Attachment 5

Drainage Design Report

PREPARED FOR:

Mr. Matt Lewis
Garrette Homes
4802 Tacoma Mall Boulevard
Tacoma, WA 98409

PROJECT:

Springwood Garden Preliminary Plat
1609 Springwood Avenue NE
Olympia, WA 98506
2240545.10

PREPARED BY:

Chris Flyckt, PE
Project Engineer

REVIEWED BY:

J. Matthew Weber, PE
Principal

DATE

January 2025
Revised December 2025

Drainage Design Report

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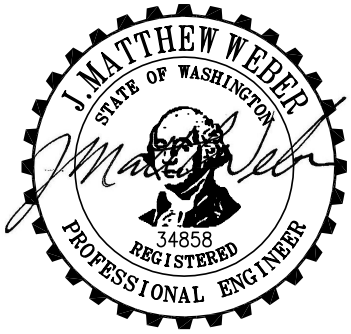
Chris Flyckt, PE
Project Engineer

REVIEWED BY:

J. Matthew Weber, PE
Principal

DATE

January 2025
Revised December 2025



12/02/2025

I hereby state that this Drainage Design Report for the Springwood Garden Preliminary Plat project has been prepared by me or under my supervision and meets the standard of care and expertise which is usual and customary in this community for professional engineers. I understand that the City of Olympia does not and will not assume liability for the sufficiency, suitability, or performance of drainage facilities prepared by me.

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1.0 Proposed Project Description

This Drainage Design Report accompanies the plat submittal for the Springwood Garden plat project. The proposed project is located on Tax Parcel No. 0968007300. The site address is 1609 Springwood Avenue NE, Olympia, Washington. The site is located in a portion of O'Bryant DLC No. 40, Township 18 North, Range 2 West, Willamette Meridian, Thurston County Washington. The parcel is approximately 7.06 acres. The site is currently bounded by residential development to the south, east, and west, and by Springwood Avenue NE to the north. The site is currently zoned Residential 4-8 Units per Acre (R 4-8). Refer to the legal description for the site below:

> PER QUIT CLAIM DEED, RECORDED UNDER RECORDING NUMBER 4917908, RECORDS OF THURSTON COUNTY:
>
> PARCEL B OF BOUNDARY LINE ADJUSTMENT NO. SS-5328, AS RECORDED DECEMBER 3, 1984, UNDER AUDITOR'S FILE NO. 8412020032.

This report demonstrates that the stormwater design for this project meets the requirements of the 2022 City of Olympia *Drainage Design and Erosion Control Manual (DDECM).*

The proposed project is considered New Development, and the following thresholds apply to the project:

- Results in 5,000 square feet or greater of new plus replaced hard surface area.
- Converts 0.75 acre or more of vegetation to lawn or landscaped areas, or
- Converts 2.5 acres or more of native vegetation to pasture.

Refer to the completed Flow Chart for Determining Requirements for New Development below.

