend
Report Date:	11/9/2023
Gage:	Port Angeles
Data Start:	1948/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	0.800
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
SAT, Forest, Steep	7.01
Pervious Total	7.01
Impervious Land Use	acre
Impervious Total	0
Basin Total	7.01

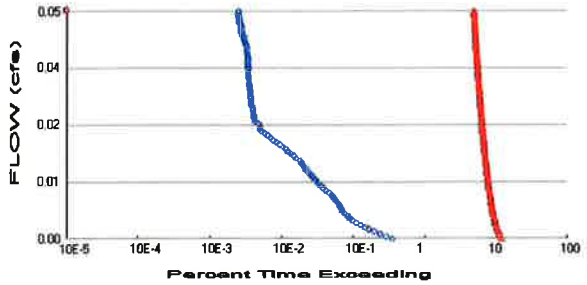
Mitigated Land Use

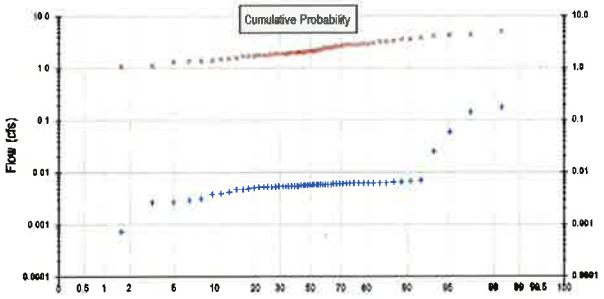
Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
Pervious Total	0
Impervious Land Use	acre
ROADS MOD	3.89
ROOF TOPS FLAT	2.04
SIDEWALKS MOD	1.08
Impervious Total	7.01
Basin Total	7.01

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 7.01
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0
Total Impervious Area: 7.01

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.005404
5 year	0.011689
10 year	0.018561
25 year	0.031842
50 year	0.046323
100 year	0.066071

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	2.192965
5 year	2.959845
10 year	3.485243
25 year	4.169832
50 year	4.695238
100 year	5.234099

stormwater flow rate

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1949	0.006	2.876
1950	0.006	1.793
1951	0.006	3.842
1952	0.004	1.558
1953	0.005	3.553
1954	0.060	2.922
1955	0.006	2.141
1956	0.006	2.033
1957	0.005	1.934
1958	0.005	2.412

1959	0.006	2.746
1960	0.006	2.656
1961	0.006	2.046
1962	0.006	2.043
1963	0.005	2.101
1964	0.006	4.275
1965	0.005	1.373
1966	0.006	1.898
1967	0.007	2.105
1968	0.005	1.993
1969	0.006	2.013
1970	0.005	3.044
1971	0.006	4.527
1972	0.006	2.632
1973	0.004	1.883
1974	0.005	1.097
1975	0.005	2.822
1976	0.006	2.442
1977	0.001	1.739
1978	0.003	1.705
1979	0.003	3.288
1980	0.006	1.767
1981	0.006	3.244
1982	0.026	2.781
1983	0.006	2.395
1984	0.005	1.594
1985	0.006	3.622
1986	0.006	1.953
1987	0.006	5.195
1988	0.006	1.923
1989	0.005	2.127
1990	0.006	2.784
1991	0.142	2.455
1992	0.006	2.260
1993	0.004	1.387
1994	0.000	1.349
1995	0.005	1.093
1996	0.006	1.438
1997	0.006	1.902
1998	0.003	1.817
1999	0.175	2.513
2000	0.006	3.301
2001	0.003	1.112
2002	0.007	2.180
2003	0.006	1.702
2004	0.006	2.174
2005	0.006	2.761
2006	0.005	1.788
2007	0.005	4.210
2008	0.005	1.972
2009	0.006	1.486

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.1755	5.1955
2	0.1420	4.5272
3	0.0598	4.2745

4	0.0255	4.2096
5	0.0070	3.8421
6	0.0068	3.6220
7	0.0065	3.5534
8	0.0064	3.3009
9	0.0064	3.2881
10	0.0063	3.2436
11	0.0063	3.0437
12	0.0063	2.9222
13	0.0063	2.8764
14	0.0063	2.8220
15	0.0062	2.7841
16	0.0062	2.7807
17	0.0062	2.7608
18	0.0062	2.7456
19	0.0061	2.6562
20	0.0060	2.6322
21	0.0060	2.5135
22	0.0059	2.4551
23	0.0059	2.4419
24	0.0059	2.4118
25	0.0059	2.3946
26	0.0059	2.2600
27	0.0059	2.1801
28	0.0059	2.1744
29	0.0059	2.1407
30	0.0059	2.1269
31	0.0058	2.1049
32	0.0057	2.1011
33	0.0057	2.0459
34	0.0057	2.0426
35	0.0057	2.0333
36	0.0056	2.0127
37	0.0055	1.9927
38	0.0055	1.9723
39	0.0055	1.9527
40	0.0055	1.9336
41	0.0055	1.9234
42	0.0054	1.9021
43	0.0054	1.8985
44	0.0054	1.8834
45	0.0053	1.8168
46	0.0053	1.7928
47	0.0053	1.7883
48	0.0052	1.7665
49	0.0051	1.7386
50	0.0050	1.7054
51	0.0048	1.7020
52	0.0048	1.5935
53	0.0043	1.5584
54	0.0040	1.4860
55	0.0038	1.4378
56	0.0031	1.3866
57	0.0029	1.3734
58	0.0027	1.3490
59	0.0026	1.1124
60	0.0007	1.0972
61	0.0004	1.0935

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0.6454 acre-feet
On-line facility target flow:	0.9934 cfs.
Adjusted for 15 min:	0.9934 cfs.
Off-line facility target flow:	0.5392 cfs.
Adjusted for 15 min:	0.5392 cfs.

used to size mechanical treatment facility

0.5392 cfs = 242 gpm

RECOMMEND USING CONTECH VAULT STORMFILTER 8'X12'

Appendix
Predeveloped Schematic

Mitigated Schematic

Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   22-000827_Evans Vista WWHM Model-MechTreatment.wdm
MESSU       25   Pre22-000827_Evans Vista WWHM Model-MechTreatment.MES
            27   Pre22-000827_Evans Vista WWHM Model-MechTreatment.L61
            28   Pre22-000827_Evans Vista WWHM Model-MechTreatment.L62
            30   POC22-000827_Evans Vista WWHM Model-MechTreatment1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      21
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  1                   MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1          1    1
  501          1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                        in  out           ***
   21     SAT, Forest, Steep      1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   21         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   21         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO
```

```
  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   21         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR      KVARY      AGWRC
   21              0         4         2       100       0.1        0.5      0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   21             0         0        10         2         0         0       0.7
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   21          0.2         3       0.5         1       0.7       0.8
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS       GWVS
   21             0         0         0         0       4.2         1          0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
  END IWAT-STATE1
```

```
END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  21                        7.01     COPY   501     12
PERLND  21                        7.01     COPY   501     13

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG            ***
                                       in  out                               ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                    ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *        ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN      DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><--------><--------> ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                       ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    0.8            PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    0.8            IMPLND   1 999 EXTNL  PREC
```

```
WDM      1 EVAP     ENGL    0.76            PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76            IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    501 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01         END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   22-000827_Evans Vista WWHM Model-MechTreatment.wdm
MESSU       25   Mit22-000827_Evans Vista WWHM Model-MechTreatment.MES
            27   Mit22-000827_Evans Vista WWHM Model-MechTreatment.L61
            28   Mit22-000827_Evans Vista WWHM Model-MechTreatment.L62
            30   POC22-000827_Evans Vista WWHM Model-MechTreatment1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      IMPLND       2
      IMPLND       4
      IMPLND       9
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  1                   MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                         User  t-series Engl Metr ***
                                          in  out           ***
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
  END PRINT-INFO

  PWAT-PARM1
```

```
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS       IFWS       LZS       AGWS      GWVS
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
    2      ROADS/MOD              1    1    1   27    0
    4      ROOF TOPS/FLAT         1    1    1   27    0
    9      SIDEWALKS/MOD          1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    2         0    0    1    0    0    0
    4         0    0    1    0    0    0
    9         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    2         0    0    4    0    0    4    1    9
    4         0    0    4    0    0    0    1    9
    9         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    2         0    0    0    0    0
    4         0    0    0    0    0
    9         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    2           400      0.05       0.1      0.08
    4           400      0.01       0.1       0.1
    9           400      0.05       0.1      0.08
  END IWAT-PARM2

  IWAT-PARM3
```

```
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    2              0         0
    4              0         0
    9              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    2              0         0
    4              0         0
    9              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
IMPLND   2                        3.89     COPY   501     15
IMPLND   4                        2.04     COPY   501     15
IMPLND   9                        1.08     COPY   501     15

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                       in  out                              ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                  ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN      DELTH     STCOR       KS       DB50       ***
  <------><--------><--------><--------><--------><--------><--------->       ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                     ***
```

```
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><--------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    0.8            PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    0.8            IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.76           PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76           IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL       REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL       REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15