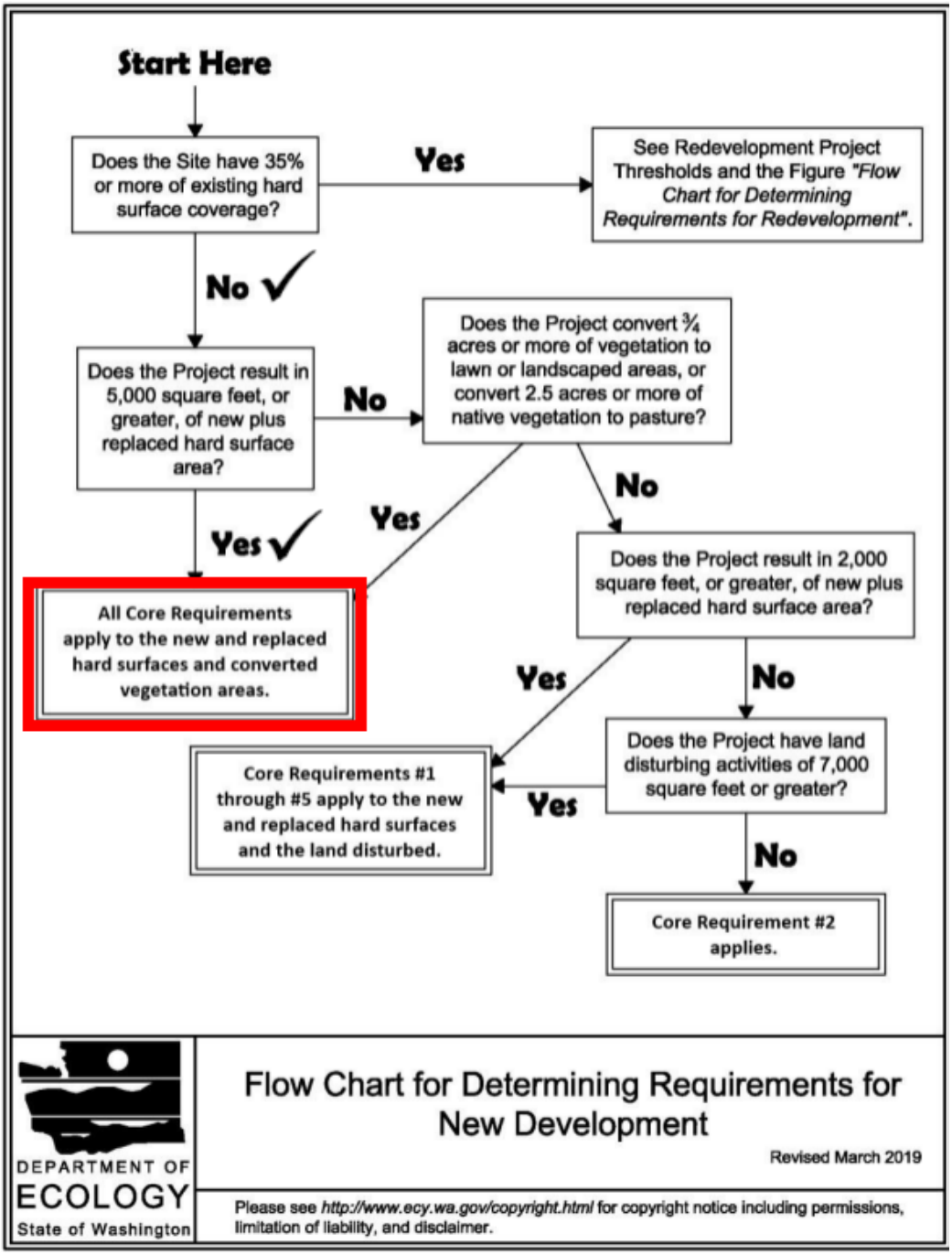


Figure 1: Flow Chart for Determining Core Requirements for New Development

1.1 Summary of Core Requirements

The proposed project is a 7.06-acre, single-family, residential subdivision consisting of 39 residential lots. The project includes erosion control, grading, surfacing, sewer, water, and storm drainage improvements. Road improvements include extension of existing roadways, Marion Street East and Central Street NE, frontage improvements to Springwood Avenue NE and the creation of a new internal plat road (Road A). A system of catch basins and subsurface storm piping will be used to convey runoff. All Core Requirements (CR) apply to the project.

1.1.1 CR 1 – Preparation of Stormwater Site Plans

This report and the project plans represent the Stormwater Site Plan for this project and satisfy CR 1.

1.1.2 CR 2 - Construction Stormwater Pollution Prevention

A Construction Stormwater Pollution Prevention Plan (SWPPP) has been submitted with this application and satisfies CR 2.

1.1.3 CR 3 – Source Control of Pollution

The proposed project is required to provide source control of pollution. The following are proposed measures to be implemented as part of the civil plans.

- All pollutants, including waste materials and demolition debris created onsite during construction, shall be handled and disposed of in a manner that does not cause contamination of surface water.
- All mandatory source control Best Management Practices (BMPs) listed is Chapter IV-4 of Volume IV in the 2022 *DDECM* will be followed.
- Cover, containment, and protection from vandalism shall be provided for all chemicals, liquid products, petroleum products, and non-inert wastes present on the site (see Chapter 173-304 WAC for the definition of inert waste).
- Maintenance and repair of heavy equipment and vehicles that may result in discharge or spillage of pollutants to the ground or into surface water runoff must be conducted using spill prevention measures such as drip pans.
- Construction Demolition (BMP S438) and Concrete Pouring, Concrete Cutting, and Asphalt Application at Temporary Sites (BMP S112) shall be used to prevent or treat contamination of surface water runoff by pH modifying sources.

The Construction SWPPP will provide additional details on the control of pollution during construction.

1.1.4 CR 4 – Preservation of Natural Drainage Systems and Outfalls

Runoff from the site generally sheet flows from north to south and east to west, and discharges to the neighboring property's low point located in the southwest corner of the site. Onsite stormwater is proposed to be collected by catch basins and conveyed via underground pipes to a combined detention/wet pond located in the southwest portion of the site. This water will then be discharged via a dispersion trench located at a natural low point of the site outside the wetland buffer. The natural drainage system will be preserved, as no alteration to the preexisting runoff course is proposed.

1.1.5 CR 5 – Onsite Stormwater Management

The project will use the list approach compliance method to meet CR 5. Per the flow chart below, BMPs will be evaluated per List #2.

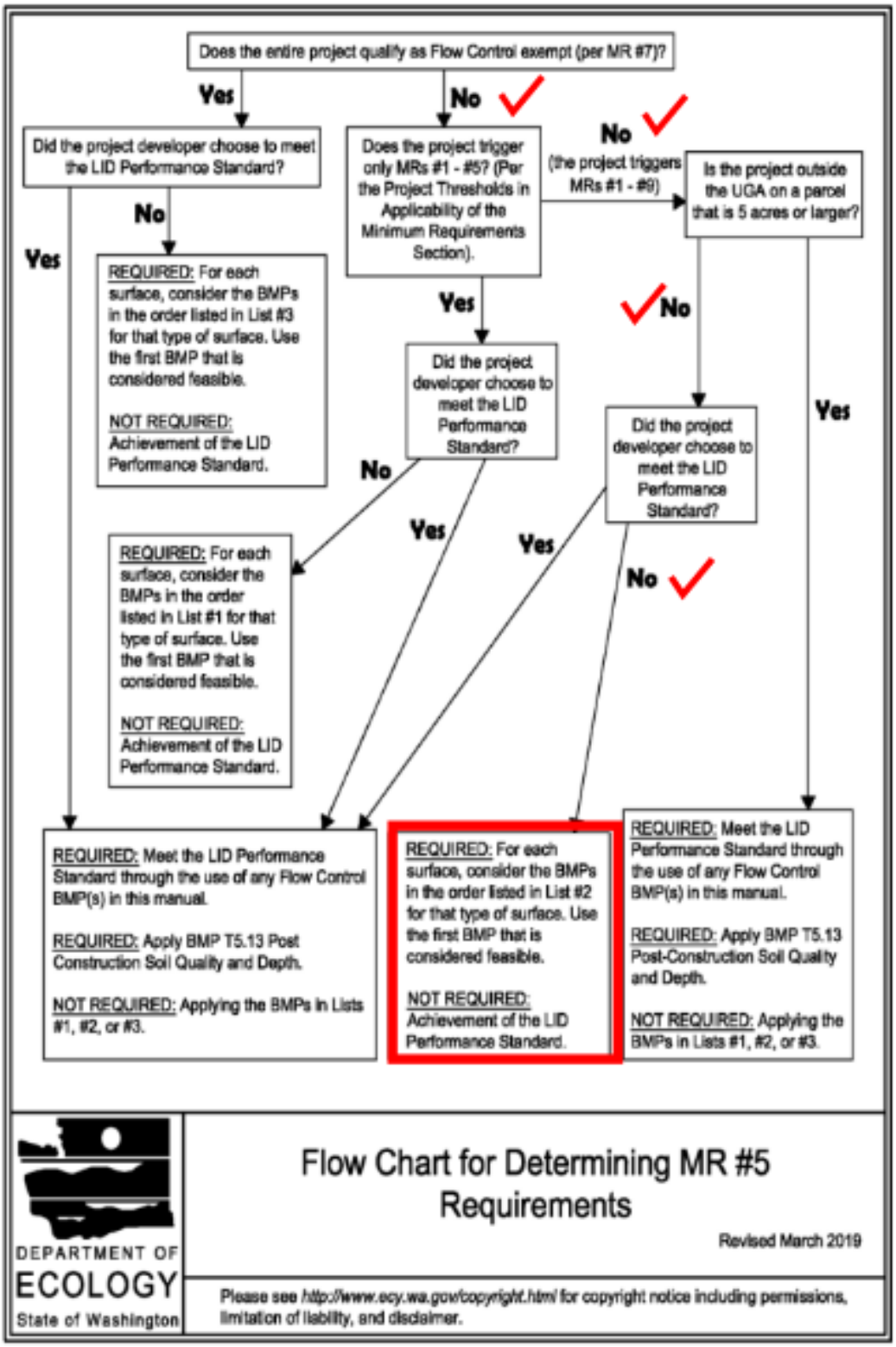


Figure 2: Flow Chart for Determining MR #5 Requirements

List #2 BMP Evaluation Criteria:

Surface Type: Lawn and Landscape Areas

BMP T5.13: Post-Construction Soil Quality and Depth – This BMP will be applied to all disturbed lawn and landscape areas.

No further BMPs are proposed.

Surface Type: Roofs

1. BMP T5.30: Full Dispersion or BMP T5.10A: Downspout Full Infiltration – The project will fully infiltrate roof runoff through the use of a combination of the reservoir course under the permeable driveways and shallow infiltration trenches located in the rear yards.

   No further BMPs are proposed.

Surface Type: Other Hard Surface

1. BMP T5.30: Full Dispersion – The layout of the project does not allow for a long enough dispersion flow path to be able to implement full dispersion to other hard surfaces.

2. BMP T5.15: Permeable Pavements – Driveways for every lot on the project will be constructed of pervious pavement.

   No further BMPs are proposed.

This satisfies the requirements of CR 5 – Onsite Stormwater Management.

1.1.6 CR 6 – Runoff Treatment

Over 5,000 square feet of pollution generating impervious surface (PGIS) will be added as part of these improvements; therefore, runoff treatment is required for this site. The breakdown of pollution generating hard surface is summarized in the table below. Refer to Appendix B-2 for developed basin map.

Table 1 – Project Land Use Types

Land Use	Forest (AC)	Lawn (AC)	Roof (AC)	Driveways (AC)	Road (AC)	Sidewalks (AC)	Combined (AC)
Onsite Area	0.46	2.21*	0.28	0.07	1.26	0.36	4.64
On-Lot Mitigation	-	0.98*	1.5	0.62**	-	-	3.10

** Lawn areas modeled as pasture, per post-construction soil quality and depth BMP T5.13 runoff model representation criteria.*