END MASS-LINK

END RUN
```

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APPENDIX G
WEB SOIL SURVEY

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Jefferson County Area, Washington

Evans Vista Housing Development

November 7, 2023

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

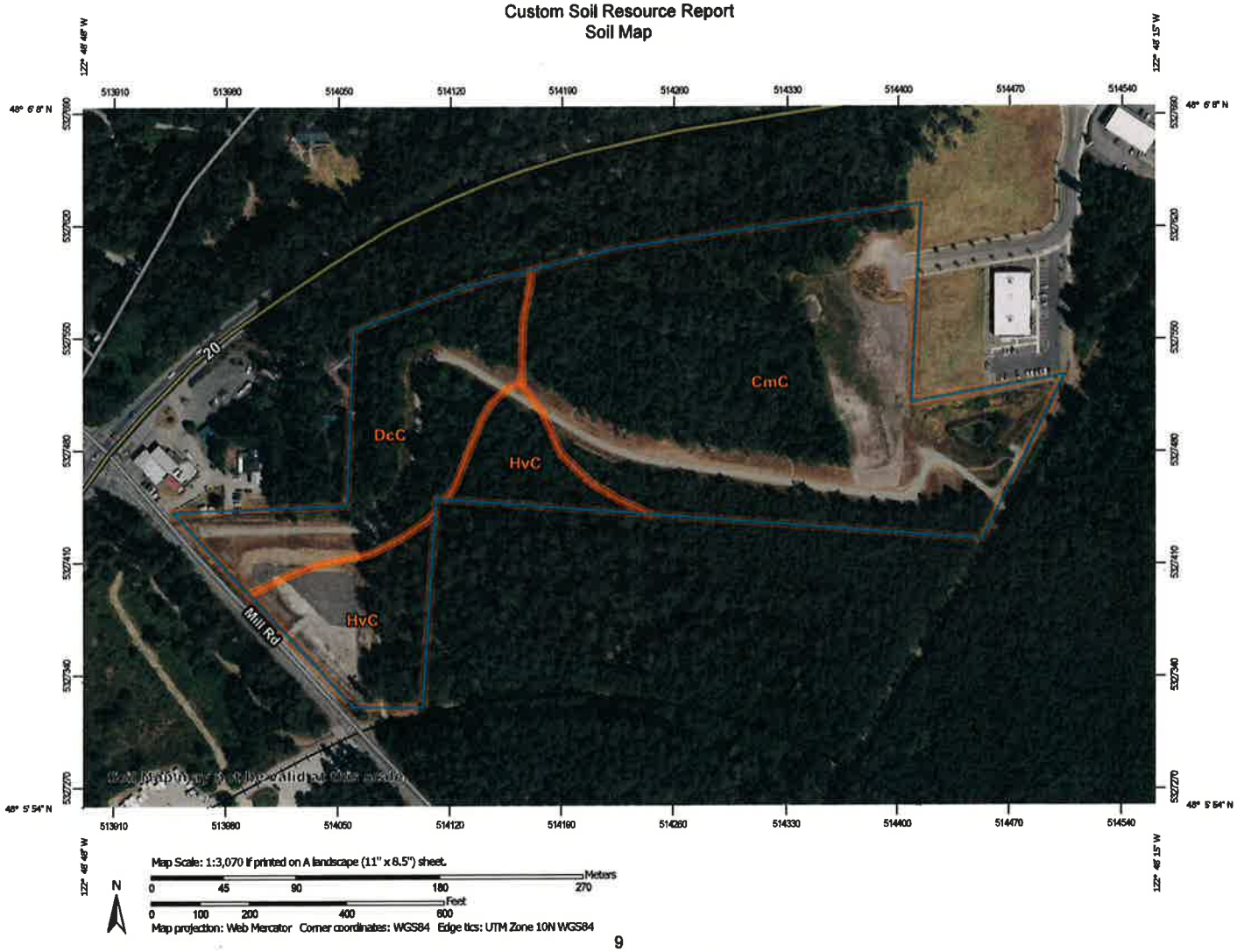
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:3,070 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 45 90 180 270

Feet: 0 100 200 400 600

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

MAP LEGEND

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

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Jefferson County Area, Washington
Survey Area Data: Version 22, Aug 29, 2023

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

Date(s) aerial images were photographed: Jul 31, 2022—Aug 8, 2022

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres In AOI	Percent of AOI
CmC	Clallam gravelly sandy loam, 0 to 15 percent slopes	11.8	62.1%
DcC	Dick loamy sand, 0 to 15 percent slopes	4.1	21.6%
HvC	Hoypus gravelly sandy loam, 0 to 15 percent slopes	3.1	16.3%
Totals for Area of Interest		**19.0**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or

landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases.* Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Jefferson County Area, Washington

CmC—Clallam gravelly sandy loam, 0 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2gqp
Elevation: 50 to 820 feet
Mean annual precipitation: 23 inches
Mean annual air temperature: 48 degrees F
Frost-free period: 160 to 200 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Clallam and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Clallam

Setting

Parent material: Basal till

Typical profile

H1 - 0 to 3 inches: gravelly sandy loam
H2 - 3 to 23 inches: very gravelly sandy loam
H3 - 23 to 60 inches: gravelly sandy loam

Properties and qualities

Slope: 0 to 15 percent
Depth to restrictive feature: 20 to 40 inches to densic material
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 19 to 39 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 1.9 inches)

Interpretive groups

Land capability classification (irrigated): 6s
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: F002XA001WA - Puget Lowlands Dry Forest
Forage suitability group: Limited Depth Soils (G002XN302WA)
Other vegetative classification: Limited Depth Soils (G002XN302WA)
Hydric soil rating: No

DcC—Dick loamy sand, 0 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2gqx
Elevation: 0 to 330 feet

Mean annual precipitation: 21 inches
Mean annual air temperature: 50 degrees F
Frost-free period: 160 to 200 days
Farmland classification: Farmland of statewide importance

Map Unit Composition
Dick and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Dick

Setting
Landform: Plains, terraces
Parent material: Glacial outwash

Typical profile
H1 - 0 to 4 inches: loamy sand
H2 - 4 to 37 inches: loamy sand
H3 - 37 to 60 inches: stratified sand to loamy sand

Properties and qualities
Slope: 0 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.6 inches)

Interpretive groups
Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: A
Ecological site: F002XA004WA - Puget Lowlands Forest
Forage suitability group: Droughty Soils (G002XN402WA)
Other vegetative classification: Droughty Soils (G002XN402WA)
Hydric soil rating: No

HvC—Hoypus gravelly sandy loam, 0 to 15 percent slopes

Map Unit Setting
National map unit symbol: 2grq
Elevation: 100 to 720 feet
Mean annual precipitation: 24 inches
Mean annual air temperature: 48 degrees F
Frost-free period: 200 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition
Hoypus and similar soils: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hoypus

Setting

Landform: Terraces
Parent material: Glacial outwash

Typical profile

H1 - 0 to 2 inches: gravelly fine sandy loam
H2 - 2 to 10 inches: gravelly sandy loam
H3 - 10 to 26 inches: gravelly loamy sand
H4 - 26 to 60 inches: gravelly loamy sand

Properties and qualities

Slope: 0 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 1.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Ecological site: F002XA001WA - Puget Lowlands Dry Forest
Forage suitability group: Droughty Soils (G002XN402WA)
Other vegetative classification: Droughty Soils (G002XN402WA)
Hydric soil rating: No

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

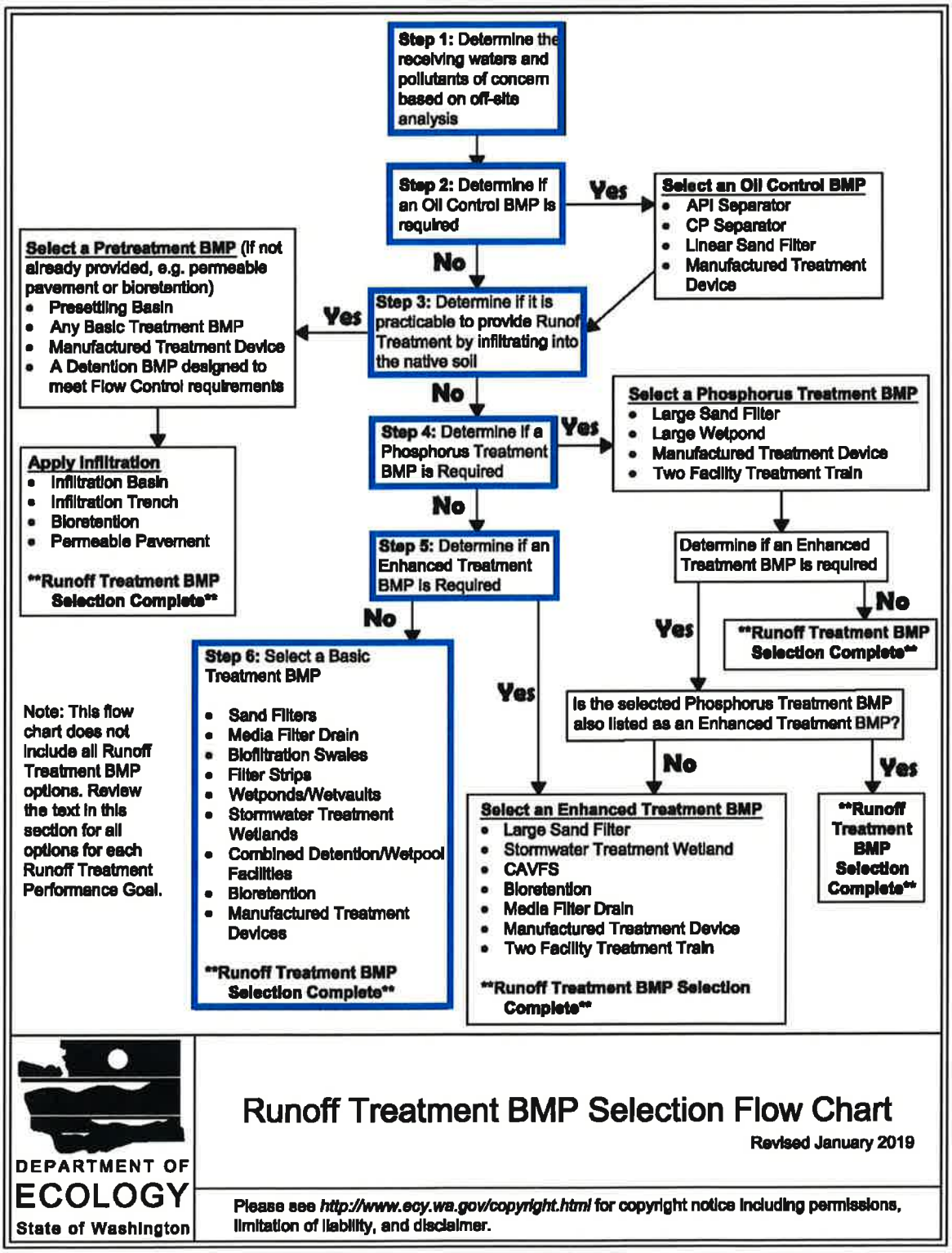
United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

APPENDIX H

RUNOFF TREATMENT BMP WORKSHEET

Figure III-1.1: Runoff Treatment BMP Selection Flow Chart



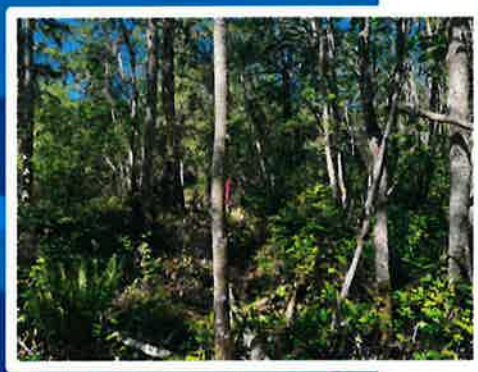
APPENDIX I
CRITICAL AREAS STUDY

CONFLUENCE
ENVIRONMENTAL COMPANY

Port Townsend Evans Vista Housing Development
CRITICAL AREAS STUDY

Prepared for:

SCJ Alliance
July 2023



146 N Canal Street, Suite 111 • Seattle, WA 98103 • www.confenv.com

Port Townsend Evans Vista Housing Development
CRITICAL AREAS STUDY

Prepared for:

SCJ Alliance
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Prepared by:

Confluence Environmental Company
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Audrey Michniak, WPIT

July 2023

This report should be cited as:

Confluence (Confluence Environmental Company). 2023. Port Townsend Evans Vista Housing Development Critical Areas Study. Prepared for SCJ Alliance, Lacey, Washington, by Confluence, Seattle, Washington.

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APPENDICES

1.0 INTRODUCTION

Confluence Environmental Company (Confluence) conducted a critical areas study to assist with permitting an affordable and mixed-income workforce housing development on a 14-acre parcel owned by the City of Port Townsend. This project included creating a master plan and preparing the land use entitlement application for the housing development on tax parcel 001094006 (Figure 1).

On May 15, 2023, Confluence conducted a site investigation to determine the presence and extent of critical areas on and adjacent to the property. The effort focused on wetlands and streams. Critical areas such as erosion hazard areas, steep slopes, and landslide hazard areas were not evaluated in this study. This report discusses the results of the study.

The site currently has no development on it besides a gravel road along the southern boundary. The site is partially forested with an open field on the eastern boundary. A stormwater pond is located on the southwest portion of the property.

Figure 1. Study area

2.0 METHODS

Confluence conducted a critical areas study on the property. This section describes the methods used to confirm the presence or absence of critical areas.

2.1 Desktop Analysis

To develop a strategy for the site investigation, Confluence reviewed relevant regulations and GIS databases.

Confluence reviewed Port Townsend Municipal Code (PTMC) 19.05 to determine the standard buffer requirements for critical areas in the project vicinity.

Confluence reviewed the GIS databases listed below for the documented presence of wetlands, streams, lakes, or species listed under the Endangered Species Act as threatened or endangered on or within 300 feet of the study area. It was necessary to search within 300 feet to determine whether buffers for off-site critical areas encroach onto the site (300 feet is the largest buffer identified in PTMC).

- Jefferson County, Washington GIS Map Gallery (Jefferson County 2023)
- U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) (USFWS 2023)
- Natural Resources Conservation Service (NRCS) Soil Survey (NRCS 2023a)
- Washington Department of Fish and Wildlife (WDFW) SalmonScape (WDFW 2023a)
- WDFW Priority Habitats and Species (PHS) (WDFW 2023b)
- Washington Department of Natural Resources (WDNR) Water Type GIS (WDNR 2023)

Results of the GIS database searches are in Appendix A.

2.2 Site Investigation

On May 15, 2023, Confluence conducted a site investigation to determine the presence or absence of critical areas on or near the property.

2.2.1 Wetlands

2.2.1.1 Wetland Identification and Delineation

Confluence identified wetlands and delineated their boundaries using the methods described by the U.S. Army Corps of Engineers (Corps) in the Corps of Engineers Wetlands Delineation Manual (Corps 1987) and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Corps 2010). The Corps typically requires that the following 3 characteristics be present for an area to be identified as a

wetland: (1) hydrophytic vegetation, (2) hydric soil, and (3) wetland hydrology. For each criterion, there are several possible indicators that can be used to determine whether the criterion has been met. The indicators were established so that if a wetland were present on-site, sufficient indicators would be observed at any time of the year, including the driest months, to identify the wetland. Since "normal circumstances," as defined by the Corps (1987), exist on the site, all 3 criteria must be present for an area to be determined a wetland. A more detailed description of delineation methodology is provided in Appendix B. Wetland delineation data forms completed during the site investigation are provided in Appendix C.

To confirm the presence or absence of a wetland, data were collected from representative test plots within and outside of potential wetlands. The locations of the test plots were based on the presence of visual wetland indicators (e.g., wetland vegetation, evidence of standing water) or were chosen to represent vegetative, topographic, or hydrologic features in the vicinity. Within these test plots, vegetation, soils, and hydrology were examined to determine whether wetland characteristics were present (see Appendix B for details). Plots that met all 3 wetland criteria were determined to be wetland plots; plots that did not meet all 3 wetland criteria were determined to be upland plots.

Once the presence of a wetland was confirmed, visual wetland indicators, such as topographic and vegetative shifts, were used to delineate the remainder of the wetland boundary. In areas with a lack of visual wetland indicators (i.e., areas with monoculture vegetation and no clear topographic break), Confluence used soil probes to determine the wetland boundary between test plots. Confluence evaluated the presence or absence of hydric soil and wetland hydrology indicators at soil probe locations to determine whether the area represented by the soil probe was wetland or upland. Soil probe locations and presence or absence of hydric soil and wetland hydrology indicators were recorded using GPS.

Confluence used the PLANTS Database (NRCS 2023b) to provide consistency in scientific naming and the 2020 National Wetland Plant List (Corps 2020) to determine the wetland indicator status of plants.

The wetland boundary, test plot, and soil probe locations were flagged using pink ribbon flagging. The flags were mapped using a Trimble mapping grade GPS receiver capable of sub-meter accuracy after post-processing.

2.2.1.2 Off-Site Wetland Identification

To assess whether there are possible wetlands with buffers encroaching from adjacent properties, Confluence modified the methods described by the Corps (Corps 1987, 2010). The modified method identified the presence or absence of visual wetland indicators. If hydrophytic vegetation was dominant and visual indicators of wetland hydrology were observed, then hydric soils were assumed to be present.

2.2.1.3 *Wetland Rating*

Confluence determined wetland ratings using the Washington State Wetland Rating System for Western Washington (Hruby 2014) to assess the resource value of any wetland identified on the site. This rating system is based on the wetland functions and values, sensitivity to disturbance, rarity, and irreplaceability.

Wetland rating forms are in Appendix D.

2.2.2 Streams/Shorelines

No streams or shorelines were identified in the study area, so no ordinary high water mark delineation was needed.

3.0 RESULTS

3.1 Desktop Analysis

The property is zoned M-C - Mixed Commercial - Light Manufacturing (City) and is located inside the urban growth boundary.

USFWS's NWI and Jefferson County do not identify any wetlands on or within the vicinity of the property (USFWS 2023) (Jefferson County 2023).

The soil survey indicates the study area and surrounding areas include Clallam gravelly sandy loam (0-15%), Dick loamy sand (0-15%), and Hoypus gravelly sandy loam (0-15%). None of the 3 soil types in the vicinity of the study area is considered a hydric soil (NRCS 2023a).

WDWF's SalmonScape documents no presence of any salmonid species on the property (WDFW 2023a). WDFW's PHS system does not identify any priority habitat on the property or within the vicinity (WDFW 2023b).

3.2 Test Plots

During the site investigation, 6 test plots were established, 4 in uplands and 2 in wetlands. Test plot locations are shown on Figure 2. Test plot characteristics are detailed below. Technical terms are explained in Appendix B. Photographs of the site are in Appendix E.

Figure 2. Location of Wetland A, test plots, and soil probes

Test Plot 1 (TP-1) was located in the central portion of the property, in a forested area dominated by red alder *(Alnus rubra)*, common snowberry (*Symphoricarpos albus*), Himalayan blackberry (*Rubus armeniacus*), Nootka rose (*Rosa nutkana*), common vetch (*Vicia sativa*), and bracken fern (*Pteridium aquilinum)*. Vegetation within TP-1 passed the Dominance Test and therefore met the wetland vegetation criterion. Soil in the top layer (0-8 inches) was a black (10YR 2/1) loam. Soil in the second layer (8-11 inches) was a brown (10YR 4/3) loamy sand. The soils did not meet any hydric soil indicator; therefore, the hydric soil criterion was not met. No primary or secondary wetland hydrology indicators were observed; therefore, the wetland hydrology criterion was not met. Since TP-1 did not meet all 3 criteria, the area represented by TP-1 is not a wetland. TP-1 represents an upland area.

TP-2 was located in the northwest portion of the property along the northern boundary, in a forested area dominated by western red-cedar (*Thuja plicata*) and salal (*Gaultheria shallon*). Vegetation within TP-2 passed the Dominance Test and therefore met the wetland vegetation criterion. Soil in the top layer (0-7 inches) was a black (10YR 2/1) sandy loam. Soil in the second layer (7-12 inches) was a very dark grayish brown (10YR 3/2) sandy loam. The soils did not meet any hydric soil indicator; therefore, the hydric soil criterion was not met. No primary or secondary wetland hydrology indicators were observed; therefore, the wetland hydrology criterion was not met. Since TP-2 did not meet all 3 criteria, the area represented by TP-2 is not a wetland. TP-2 represents an upland area.

TP-3 was located in the north central portion of the property on the northern boundary line, in a forested area dominated by Douglas-fir, common snowberry, Himalayan blackberry, Nootka rose, salal, and ocean-spray (*Holodiscus discolor*). Vegetation within TP-3 did not pass the Prevalence Index Test and therefore did not meet the wetland vegetation criterion. Soil in the top layer (0-7 inches) was a very dark gray (10YR 3/1) silt loam. Soil in the second layer (7-12 inches) had a dual matrix that consisted of a very dark grayish brown (10YR 3/2) loam and a very dark gray (10YR 3/1) sandy loam with 10% light olive brown (10YR 5/6) redoximorphic concentrations in the matrix. The soils did not meet any hydric soil indicator; therefore, the hydric soil criterion was not met. No primary or secondary wetland hydrology indicators were observed; therefore, the wetland hydrology criterion was not met. Since TP-3 did not meet all 3 criteria, the area represented by TP-3 is not a wetland. TP-3 represents the transition zone between upland and Wetland A.

TP-4 was located in the north central portion of the property on the northern boundary line, in a forested area dominated by Douglas-fir, common snowberry, Himalayan blackberry, Nootka rose, salal, and ocean-spray. Vegetation within TP-4 passed the Dominance Test and therefore met the wetland vegetation criterion. Soil in the top layer (0-9 inches) was a black (10YR 2/1) loam. Soil in the second layer (9-13 inches) was a very dark gray (10YR 3/1) sandy loam with 15% strong yellowish red (5YR 4/6) redoximorphic concentrations in the matrix. Soils met the Redox Dark Surface (F6) hydric soil indicator; therefore, the hydric soil criterion was met. One

primary wetland hydrology indicator—Saturation—was observed. The presence of at least 1 primary or 2 secondary indicators meets the wetland hydrology criterion. Since TP-4 met all 3 criteria, the area represented by TP-4 is a wetland, identified as Wetland A.

TP-5 was located in the northeastern corner of the property, in an open field dominated by soft rush (*juncus effusus*), American brooklime (*Veronica americana*), curly dock (*Rumex crispus*), and bull thistle (*Cirsium vulgare*). Vegetation within TP-5 passed the Dominance Test and therefore met the wetland vegetation criterion. Soil in the top layer (0-11 inches) was a black (10YR 2/1) loam. Soil in the second layer (11-16 inches) was a dark gray (10YR 4/1) loam with a 2% yellowish brown (10YR 5/6) redoximorphic concentrations in the matrix. Soils met the Depleted Below Dark Surface (A11) hydric soil indicator; therefore, the hydric soil criterion was met. One primary wetland hydrology indicator—Saturation—was observed. The presence of at least 1 primary or 2 secondary indicators meets the wetland hydrology criterion. Based on review of historical imagery from Jefferson County GIS (Jefferson County 2023), significant portions of the property, including the in the vicinity of TP 5 had been logged and a gravel road installed. It is our understanding that this area was a borrow pit for this activity and does not represent natural/pre-disturbance conditions. Though TP-5 met all 3 criteria, Confluence did not consider it a wetland because the location was in a small recently excavated depression within an upland area. TP-5 represents an upland area. TP-6, described below, represents the surrounding upland area, including what the soils and hydrology indicators looked like at TP-5 prior to the excavation.

TP-6 was located in the northeastern corner of the property, in an open field dominated by meadow grasses (*Poa* spp.), bentgrass (*Agrostis* sp.), common vetch, curly dock, and bull thistle. Vegetation within TP-6 passed the Dominance Test and therefore met the wetland vegetation criterion. Soil in the top layer (0-12 inches) had a dual matrix of black (10YR 2/1) and dark brown (10YR 3/3) loam. The soils did not meet any hydric soil indicator; therefore, the hydric soil criterion was not met. No primary or secondary wetland hydrology indicators were observed; therefore, the wetland hydrology criterion was not met. Since TP-6 did not meet all 3 criteria, the area represented by TP-6 is not a wetland. TP-6 represents an upland area.