*** Permeable driveways.*

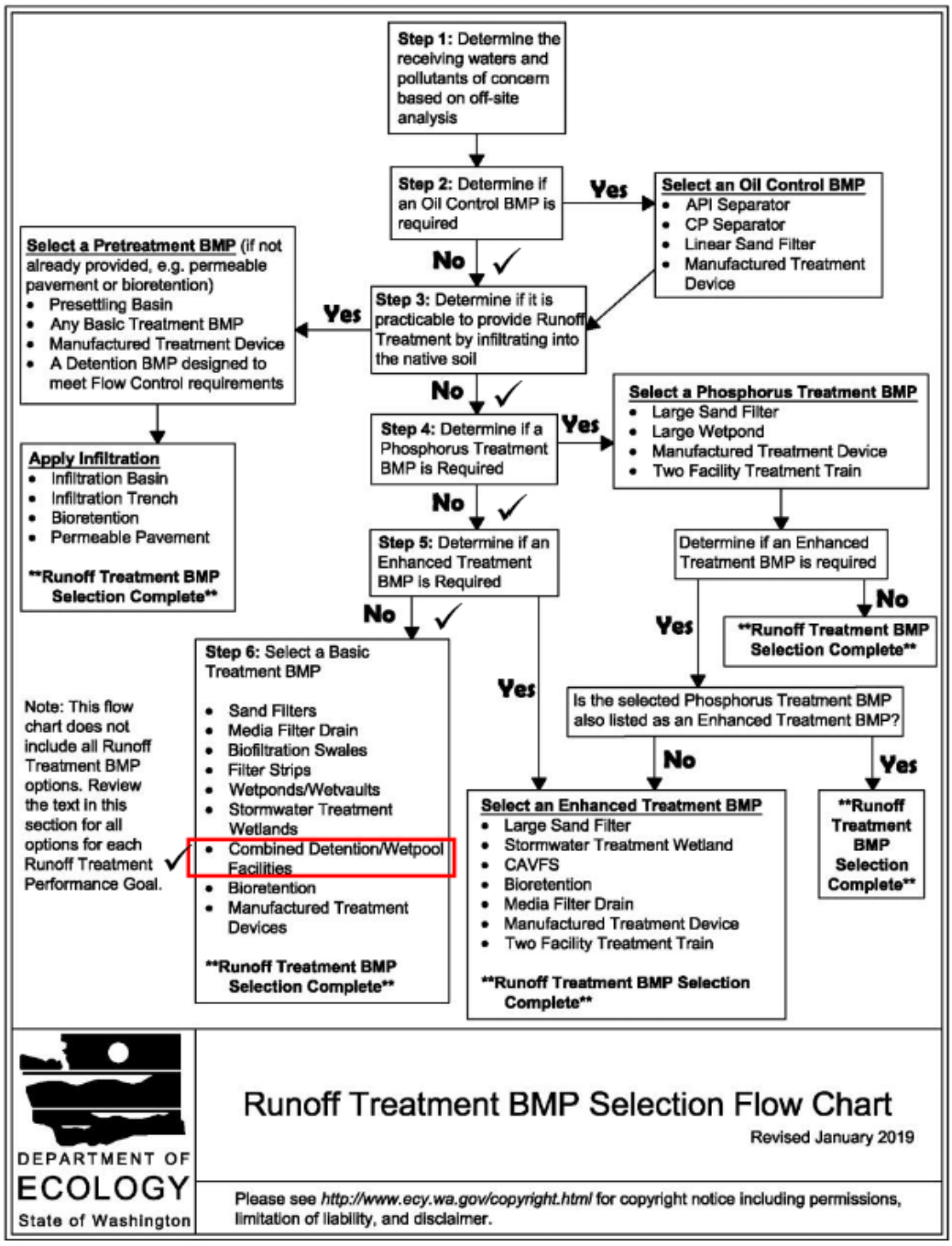


Figure 3: Runoff Treatment BMP Selection Flow Chart

The following is a discussion of the treatment decision factors through each step of the flow chart:

Step 1: The primary pollutants of concern include sediment, hydrocarbons from motor vehicles, and limited herbicides/pesticides. This is a residential area with minimal anticipated pollution loading.

Step 2: The project is residential in nature and will not trigger oil control requirements.

Step 3: Infiltration tests have shown that infiltration is not feasible in the area proposed for the combined detention/wet pond facility.

Step 4: The project site is not located within a watershed requiring phosphorous treatment.

Step 5: The project is residential in nature and will not produce a high AADT, nor does it propose to infiltrate into a wellhead protection area. As such, enhanced treatment is not required.

Step 6: A combined detention/wet pond facility has been selected to provide basic treatment for the project.

The onsite road will be collected via catch basins and conveyed to a combination detention/ wet pond. The pond will be sized to accommodate the full water quality design volume.

Roof runoff will be fully infiltrated into the soils beneath the pervious driveways on each lot.

This satisfies the requirements of CR 6 – Runoff Treatment.

1.1.7 CR 7 – Flow Control

The project exceeds the thresholds for new development projects and must provide flow control. The runoff from the onsite roads will be collected and conveyed to the proposed combination detention/wet pond. Stormwater will be released from this pond at a rate meeting the flow control standard sized using the Western Washington Hydrology Model (WWHM 2012) continuous modeling. All runoff from the roofs and driveways will be fully infiltrated beneath the pervious driveways on each lot.

This satisfies the requirements of CR 7 – Flow Control.

1.1.8 CR 8 – Wetlands Protection

The project will not discharge directly or indirectly through a conveyance system to a wetland. As such, no additional wetlands protection is applicable to the project.

This satisfies the requirements of CR 8 – Wetland Protection.

1.1.9 CR 9 – Operation and Maintenance

An Operations and Maintenance Manual will be provided under separate cover with the final engineering plans for this project.

This satisfies the requirements of CR 9 – Operations and Maintenance.

2.0 Existing Conditions Description

The site is currently developed with a single-family home, various outbuildings (including sheds), and yard art. The eastern half the property is heavily wooded, while the western half includes the residence, yard, driveway, and what appears to be pasture area. The site is generally flat but slopes near the southwestern corner of the site at an approximate 5% grade.

2.1 Offsite Drainage to the Property

Approximately 1.45 acres of offsite runoff enters the eastern portion of the site. This runoff will be intercepted by a gravel infiltration trench located in the backyards of the eastern lots. The trench will capture and infiltrate runoff to the maximum extent feasible. In the event of a 100-year storm, it is possible that runoff will overwhelm the infiltrative capacity of the system. An emergency

overflow will be provided that will send water to the conveyance system proposed in Springwood Avenue NE. This water is only included in the model to size the infiltration trench and is not considered for the flow control aspect of the project because any potential runoff would only occur above the full 50-year storm.

An additional 3.29 acres of offsite runoff from the north enters Springwood Avenue NE. This runoff will be captured by the conveyance system in the right-of-way, at which point it will discharge to the combined detention/wet pond, along with the remainder of site runoff. This area of runoff has been included in the model to meet the flow control requirement of the project because the runoff from this area is less than 50% of the 100-year runoff generated from the site.

2.2 Creeks, lakes, ponds, wetlands, ravines, gullies, steep slopes, springs, and other environmentally sensitive areas on or down gradient of the property.

An existing wetland is located downgradient of the southwestern corner of the site. The extents of the wetland are entirely offsite; however, the buffer enters the site and is entirely contained within a proposed wetland tract. No stormwater infrastructure or conveyance systems are proposed within this buffer.

2.3 Is the project located in an aquifer recharge area or wellhead protection area, as defined by the Thurston County Health Department, the Environmental Protection Agency, or the City?

The existing site is not located within any Drinking Water (Wellhead) Protection Areas, as identified by the Drinking Water (Wellhead) Protection Areas map prepared by City of Olympia. Therefore, it is assumed that the existing site is not located within any known aquifer recharge area.

2.4 Are there drains, channels, and swales within the project site and immediately adjacent?

There is no existing drainage conveyance present onsite, and the majority of runoff is expected to infiltrate onsite or runoff to the southwest corner of the site where the natural low point is located.

2.5 Low Impact Development (LID) Feasibility Evaluation

LID BMPs have been evaluated for feasibility for this project. Proposed LID BMPs are listed below:

- BMP T5.13: Post-Construction Soil Quality and Depth
- BMP T5.10A: Downspout Full Infiltration
- BMP T5.15: Permeable Pavements

3.0 Soils Investigation

Subsurface explorations were conducted on September 17, 2024, and June 26, 2025, by GeoResources. The report associated with this work can be found in Appendix C. A summary of their findings is listed below:

3.1 NRCS Soil Series Mapping and Hydrologic Soil Group

The USDA Natural Resources Conservation Service (NRCS) Web Soil Survey maps the surficial soils at the site as Yelm fine sandy loam (126). This soil is listed as hydrologic soil Group B.

3.2 Design Infiltration Rate

Infiltration feasibility of stormwater was evaluated using the simplified approach per Volume V, Section V-5.5 of the *DDECM*. After applying correction factors to measured infiltration rates, a design of infiltration rate of 0.04 inch per hour for the deeper recessional outwash deposits and 1.18 inches per hour for the shallow weathered soils.

3.3 Feasibility of Infiltration BMPs

It is the opinion of the project's Geotechnical Engineer that the shallow, weathered, recessional sand deposits observed in test pits across the site are suitable to support shallow infiltration facilities, such as permeable pavement. The deeper recessional silt deposits and glacial till are not suitable for infiltration.

3.4 Depth to Groundwater

Groundwater was not observed within any of the test pits at the time of excavation.

4.0 Wells and Septic Systems

An existing well is located onsite and has been noted on the drainage plans. This well will be decommissioned per Thurston County Health Department standards during construction.

5.0 Fuel Tanks

To our knowledge, no fuel tanks are located onsite.

6.0 Subbasin Description

6.1 Pre-Developed Condition

The site is modeled as three separate basins in the pre-developed condition. The three basins comprise an Onsite basin that covers the entire subject property and the associated frontage, an Offsite-1 basin that comprises runoff from the properties to the north, which convey toward Springwood Avenue NE, and an Offsite-2 basin that comprises runoff from the properties to the east of the site, which convey to the infiltration trench in the rear of the proposed eastern lots. Offsite-2 is included in the model only for infiltration trench sizing and is not considered as part of the flow control standard. The associated areas and ground cover are summarized below. A Pre-Developed Basin Map is included in Appendix B-1.