3.3 Wetlands

TP-4 represents an area in the study area that met all 3 wetland criteria, identified as Wetland A. Wetland A is described in detail below, summarized in Table 1, and shown on Figure 2.

Table 1. Wetland summary

Wetland Name	Cowardin Classification[1]	Estimated Size (square feet)	Wetland Rating[2]				
			Water Quality	Hydrology	Habitat	Total	Category
Wetland A	Palustrine forested	6,204	6	4	5	15	IV
[1] FGDC 2013							

Wetland Name	Cowardin Classification[1]	Estimated Size (square feet)	Wetland Rating[2]				
			Water Quality	Hydrology	Habitat	Total	Category

[2] Hruby 2014

3.3.1 Wetland A

Wetland A is located in the northern portion of the property (Figure 2) and continues off the property to the north. Wetland A is approximately 6,204 square feet, including the on-site and off-site portions. TP-4, described above, represents Wetland A. According to the Cowardin classification system (FGDC 2013), Wetland A is a forested wetland. Wetland A is dominated by Douglas-fir, common snowberry, Himalayan blackberry, Nootka rose, salal, and ocean-spray. The boundary of Wetland A was determined by a distinct topographic break, evidence of standing water, and the vegetative shift to non-hydrophytic vegetation (e.g., presence of sword fern). According to the 2014 Wetland Rating System (Hruby 2014), Wetland A was rated as a Category IV wetland, with a water quality score of 6, hydrology score of 4, and habitat score of 5.

4.0 REGULATORY IMPLICATIONS

According to PTMC 19.05.110, Wetland A is a Category IV wetland with a future land use of high intensity for multifamily development; therefore, the standard buffer is 50 feet.

Figure 3 shows the wetland and its standard buffer. Development within this buffer or within the wetland requires compliance with PTMC 19.05.

Figure 3. Wetland A standard buffer

5.0 REFERENCES

Corps (U.S. Army Corps of Engineers). 1987. Corps of Engineers wetlands delineation manual. Corps Environmental Laboratory, Waterways Experiment Station, Vicksburg, Mississippi. Technical Report Y-87-1.

Corps. 2010. Regional supplement to the Corps of Engineers wetland delineation manual: western mountains, valleys, and coast region. U.S. Army Engineer Research and Development Center, Vicksburg, Mississippi. ERDC/EL TR-08-13.

Corps. 2020. National wetland plant list, version 3.5 [online document]. Corps Engineer Research and Development Center, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire. Available at: https://wetland-plants.sec.usace.army.mil/nwpl_static/v34/home/home.html.

FGDC (Federal Geographic Data Committee). 2013. Classification of wetlands and deepwater habitats of the United States. Second Edition. Wetlands Subcommittee, Federal Data Committee and U.S. Fish and Wildlife Service, Publication FGDC-STD-004-2013, Washington, D.C.

Hruby, T. 2014. Washington State wetland rating system for western Washington, 2014 update. Washington State Department of Ecology, Olympia. Publication # 14-06-029.

Jefferson County. 2023. Jefferson Map Gallery, Port Townsend, Washington. Available at: https://jeffcowa.maps.arcgis.com/home/index.html (accessed on June 1, 2023).

NRCS (Natural Resources Conservation Service). 2023a Web soil survey [online database]. U.S. Department of Agriculture, NRCS, Soil Science Division, Washington D.C. Available at: http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm (accessed on June 1, 2023).

NRCS. 2023b. The PLANTS database [online database]. U.S. Department of Agriculture, NRCS, National Plant Data Team, Greensboro, North Carolina. Available at: https://plants.sc.egov.usda.gov/java/ (accessed on June 1, 2023).

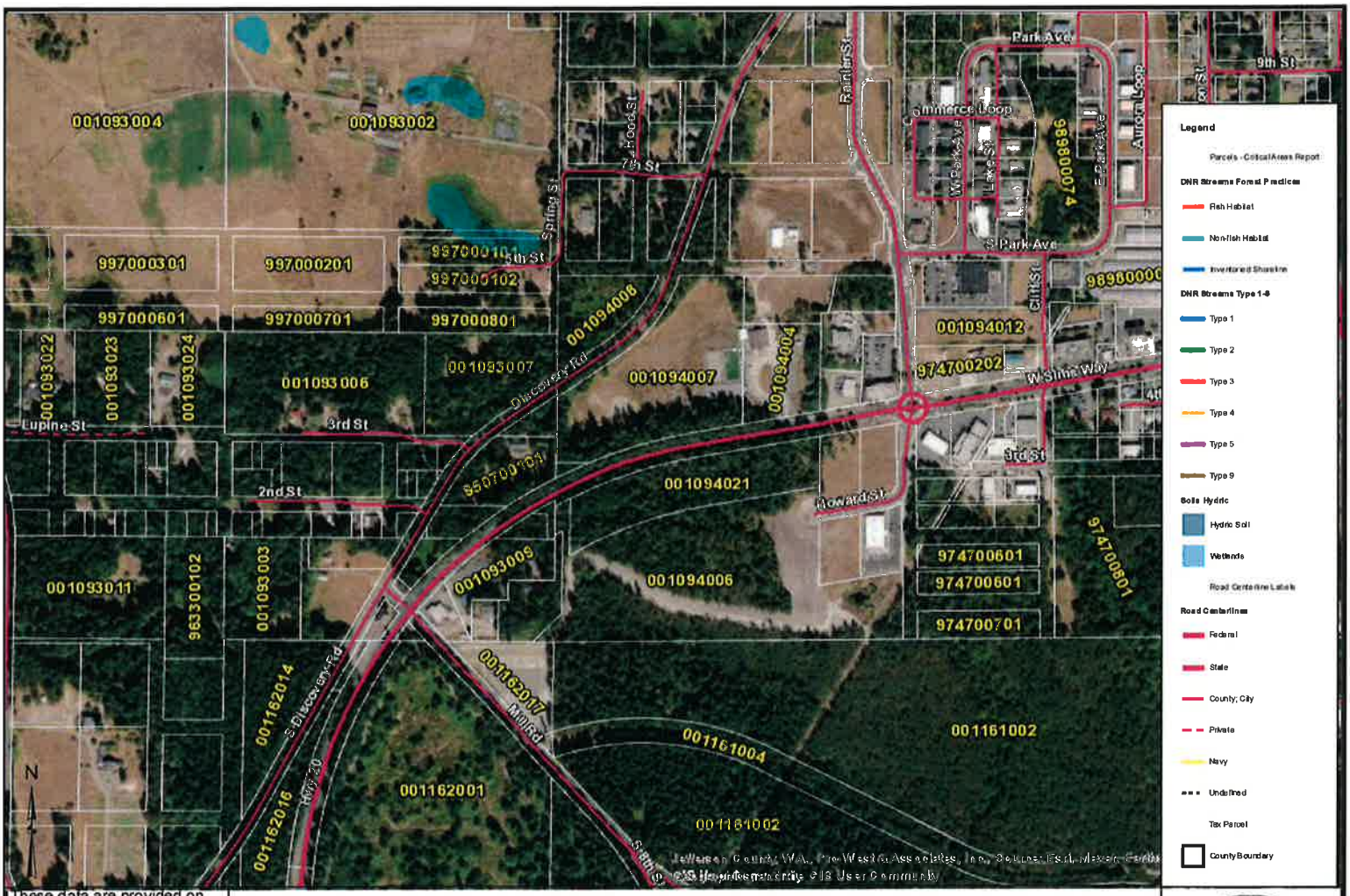
USFWS (U.S. Fish and Wildlife Service). 2023. National wetlands inventory wetlands mapper [online database]. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. Available at: https://www.fws.gov/wetlands/Data/Mapper.html (accessed on June 1, 2023).

WDFW (Washington Department of Fish and Wildlife). 2023a. SalmonScape interactive mapping [online database]. Washington Department of Fish and Wildlife, Olympia, Washington. Available at: http://apps.wdfw.wa.gov/salmonscape/map.html (accessed on June 1, 2023).

WDFW. 2023b. PHS on the web interactive mapping [online database]. Washington Department of Fish and Wildlife Habitat Program, Olympia, Washington. Available at: https://geodataservices.wdfw.wa.gov/hp/phs/ (accessed on June 1, 2023).

WDNR (Washington Department of Natural Resources). 2023. Forest practices application mapping tool. Olympia, Washington. Available at: https://fpamt.dnr.wa.gov/default.aspx# (accessed on June 1, 2023).

Appendix A
GIS Database Search Results



These data are provided on an "AS-IS" basis, without warranty of any type, expressed or implied, including but not limited to any warranty as to their performance, merchantability, or fitness for any particular purpose.

Jefferson County, WA

1:9,028

Date: 11/30/2022

This map is not a substitute for accurate field surveys or for locating actual property lines and any adjacent features.

U.S. Fish and Wildlife Service

National Wetlands Inventory

Evans Vista

June 1, 2023

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Jefferson County Area, Washington

June 1, 2023

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

MAP LEGEND

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

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Jefferson County Area, Washington
Survey Area Data: Version 21, Sep 8, 2022

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

Date(s) aerial images were photographed: Jul 31, 2022—Aug 8, 2022

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CmC	Clallam gravelly sandy loam, 0 to 15 percent slopes	12.3	75.7%
DcC	Dick loamy sand, 0 to 15 percent slopes	2.3	14.1%
HvC	Hoypus gravelly sandy loam, 0 to 15 percent slopes	1.7	10.2%
Totals for Area of Interest		**16.2**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or

landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Jefferson County Area, Washington

CmC—Clallam gravelly sandy loam, 0 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2gqp
Elevation: 50 to 820 feet
Mean annual precipitation: 23 inches
Mean annual air temperature: 48 degrees F
Frost-free period: 160 to 200 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Clallam and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Clallam

Setting

Parent material: Basal till

Typical profile

H1 - 0 to 3 inches: gravelly sandy loam
H2 - 3 to 23 inches: very gravelly sandy loam
H3 - 23 to 60 inches: gravelly sandy loam

Properties and qualities

Slope: 0 to 15 percent
Depth to restrictive feature: 20 to 40 inches to densic material
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 19 to 39 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 1.9 inches)

Interpretive groups

Land capability classification (irrigated): 6s
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: F002XA001WA - Puget Lowlands Dry Forest
Forage suitability group: Limited Depth Soils (G002XN302WA)
Other vegetative classification: Limited Depth Soils (G002XN302WA)
Hydric soil rating: No

DcC—Dick loamy sand, 0 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2gqx
Elevation: 0 to 330 feet

Mean annual precipitation: 21 inches
Mean annual air temperature: 50 degrees F
Frost-free period: 160 to 200 days
Farmland classification: Farmland of statewide importance

Map Unit Composition
Dick and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Dick

Setting
Landform: Terraces, plains
Parent material: Glacial outwash

Typical profile
H1 - 0 to 4 inches: loamy sand
H2 - 4 to 37 inches: loamy sand
H3 - 37 to 60 inches: stratified sand to loamy sand

Properties and qualities
Slope: 0 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.6 inches)

Interpretive groups
Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: A
Ecological site: F002XA004WA - Puget Lowlands Forest
Forage suitability group: Droughty Soils (G002XN402WA)
Other vegetative classification: Droughty Soils (G002XN402WA)
Hydric soil rating: No

HvC—Hoypus gravelly sandy loam, 0 to 15 percent slopes

Map Unit Setting
National map unit symbol: 2grq
Elevation: 100 to 720 feet
Mean annual precipitation: 24 inches
Mean annual air temperature: 48 degrees F
Frost-free period: 200 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition
Hoypus and similar soils: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hoypus

Setting

Landform: Terraces
Parent material: Glacial outwash

Typical profile

H1 - 0 to 2 inches: gravelly fine sandy loam
H2 - 2 to 10 inches: gravelly sandy loam
H3 - 10 to 26 inches: gravelly loamy sand
H4 - 26 to 60 inches: gravelly loamy sand

Properties and qualities

Slope: 0 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 1.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Ecological site: F002XA001WA - Puget Lowlands Dry Forest
Forage suitability group: Droughty Soils (G002XN402WA)
Other vegetative classification: Droughty Soils (G002XN402WA)
Hydric soil rating: No

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

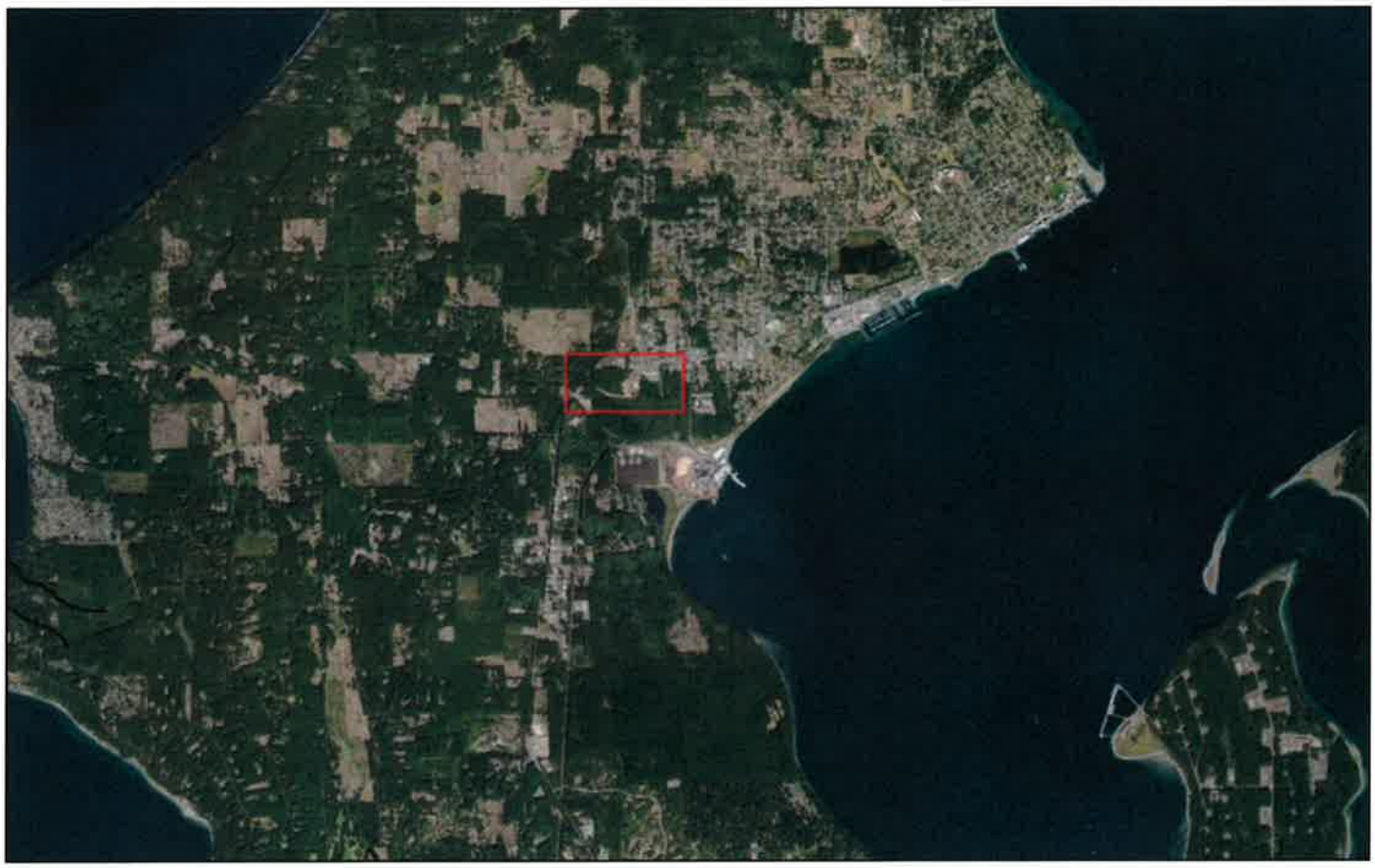
United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

Letter ANSI A Landscape



June 5, 2023

All SalmonScape Species

1:72,224

0 0.4 0.8 1.6 mi

0 0.5 1 2 km