Table 2 – Pre-Developed Basins

Pre-Developed Subbasins						
Landcover	**Forest (ac)**	**Lawn (ac)**	**Roof (ac)**	**Driveways (ac)**	**Road (ac)**	**Combined (ac)**
Onsite	7.52	0	0		0	7.52
Offsite-1	1.31	1.68	0.55		0.08	3.62
Offsite-2	0	1.20	0.25		-	1.45

6.2 Post-Developed Condition

In the post-developed condition, the site is modeled as four separate basins. The four basins comprise an Onsite basin that contains the proposed roadways, sidewalks, tracts, and the most western lots; an On-Lot Mitigation basin that comprises the remaining lots, which will discharge roof water to the proposed pervious driveway on each lot; an Offsite-1 basin which comprises

runoff from the properties to the north, which convey toward Springwood Avenue NE; and an Offsite-2 basin that comprises runoff from the properties to the east of the site, which convey to the infiltration trench in the rear of the proposed eastern lots. Offsite-2 is only included in the model for infiltration trench sizing purposes and is not included for the flow control standard. The associated areas and ground cover are summarized below. A Post-Developed Basin Map is included in Appendix B-2:

Table 3 – Post-Developed Basins

Post-Developed Subbasins							
Landcover	**Forest (ac)**	**Lawn (ac)**	**Roof (ac)**	**Driveways (ac)**	**Road (ac)**	**Sidewalks (ac)**	**Combined (ac)**
Onsite	0.46	2.21*	0.28	0.07	1.26	0.36	4.64
On-Lot Mitigation	-	0.98*	1.5	0.62**	-	-	3.10
Offsite-1	1.31	1.68	0.55		0.08	-	3.62
Offsite-2	0	1.20	0.25		-	-	1.45

** Lawn areas modeled as pasture, per post-construction soil quality and depth BMP T5.13 runoff model representation criteria.*

*** Permeable driveways.*

7.0 Floodplain Analysis

According to the FEMA Flood Insurance Rate Map (Appendix A-4), the site is not located within the 100-year floodplain.

8.0 Aesthetic Consideration for Facilities

A landscape plan has been developed for the project and is included in Appendix A-6. The stormwater tract and soil and vegetation protection area will be landscaped per *DDECM/EDDS* requirements. Long term maintenance of these facilities will be included in the Operation and Maintenance Manual for this project under a separate cover. Fencing will be provided around the wet pond per City of Olympia Standards. Final landscaping will provide screening of the wet pond and blend with the pond plantings.

9.0 Facility Selection and Sizing

The following sections discuss the conditions assumed and methodology used for stormwater facility sizing. Design analysis and calculations have been completed per the requirements of the 2022 *DDECM.* The treatment and detention components of this project were sized using WWHM. The following is a summary of the assumptions made and data used in the conveyance, treatment, and detention calculations.

9.1 Quantity Control Facility Sizing

Flow control for the site will be provided by two separate facilities, all included within and sized by WWHM (see results in Appendix B-3). The first facility is the permeable pavement driveways, which will infiltrate 100% of the runoff from the associated roof area on each lot with a corresponding pervious driveway. The next facility is the onsite combined detention/wet pond, which will detain and treat runoff from the roadways and sidewalks, both onsite and along the frontage of the site. Incidental runoff from the rear of Lots 1 through 4 and 22 through 31 will be captured by infiltrating French drain systems before conveying to the detention/wet pond. Stream protection duration analysis was performed on this outlet to ensure the post-developed discharge from the site does not exceed the pre-developed condition. The stage storage table for the pond is listed below:

Table 4 – Combined Detention/Wet Pond Stage Storage Table

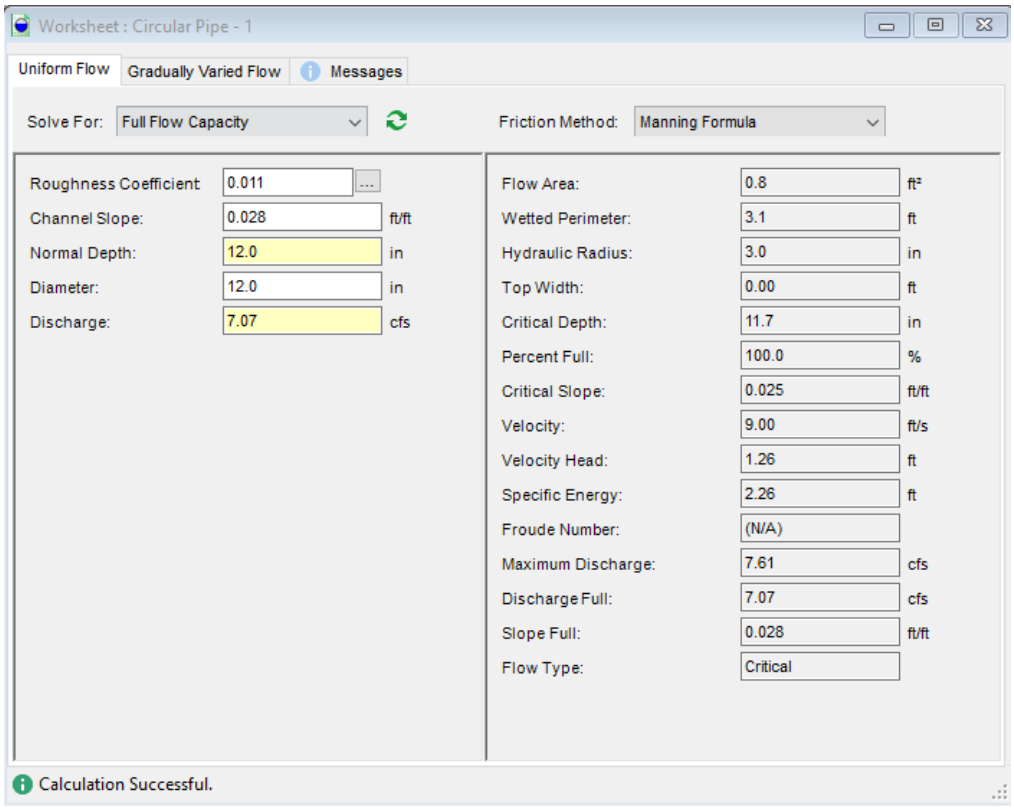
Storm	Stage (ft)
2 -Year	0.59
5 -Year	0.96
10-Year	1.25
25-Year	1.68
50-Year	2.04
100-Year	2.44

9.2 Quality Control Facility Sizing

Runoff directed to pervious pavement will be treated via the subsurface soil underlaying the site. Because this is feasible and is the first option in the runoff BMP selection flow chart within the EDDS, it was the method chosen for water quality treatment. The permeable driveways will infiltrate 100% of runoff directed to them and, as such, will meet the requirements of water quality design flow rate. The onsite combined detention/wet pond facility is designed per *DDECM* BMP T10.40 and will provide basic treatment for runoff from onsite roads, Springwood Avenue, and lots that do not direct roof runoff to pervious driveways. Refer to the WWHM results in Appendix B-3.

10.0 Conveyance System Analysis and Design

A most limiting pipe analysis was performed for this project to ensure that the conveyance system can pass the full 25-year storm runoff event per EDDS Chapter 5.025 - Conveyance Pipes. The most limiting pipe onsite is Pipe 21 (which is the outflow to the pond) because it will be conveying all runoff generated onsite (see Appendix A-7 for the pipe table). The analysis was performed using the Bentley Systems FlowMaster program using the standard Manning Formula for circular pipes. The results are shown below:



As shown above, the most restricting pipe onsite is the 12-inch CPEP pipe. At 2.82% slope outfalling to the pond, this pipe has capacity to convey 7.07 cfs. Per the WWHM model results, the 25-year storm runoff generated from the site is 4.53 cfs and the 100-year flow is 6.82 cfs. The results show that the most limiting pipe has capacity to pass both the 25-year and 100-year storm events and, as such, no negative impacts to the proposed conveyance system are anticipated.

11.0 Offsite Analysis & Mitigation

The proposed development will discharge runoff from the combined detention/infiltration pond to a dispersion trench located near the western property line. However, because the stream protection duration standard will be met, as well as preservation of the natural drainage system and outfall, no additional measures are proposed for offsite mitigation. The project is located in the Mission Creek watershed. Runoff leaving the site will first enter the neighboring property; runoff from this property is assumed to convey to the adjacent offsite wetland neighboring the property. This wetland conveys southward to Mission Creek. Water entering Mission Creek will continue eastward until discharging to Puget Sound, just south of Ellis Cove. The course of water can be seen in the Downstream Drainage Map in Appendix A-5. A representative from AHBL visited the site on August 4, 2025, to observe conditions and confirm the downstream drainage path for one-quarter mile from the site.

12.0 Utilities

The project will include the development of 39 residential lots with associated utilities, including the following:

- Sewer
- Water
- Electric
- Communications

The project has been designed to eliminate any conflicts between utilities and the proposed stormwater conveyance, detention, and treatment system.

13.0 Covenants, Dedications, Easements, Agreements

The proposed combined detention/wet pond will mitigate stormwater runoff from the public right-of-way, including Springwood Avenue NE, Marion Street, Central Street, and a yet-to-be-named new public road referred to as Road A. As such, the pond will be located in a public stormwater tract and City of Olympia will be responsible for maintenance.

- A 10-Foot utility easement will be located along the frontage of each lot.
- A 17.5-foot right-of-way dedication along Springwood Avenue NE will be granted to City of Olympia as part of the project.
- The combined detention/wet pond will be encompassed within a public stormwater tract.

14.0 Other Permits or Conditions

The following permits will be required for this project:

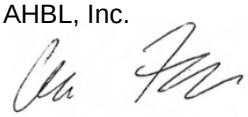
- Civil Engineering Permit
- NPDES Permit

15.0 Bond Quantities Worksheet

A completed Bond Quantity Worksheet will be provided at time of final engineering.

This analysis is based on data and records either supplied to or obtained by AHBL, Inc. These documents are referenced within the text of the analysis. The analysis has been prepared using procedures and practices within the standard accepted practices of the industry. We conclude that this project, as proposed, will not create any new problems within the existing downstream drainage system. This project will not noticeably aggravate any existing downstream problems due to either water quality or quantity.

AHBL, Inc.



Chris Flyckt, PE
Project Engineer

CF/lsk

January 2025
Revised December 2025

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Appendix A

Exhibits

A-1.....Vicinity Map
A-2.....Existing Conditions Map
A-3.....Developed Conditions Map
A-4.....FEMA Flood Insurance Rate Map
A-5.....Downstream Drainage Map
A-6.....Landscape Plan
A-7.....Storm Structure Table



N

NOT TO SCALE

AHBL
2215 North 30th Street
Suite 300
Tacoma, WA 98403
253.383.2422 TEL
253.383.2572 FAX