Earthstar Geographics, NOAA, USFWS, WDFW

Priority Habitats and Species on the Web

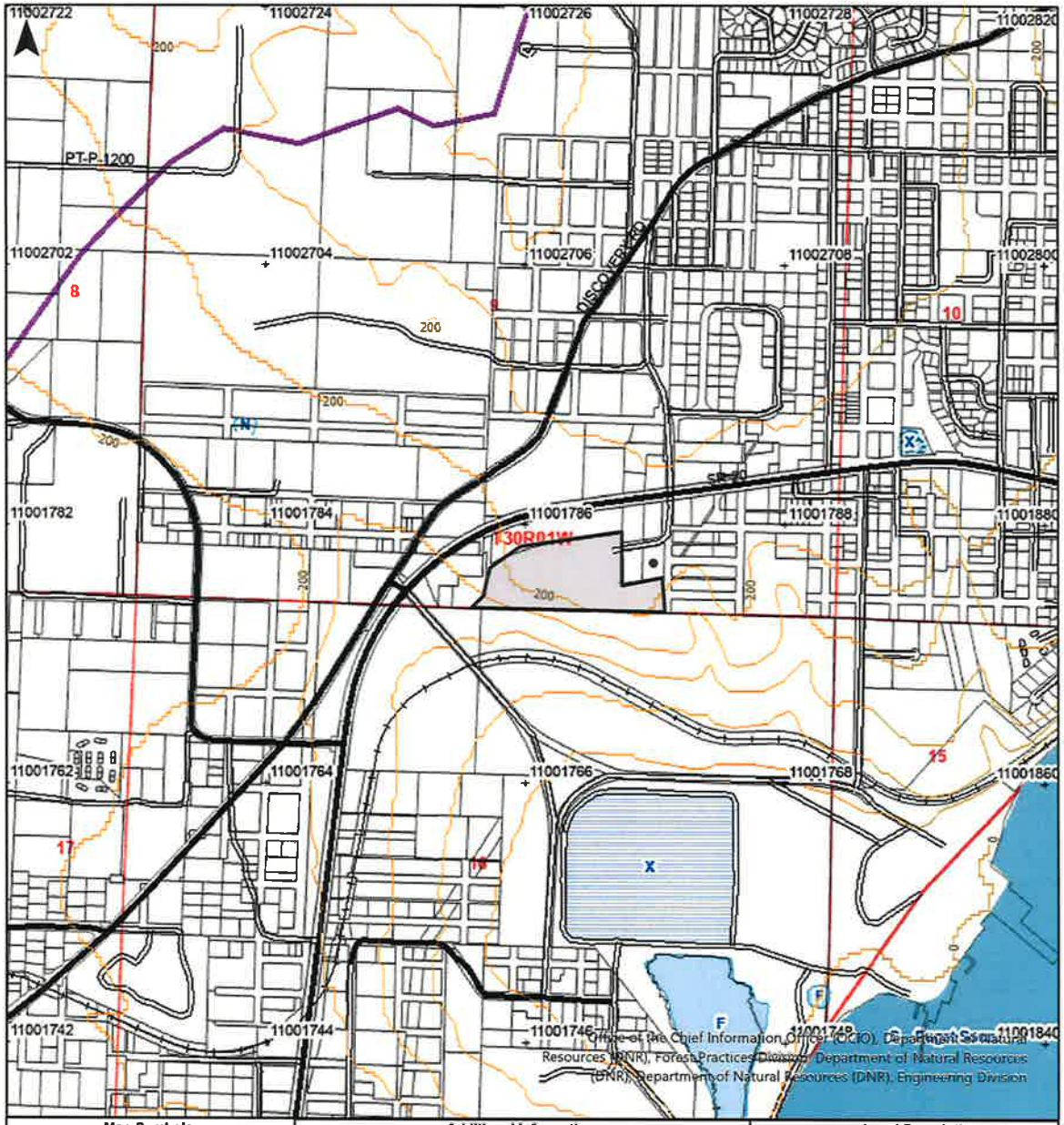
Buffer radius: 300 Feet

Report Date: 06/01/2023

The Priority Habitats and Species (PHS) datasets do not contain information for your project area. This does not mean that species and habitats do not occur in your project area. PHS data, points, lines and polygons are mapped only when occurrences of these species or habitats have been observed in the field. Unfortunately, we have not been able to comprehensively survey all sections in the state and therefore, it is important to note that priority species and habitats may occur in areas not currently known to the Department.

surveys have not been conducted. Site specific surveys are frequently necessary to rule out the presence of priority resources. Locations of fish and wildlife resources are subject to variation caused by disturbance, changes in season and weather, and other factors. WDFW does not recommend using reports more than six months old.

Forest Practices Activity Map - Application #_____



Map Symbols

- Harvest Boundary
- Road Construction
- Stream
- RMZ / WMZ Buffers
- Rock Pit
- Landing
- Waste Area
- Clumped WRTS/GRTS
- Existing Structure

Additional Information

Legal Description

S17 T30.0N R01.0W, S16 T30.0N R01.0W, S15 T30.0N R01.0W, S10 T30.0N R01.0W, S08 T30.0N R01.0W, S09 T30.0N R01.0W

WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES

Extreme care was used during the compilation of this map to ensure its accuracy. However, due to changes in data and the need to rely on outside information, the Department of Natural Resources cannot accept responsibility for errors or omissions, and therefore, there are no warranties that accompany this material.

Approximate Scale : 1:12,000

0 500 1,000 2,000 Feet

Date: 6/1/2023 Time: 2:44 PM

Legend

- Water Type Breaks (FP)
- Map Registration Tics
- 40 ft. Contours
- Type S
- Type F
- Type N, Np, Ns
- U, unknown
- X, non-typed per WAC 222-16
- Paved Road
- Unpaved Road/Surface Unknown
- Abandoned
- Orphaned
- Trail
- Railroad
- Railroad Grade
- County Boundaries
- County Tax Parcels
- Tribal Cultural Resource Contacts
- Fire Shutdown Zones
- SOSEA Boundaries
- Other Impoundments
- Open Freshwater
- Subject to Inundation
- Glacier / Snowfield
- Wet Area
- Open Saltwater
- Artificial Feature
- WAUs
- WRIA Boundaries
- Public Land Survey Sections
- Public Land Survey Townships

Appendix B
Wetland Delineation Methods

Port Townsend Evans Vista Housing Development: Appendix B

CONFLUENCE ENVIRONMENTAL COMPANY WETLAND DELINEATION METHODS

Prepared by:

Confluence Environmental Company
2023

146 N Canal St, Suite 111 • Seattle, WA 98103 • www.confenv.com

TABLE OF CONTENTS

This appendix describes the methods used to confirm the presence or absence of wetlands in a study area.

1.0 METHODOLOGIES

Confluence delineates the boundaries of wetlands using the "Routine Determinations for Areas Less Than 5 Acres in Size" method described by the U.S. Army Corps of Engineers (Corps) in the Corps of Engineers Wetlands Delineation Manual (Delineation Manual; Corps 1987) and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Regional Supplement; Corps 2010). The Regional Supplement was part of a nationwide effort to address regional wetland characteristics and improve the accuracy and efficiency of wetland-delineation procedures. The Regional Supplement uses the best available science to address regional differences in climate, geology, soils, hydrology, and plant and animal communities that cannot be addressed in a single national document, such as the Delineation Manual. The Regional Supplement was designed for use with the 1987 Delineation Manual and all subsequent versions. Where differences in the 2 documents occur, the Regional Supplement takes precedence over the 1987 Delineation Manual (Corps 2010). The Regional Supplement was developed to clarify the indicators of hydrophytic vegetation, hydric soils, and wetland hydrology found in the region (these indicators are discussed in detail in Section 2.0). It is important to note that areas that may have been determined to be wetlands under the 1987 Delineation Manual may not be determined to be wetlands under the Regional Supplement, and vice versa.

Confluence uses the PLANTS Database (NRCS 2023) for scientific names and the 2020 National Wetland Plant List (Corps 2020) to determine the wetland indicator status of plants. Wetlands are classified using the Cowardin Classification System (FGDC 2013). Confluence determines the wetland rating using Washington State Department of Ecology's Wetland Rating System for Western Washington (Hruby 2023). The National Wetland Inventory is also researched to determine if wetlands have previously been identified on the property (USFWS 2023).

The locations of test plots, soil cores, and wetland edges on a project property are recorded using a differential Global Positioning System with sub-meter accuracy. Delineated and surveyed wetland boundaries are subject to verification and approval by jurisdictional agencies.

2.0 WETLAND CRITERIA

There is specific technical language that applies to the study of wetlands. This section briefly explains the language Confluence uses in its wetland delineation reports.

The identification of wetlands is based on 3 criteria: hydrophytic vegetation, hydric soils, and hydrology. Each criterion has a number of indicators that can be used to determine whether the

criterion has been met. The Corps, which is the federal authority on the regulation of wetlands, has developed the guidance and the data form that are the standards used in all wetland determinations. The information presented below is based on their Delineation Manual (Corps 1987) and Regional Supplement (Corps 2010).

In order to confirm the presence of a wetland, data are collected from representative test plots chosen within and outside of a potential wetland. The test plots are representative of particular vegetative, topographic, and hydrologic features in the vicinity. Within the test plots particular data (see sections below) about vegetation, soils, and hydrology are collected to determine whether wetland characteristics are present. Plots that meet all 3 wetland criteria are wetland plots; plots that do not meet all 3 wetland criteria are upland (i.e., nonwetland) plots. The test plots (along with topographic and vegetative shifts) then inform the delineation of wetland boundaries.

2.1 Hydrophytic Vegetation

Vegetation is often the first visual cue that an area is a wetland. Similarly, vegetation often also signals the shift from wetland to upland. The question regarding plants to be answered when performing a wetland delineation is, "Is the vegetation hydrophytic?" That is, is the vegetation of the variety that is adapted to live in wetter-than-average conditions? To determine the answer, there are a few resources and steps to follow. First, the indicator status for each plant present in the test plot is determined from the National Wetland Plant List (Corps 2020). The indicator status is a continuum from almost exclusively occurring in wetlands (obligate wetland plants, or OBL) to almost never occurring in wetlands (obligate upland plants, or UPL). The middle ground between those 2 extremes is known as a facultative plant (or FAC), which is found equally in wetland and upland environments. The FAC category has 2 further gradations: facultative upland plants (FACU), which are plants that are usually found in uplands, and facultative wetland plants (FACW), which are plants that are usually found in wetlands.

After the status of each plant species in the test plot has been determined, the hydrophytic vegetation indicators can be applied. The application of the indicators is performed sequentially, and once one is "passed," the box for hydrophytic vegetation is checked, and the process continues to the next criterion. The first hydrophytic vegetation indicator is the "Rapid Test," which means with a quick visual survey, all the plants in the test plot are either OBL or FACW. The second test is the "Dominance Test." For the Dominance Test, the total number of dominant species in the test plot is divided by the number of species that are OBL, FACW, or FAC. The resulting percentage must be greater than 50 to pass this test. The third test is the "Prevalence Index." The Prevalence Index is a weighted average of the absolute cover of all the plant species present in the plot, regardless of dominance. There are also 2 other, less common,

indicators: morphological adaptations (e.g., buttressed trunks) and nonvascular plant species (e.g., sphagnum moss).

2.2 Hydric Soils

The soils tell the story about the presence of water over time. The National Technical Committee defines a hydric soil as, "A soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part" (USDA Soil Conservation Service 1994). The question to be answered here is, "Has water been present long enough and recently enough to form hydric soils?" In order to examine the soil characteristics, a test pit must be dug, usually to about 18 inches. A sliver of soil from the test pit is extracted with a shovel (i.e., the soil profile) to examine the layers. The thickness, color, texture, redoximorphic features, and any other interesting information about each layer are observed and recorded. Those features are described more fully below.

- **Thickness.** Layers are measured to the nearest inch. Usually, each soil profile has at least 2 layers.
- **Color.** Color is determined by comparison to a color chart. The industry standard is the Munsell Soil-Color Chart, which assigns each color a designation for hue, value, and chroma (e.g., 10YR 3/2, where 10YR=hue, 3=value, and 2=chroma).
- **Texture.** The precision of texture description for the purpose of wetland delineation is at a general scale. The Washington State University texture chart (Cogger 2010) is often used, but the delineator just needs to determine if the soil is sandy or loamy/clayey.
- **Redoximorphic Features.** The most common redoximorphic features are concentrations or depletions of iron in the soil matrix. Concentrations occur as red or yellow deposits, and depletions occur as grayish deposits.

When the soil profile is fully described, it can be determined whether any of the layers meets a hydric soil indicator. The presence of any hydric soil indicator signifies a hydric soil, although a soil may be hydric and not meet any of these indicators. There are 19 hydric soil indicators in our region, 2 of which were observed at the site (Corps 2010). Additional hydric soil terminology definitions are in the sidebar.

More Hydric Soils Definitions
(adapted from Corps 2010)

Matrix: the dominant soil volume in a given soil layer

Depleted Matrix: the volume of a soil horizon in which soil processes have removed or transformed iron, creating colors of low chroma and high value, specifically:

- Value ≥5, chroma = 1, with or without redoximorphic features
- Value ≥6, chroma = 1 or 2, with or without redoximorphic features
- Value of 4 or 5, chroma =2, ≥2% distinct or prominent redoximorphic features
- Value of 4, chroma =1, ≥2% distinct or prominent redoximorphic features

Distinct: readily seen, but contrasting* moderately with comparison color

Prominent: readily seen and contrasting* greatly with comparison color

*See Corps 2010, Table A1, page 130 for full key on contrast determinations.

- **A11—Depleted Below Dark Surface.** A soil layer with a depleted matrix, with 60% or more chroma of ≤2, which starts within 12 inches of the surface and is at least 6 inches thick. Layers above the depleted layer must have a value ≤3, and a chroma ≤2.

- **F6—Redox Dark Surface.** A soil layer at least 4 inches thick, entirely within the upper 12 inches of the soil with:

  - **matrix value ≤3, chroma ≤1, and 2%** or more distinct or prominent redoximorphic concentrations, or
  - **matrix value ≤3, chroma ≤2, and 5%** or more distinct or prominent redoximorphic concentrations.

2.3 Hydrology

Wetland hydrology is the broadest criterion and has to do with signs of saturation and inundation in the test plot. While hydrophytic vegetation and hydric soils are the result of hydrology, they remain even during the dry season, whereas wetland hydrology can be less apparent or absent during the dry season. The hydrology indicators are broad enough to encompass characteristics that may be present even during the dry season. Hydrology indicators are in 4 groups:

- Group A is based on direct observation of surface or ground water.
- Group B consists of evidence that the site is subject to inundation.
- Group C consists of other evidence that soil is or was saturated.
- Group D consists of landscape, vegetation, and soil characteristics indicating contemporary wet conditions.

The indicators are further divided into 2 categories: primary and secondary. A test plot must have either 1 primary or 2 secondary indicators to pass the hydrology criterion. Primary and secondary indicators observed during this delineation are recorded on the wetland delineation data forms in Appendix C.

3.0 REFERENCES

Cogger, C.G. 2010. Estimating soil texture flowchart. Washington State University Puyallup Research Center, Puyallup, Washington.

Corps (U.S. Army Corps of Engineers). 1987. Corps of Engineers Wetlands Delineation Manual. Corps Environmental Laboratory, Waterways Experiment Station, Technical Report Y-87-1, Vicksburg, Mississippi.

Corps. 2010. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region. U.S. Army Engineer Research and Development Center, ERDC/EL TR-08-13, Vicksburg, Mississippi.

Corps. 2020. National wetland plant list, version 3.5 [online document]. Corps Engineer Research and Development Center, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire. Available at: https://wetland-plants.sec.usace.army.mil/nwpl_static/v34/home/home.html.

FGDC (Federal Geographic Data Committee). 2013. Classification of wetlands and deepwater habitats of the United States. Second Edition. Wetlands Subcommittee, Federal Data Committee and U.S. Fish and Wildlife Service, Publication FGDC-STD-004-2013, Washington, D.C.

Hruby, T. 2023. Washington State wetland rating system for western Washington, 2014 update. Washington State Department of Ecology, Publication #14-06-029, Olympia, Washington.

NRCS (Natural Resources Conservation Service). 2023. The PLANTS database [online database]. U.S. Department of Agriculture, NRCS, National Plant Data Team, Greensboro, North Carolina. Available at: https://plants.sc.egov.usda.gov/java/ (accessed on June 1, 2023).

USDA (U.S. Department of Agriculture) Soil Conservation Service. 1994. Changes in hydric soils of the United States. Federal Register 59(133): 35680-35681, July 13, 1994.

USFWS (U.S. Fish and Wildlife Service). 2023. National wetlands inventory wetlands mapper [online database]. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. Available at: https://www.fws.gov/wetlands/Data/Mapper.html (accessed on June 1, 2023).

Appendix C
Wetland Delineation Data Forms

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Evans Vista City/County: Port Townsend Sampling Date: 5/15/23
Applicant/Owner: Port Townsend State: WA Sampling Point: TP-1
Investigator(s): AAM / AHM Section, Township, Range:
Landform (hillslope, terrace, etc.): Local relief (concave, convex, none): concave Slope (%): 0
Subregion (LRR): A Lat: 48.10102°N Long: 122.80821°W Datum: WGS84
Soil Map Unit Name: NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ 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 ____	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____	No ____	
Wetland Hydrology Present?	Yes ____	No ____	

Remarks:
Sunny. good light for coloring soils

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. red alder	80	✓	FAC
2.			
3.			
4.			
	80 = Total Cover		

Sapling/Shrub Stratum (Plot size: 10')			
1. D. spirea	40	✓	FACW
2. Snowberry	60	✓	FACU
3. Him. blackberry	10		FAC
4. Nootka rose	10		
5.			
	120 = Total Cover		

Herb Stratum (Plot size: ____)			
1. bracken fern	5	✓	FACU
2. Vetch	1		FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	6 = Total Cover		

Woody Vine Stratum (Plot size: 10')			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum ____

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 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

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 ____

Remarks:

SOIL

Sampling Point: TP-1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 2/1	100					loam	
8-11+	10YR 4/3	100					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)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky 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)
- ___ 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 ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of 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 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 _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No indicators observed

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Evans Vista City/County: Port Townsend Sampling Date: 5/15/23
Applicant/Owner: Port Townsend State: WA Sampling Point: TP-2
Investigator(s): KAM/[illegible] Section, Township, Range:
Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): none Slope (%): 5%
Subregion (LRR): A Lat: 48.10122°W Long: 122.80967°W Datum: WGS 84
Soil Map Unit Name: NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ 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 ____	**Is the Sampled Area within a Wetland?** Yes ____ No ✓
Hydric Soil Present?	Yes ____	No ✓	
Wetland Hydrology Present?	Yes ____	No ✓	

Remarks:

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30)			
1. western red cedar	100	✓	FAC
2.			
3.			
4.			
	100 = Total Cover		
Sapling/Shrub Stratum (Plot size: 10')			
1. Salal	5	✓	FACU
2.			
3.			
4.			
5.			
	5 = Total Cover		
Herb Stratum (Plot size: 10')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	0 = Total Cover		
Woody Vine Stratum (Plot size: 10')			
1.			
2.			
	0 = Total Cover		

% Bare Ground in Herb Stratum 100

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 ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

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 ____

Remarks:

SOIL

Sampling Point: TP-2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-7	10YR 2/1	100					Sandy loam	
7-12+	10YR 3/2	100					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)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky 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)
- ___ 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: roots - too many to dig too large to dig

Depth (inches): 7

Hydric Soil Present? Yes ___ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of 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 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 ___ Depth (inches): ___

Water Table Present? Yes ___ No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___

Wetland Hydrology Present? Yes ___ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No indicators observed

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Evans Vista City/County: Port Townsend Sampling Date: 5/15/23
Applicant/Owner: Port Townsend State: WA Sampling Point: TP-3
Investigator(s): KAM/AHM Section, Township, Range:
Landform (hillslope, terrace, etc.): — Local relief (concave, convex, none): Concave Slope (%): 0
Subregion (LRR): A Lat: 48.10151 °N Long: 122.80871 °W Datum: WGS 84
Soil Map Unit Name: NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ 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 ✓	Is the Sampled Area within a Wetland? Yes ____ No ✓
Hydric Soil Present?	Yes ✓	No ____	
Wetland Hydrology Present?	Yes ____	No ✓	

Remarks:
transition area

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. D fir.	20	✓	FACU
2.			
3.			
4.			
	20 = Total Cover		

Sapling/Shrub Stratum (Plot size: 10')			
1. H. blackberry	45	✓	FAC
2. Nootka rose	40	✓	FAC
3. Snowberry	5		FACU
4. Salal	5		FACU
5. Ocean spray	5		FACU
	____ = Total Cover		

Herb Stratum (Plot size: 10')			
1. Sword fern	5	✓	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	5 = Total Cover		

Woody Vine Stratum (Plot size: 10')			
1.			
2.			
	0 = Total Cover		

% Bare Ground in Herb Stratum 0

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across All Strata: 4 (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	x 1 =	0
FACW species	0	x 2 =	0
FAC species	85	x 3 =	255
FACU species	40	x 4 =	160
UPL species	0	x 5 =	0
Column Totals:	125 (A)		415 (B)

Prevalence Index = B/A = 3.32

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 ✓

Remarks:

SOIL

Sampling Point: TP-3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-7	10YR 3/1	100					silt loam	
7-12	10YR 3/2	30					loam	
	10YR 3/1	60	10YR 4/6	10	C	M	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)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky 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)
- ___ 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 ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of 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 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 ✓ Depth (inches): _____

Water Table Present? Yes ___ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ___ No ✓ Depth (inches): _____

Wetland Hydrology Present? Yes ___ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Soils moist but not saturated

No indicators observed

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Evans Vista City/County: Port Townsend Sampling Date: 5/15/23

Applicant/Owner: Port Townsend State: WA Sampling Point: TP-4

Investigator(s): KAM/AHM Section, Township, Range: —

Landform (hillslope, terrace, etc.): — Local relief (concave, convex, none): Concave Slope (%): —

Subregion (LRR): A Lat: 48.10152°N Long: 122.80846°W Datum: NAD84

Soil Map Unit Name: — NWI classification: —

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ 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 ____	**Is the Sampled Area within a Wetland?** Yes ✓ No ____
Hydric Soil Present?	Yes ✓	No ____	
Wetland Hydrology Present?	Yes ✓	No ____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Douglas fir	10		FACU
2. Red alder	80	✓	FAC
3. willows	10		FAC
4.			
	100	= Total Cover	

Sapling/Shrub Stratum (Plot size: 10')			
1. Nootka rose	40	✓	FAC
2. H. blackberry	10		FAC
3. salal	5		FACU
4. snowberry	3		FACU
5.			
	57	= Total Cover	

Herb Stratum (Plot size: 10')			
1. bracken fern	3		FACU
2. sword fern	10	✓	FACU
3. slough sedge	10	✓	OBL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	23	= Total Cover	

Woody Vine Stratum (Plot size: ____)			
1. trailing blackberry	50	✓	FACU
2.			
	50	= Total Cover	

% Bare Ground in Herb Stratum 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 60 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: (A)		(B)

Prevalence Index = B/A = ____

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 ____

Remarks:

SOIL

Sampling Point: TP 4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-9	10YR 2/1	100					loam	
9-13+	10YR 3/1	85	5YR 4/6	15	C	M	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)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky 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)
- ___ 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 ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of 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 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 ___ Depth (inches): _____

Water Table Present? Yes ___ No ___ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): 9"

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Evans Vista City/County: Port Townsend Sampling Date: 5/15/23
Applicant/Owner: Port Townsend State: WA Sampling Point: TP-5
Investigator(s): KAM / AHM Section, Township, Range:
Landform (hillslope, terrace, etc.): A Local relief (concave, convex, none): Concave Slope (%): 0
Subregion (LRR): Lat: 48.10122 °N Long: 122.80727 °W Datum: WGS 84
Soil Map Unit Name: NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ 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 ____	**Is the Sampled Area within a Wetland?** Yes ____ No ✓
Hydric Soil Present?	Yes ✓	No ____	
Wetland Hydrology Present?	Yes ✓	No ____	

Remarks:
Small, recently excavated depression (seen on aerial). Not wet because area excavated out of previous upland area (TP-6 = representative)

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: 10')			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: 10')			
1. soft rush	20	✓	FACW
2. Veronica	20	✓	FACW
3. curly dock	10		FAC
4. bull thistle	5		FACU
5. Agrostis spp.	5		FAC
6. daisy	1		
7.			
8.			
9.			
10.			
11.			
	60% = Total Cover		
Woody Vine Stratum (Plot size: 10')			
1.			
2.			
	0 = Total Cover		

% Bare Ground in Herb Stratum 40%

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 ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

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 ____

Remarks:

SOIL

Sampling Point: TP-5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-11	10YR 2/1	100					loam	
11-16+	10YR 4/1	98	10YR 5/6	2	C	M	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)
- ✓ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky 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)
- ___ 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 ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of 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 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 ___ Depth (inches): _____

Water Table Present? Yes ___ No ___ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): 0

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Evans Vista City/County: Port Townsend Sampling Date: 5/13/23

Applicant/Owner: Port Townsend State: WA Sampling Point: TP-6

Investigator(s): Kami AHM Section, Township, Range: —

Landform (hillslope, terrace, etc.): — Local relief (concave, convex, none): none Slope (%): —

Subregion (LRR): A Lat: 48.10122°N Long: 122.80712°W Datum: WGS 84

Soil Map Unit Name: — NWI classification: —

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ 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 ____	**Is the Sampled Area within a Wetland?** Yes ____ No ✓
Hydric Soil Present?	Yes ____	No ✓	
Wetland Hydrology Present?	Yes ____	No ✓	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: 10')			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: 10')			
1. poa sp.	50	✓	FAC
2. agrostis sp.	50	✓	FAC
3. Bull thistle	5		FACU
4. daisy	3		
5. curly dock	3		FAC
6. vetch	3		FAC
7.			
8.			
9.			
10.			
11.			
	114 = Total Cover		
Woody Vine Stratum (Plot size: 10')			
1.			
2.			
	0 = Total Cover		

% Bare Ground in Herb Stratum 0

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 ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

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 ____

Remarks:

SOIL

Sampling Point: TP-6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 2/1	60					loam	
	10YR 3/3	40						

[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 Mucky 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)
- ___ 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 ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of 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 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 _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (Includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No indicators observed

Appendix D
Wetland Rating Forms

Wetland name or number Wetland A

RATING SUMMARY – Western Washington

Name of wetland (or ID #): Wetland A Date of site visit: 5/15/2023

Rated by K. McArthur, A. Michniak Trained by Ecology? ☑ Yes ☐ No Date of training Mar-23

HGM Class used for rating Depressional & Flats Wetland has multiple HGM classes? ☐ Yes ☑ No

NOTE: Form is not complete with out the figures requested (*figures can be combined*).
Source of base aerial photo/map Esri, Maxar, Earthstar Geographics

OVERALL WETLAND CATEGORY III (based on functions ☑ or special characteristics ☐)

1. Category of wetland based on FUNCTIONS

_____ **Category I** - Total score = 23 - 27
_____ **Category II** - Total score = 20 - 22
_____ **Category III** - Total score = 16 - 19
X **Category IV** - Total score = 9 - 15

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
	List appropriate rating (H, M, L)			
Site Potential	M	M	L	
Landscape Potential	M	L	H	
Value	M	L	L	**Total**
Score Based on Ratings	6	4	5	**15**

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**

Wetland name or number Wetland 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	1
Hydroperiods	D 1.4, H 1.2	2
Location of outlet (*can be added to map of hydroperiods*)	D 1.1, D 4.1	2
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	D 2.2, D 5.2	2
Map of the contributing basin	D 4.3, D 5.3	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	4
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	5
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	D 3.3	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 another figure*)	S 4.1	
Boundary of area within 150 ft of the wetland (*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	

HGM Classification of Wetland in Western Washington

For questions 1 -7, the criteria described must apply to the entire unit being rated.
If 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.

☑ 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.*

NOTES and FIELD OBSERVATIONS:

Wetland name or number Wetland 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). Wetland has an intermittently flowing stream or ditch, OR highly constricted permanently flowing outlet. ☐ Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing ☐ Wetland is a flat depression (QUESTION 7 on key), whose outlet is a permanently flowing ditch.	points = 3 points = 2 points = 1 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 Wetland has persistent, ungrazed, plants > ½ of area Wetland has persistent, ungrazed plants > $^1/_{10}$ of area Wetland has persistent, ungrazed plants < $^1/_{10}$ of area	points = 5 points = 3 points = 1 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 Area seasonally ponded is > ¼ total area of wetland Area seasonally ponded is < ¼ total area of wetland	points = 4 points = 2 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** ☑ **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	0
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 Homeless Encampments/human waste	Yes = 1 No = 0	1
Total for D 2	Add the points in the boxes above	**1**

Rating of Landscape Potential If score is: ☐ **3 or 4 = H** ☑ **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	0
Total for D 3	Add the points in the boxes above	**1**

Rating of Value If score is: ☐ **2 - 4 = H** ☑ **1 = M** ☐ **0 = L** *Record the rating on the first page*

Wetland name or number Wetland 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	4
Wetland has an intermittently flowing stream or 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	
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	3
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	
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	3
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	
Total for D 4	Add the points in the boxes above	**10**

Rating of Site Potential If score is: ☐ **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 function of the site?

D 5.1. Does the wetland unit 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	0
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	**0**

Rating of Landscape Potential If score is: ☐ **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. 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	0
☐ • 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	
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	**0**

Rating of Value If score is: ☐ **2 - 4 = H** ☐ **1 = M** ☑ **0 = L** *Record the rating on the first page*

Wetland name or number Wetland A

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
- ☐ Emergent
- ☐ Scrub-shrub (areas where shrubs have > 30% cover)
- ☑ Forested (areas where trees have > 30% cover)

4 structures or more: points = 4
3 structures: points = 2
2 structures: points - 1
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

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 ¼ ac to count (*see text for descriptions of hydroperiods*).

- ☐ Permanently flooded or inundated
- ☑ Seasonally flooded or inundated
- ☐ Occasionally flooded or inundated
- ☑ Saturated only

4 or more types present: points = 3
3 types present: points = 2
2 types present: points = 1
1 types 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***

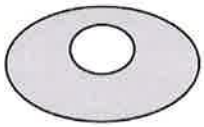
If you counted:
- > 19 species — points = 2
- 5 - 19 species — points = 1
- < 5 species — points = 0

1

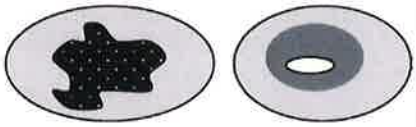
H 1.4. Interspersion of habitats

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 = 0 points



Low = 1 point



Moderate = 2 points

All three diagrams in this row are **HIGH** = 3 points

1

Wetland name or number Wetland A

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*) ☑ Invasive plants cover less than 25% of the wetland area in every stratum of plants (*see H 1.1 for list of strata*)	2
Total for H 1 Add the points in the boxes above	**6**

Rating of Site Potential If Score is: ☐ **15 - 18 = H** ☐ **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 function of the site?	
H 2.1 Accessible habitat (include *only habitat that directly abuts wetland unit*). *Calculate:* 15 % undisturbed habitat + (50 % moderate & low intensity land uses / 2) = 40% 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	3
H 2.2. Undisturbed habitat in 1 km Polygon around the wetland. *Calculate:* 30 % undisturbed habitat + (50 % moderate & low intensity land uses / 2) = 55% 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	3
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 1km Polygon is high intensity points = 0	0
Total for H 2 Add the points in the boxes above	**6**

Rating of Landscape Potential If Score is: ☑ **4 - 6 = H** ☐ **1 - 3 = M** ☐ **< 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 ☐ 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) with in 100m points = 1 Site does not meet any of the criteria above points = 0	0

Rating of Value If Score is: ☐ **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*).
- ☐ **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*).
- ☐ **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.
- ☐ **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 Wetland A

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Wetland Type *Check off any criteria that apply to the wetland. List 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**	
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**	
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 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 to SC 2.4** ☑ No = **Not 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 WHCV**	
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**	

Wetland name or number Wetland 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**

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**

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**

Category of wetland based on Special Characteristics

If you answered No for all types, enter "Not Applicable" on Summary Form: Not Applicable

CONFLUENCE
ENVIRONMENTAL COMPANY

Wetland A Cowardin Class

Forested

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 50 Feet

N

CONFLUENCE
ENVIRONMENTAL COMPANY

Wetland A Hydroperiod

- Saturated Only
- Seasonally flooded or inundated
- Weland A 150 foot Boundary

Note: Wetland A has no outlet.

0 75 Feet

N

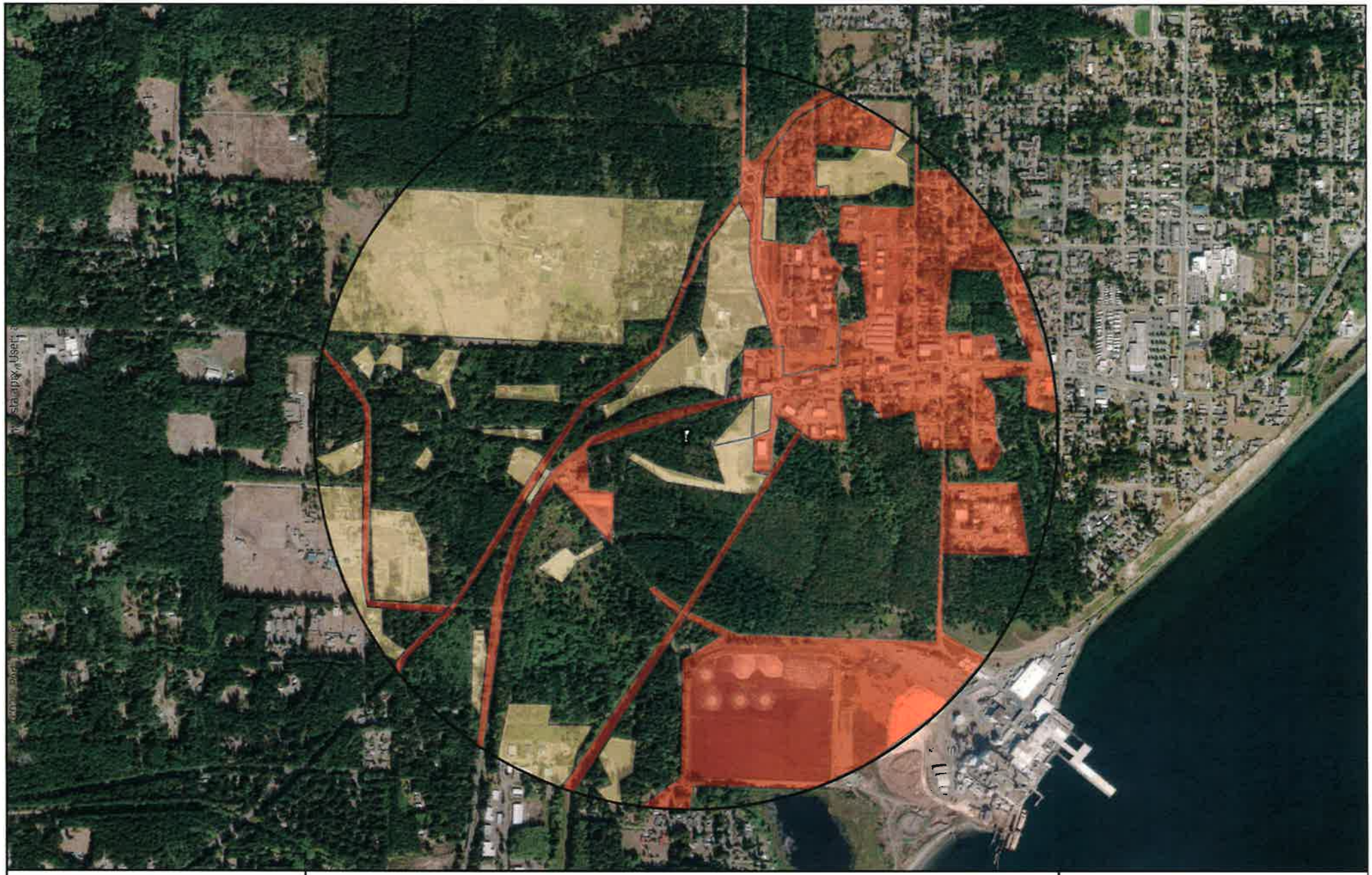
CONFLUENCE
ENVIRONMENTAL COMPANY

Wetland A

Wetland A Contributing Basin

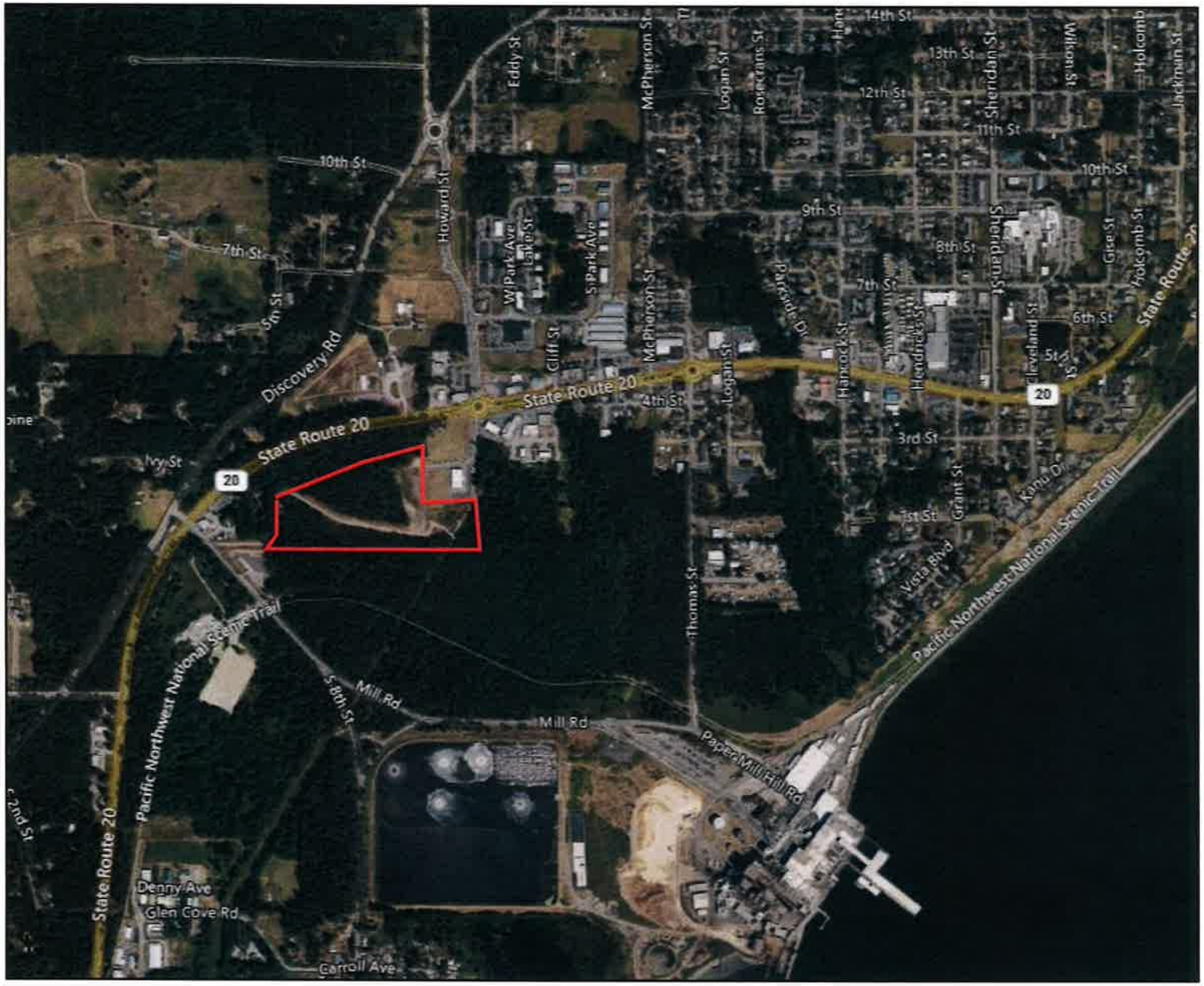
0 100 Feet

N


Wetland A
Wetland A 1km Buffer
Land Use Intensity
High Intensity
Moderate/Low Intensity
Note: unshaded areas represent relatively undisturbed habitat.
CONFLUENCE
ENVIRONMENTAL COMPANY
0
1,000
Feet
N

June 2, 2023

Water Quality Atlas



Assessed Water/Sediment

Water
- Category 5 - 303d
- Category 4C
- Category 4B
- Category 4A
- Category 2
- Category 1

Sediment
- Category 5 - 303d
- Category 4C
- Category 4B
- Category 4A
- Category 2
- Category 1

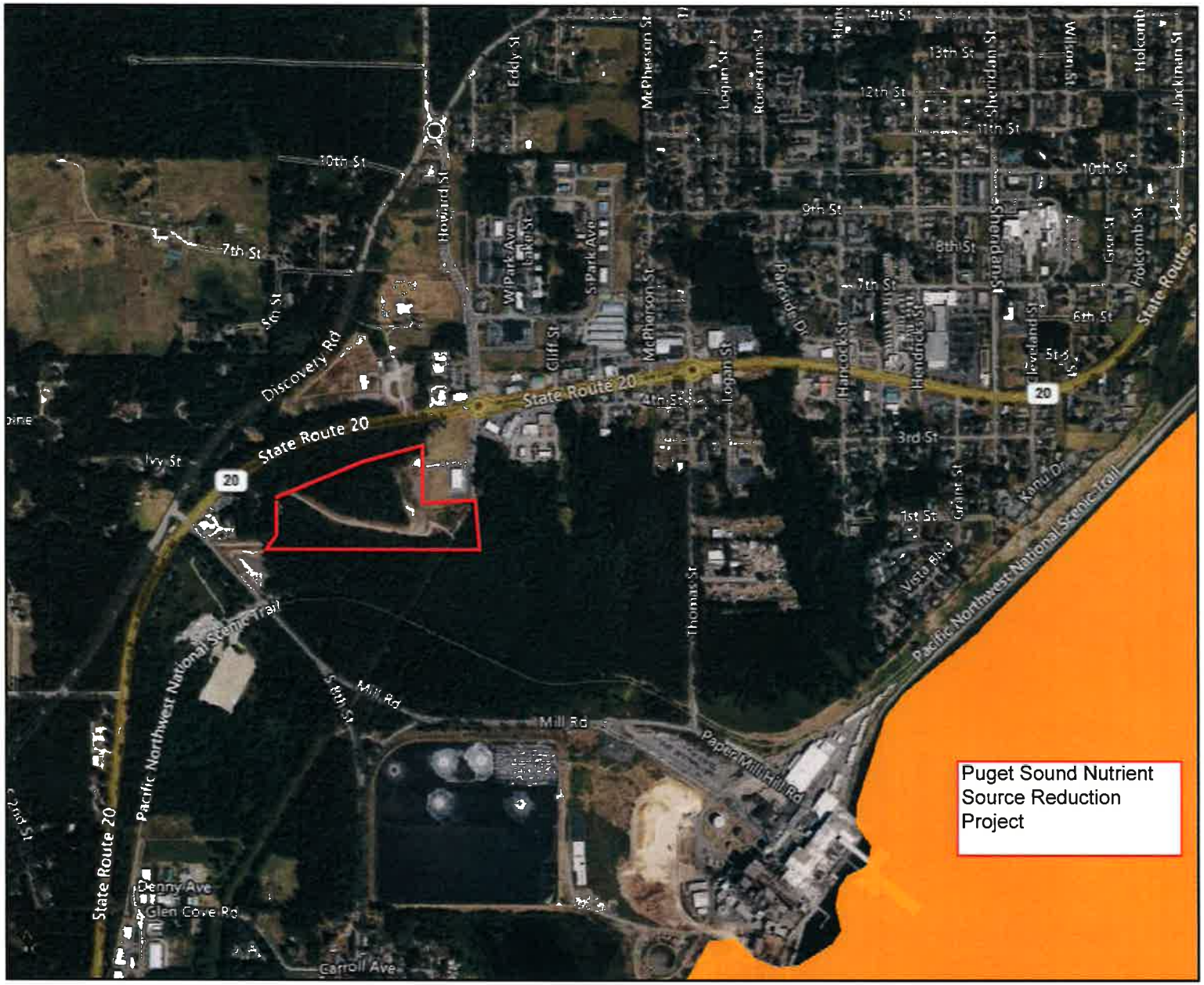
Miles
0 0.1 0.2 0.4

Esri Community Maps Contributors, Island County, WA State Parks GIS, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, US Census Bureau, USDA

DEPARTMENT OF ECOLOGY
State of Washington

June 2, 2023

Water Quality Atlas



WQ Improvement Projects
- Approved
- In Development

Miles
0 0.1 0.2 0.4

Esri Community Maps Contributors, Island County, WA State Parks GIS, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, US Census Bureau, USDA

DEPARTMENT OF ECOLOGY
State of Washington

Appendix E
Site Photographs

Photo 1. Soil profile at test plot (TP-1)

Photo 2. View from TP-1 facing north

Photo 3. Soil profile at TP-2

Photo 4. View from TP-2 facing east

Photo 5. Soil profile at TP-3

Photo 6. View of TP-3 facing east

Photo 7. Soil profile at TP-4

Photo 8. View from TP-4 facing west

Photo 9. Soil profile at TP-5

Photo 10. View of TP-5 facing north

Photo 11. Soil profile at TP-6

Photo 12 View of TP-6 facing northwest

Photo 13. Stormwater retention pond facing northeast

Photo 14. View from stormwater retention pond facing southwest

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