Springwood Garden Prelim Plat
2240545.10

VICINITY MAP

A-1

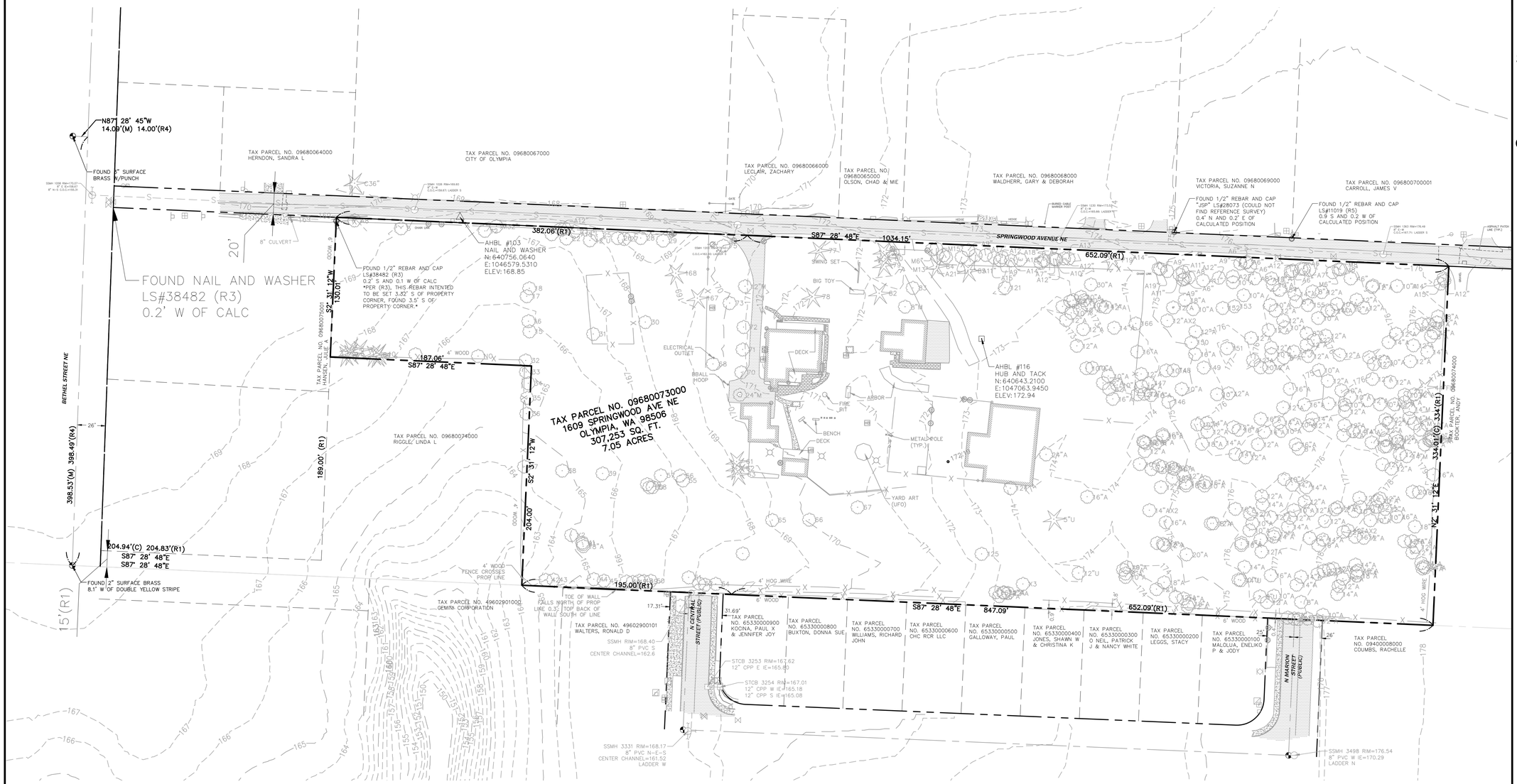
Know what's **below.** **Call** before you dig.

SPRINGWOOD GARDEN

A PORTION OF THE O'BRYANT D.L.C. NO. 40, LYING WITHIN THE NW 1/4 AND SW 1/4 OF SECTION 12, TWN. 18 N., RGE. 2 W., W.M., CITY OF OLYMPIA, THURSTON COUNTY, WASHINGTON.

GRAPHIC SCALE
0 25 50 100
1" = 50 FEET

N



AHBL
TACOMA · SEATTLE · SPOKANE · TRI-CITIES
2215 North 30th Street, Suite 300 Tacoma, WA 98403
253.383.2422 TEL 253.383.2572 FAX www.ahbl.com WEB

Project Title:
SPRINGWOOD GARDEN PRELIMINARY PLAT

Client:
GARRETTE CUSTOM HOMES PUGET SOUND, INC.

4802 TACOMA MALL BOULEVARD
TACOMA, WA 98409

CONTACT: MATT LEWIS, PRESIDENT

Project No.
2240545.10

Issue Set & Date:
PRELIMINARY PLAT
2/3/2025

J. MATTHEW WEBER — STATE OF WASHINGTON — 24852 — REGISTERED PROFESSIONAL ENGINEER

NOTICE
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Revisions:
4
3
2
1

Sheet Title:
EXISTING CONDITIONS PLAN

Designed by:	Drawn by:	Checked by:
CF	CR	JMW

Sheet No.
C1.0
2 of 11 Sheets

DATE: January 31, 2025 FILENAME: Q:\2024\2240545\10_CIV\CAD_P-PLAT\2240545-SH-EXST-COND.dwg

Attachment 5

Attachment 5

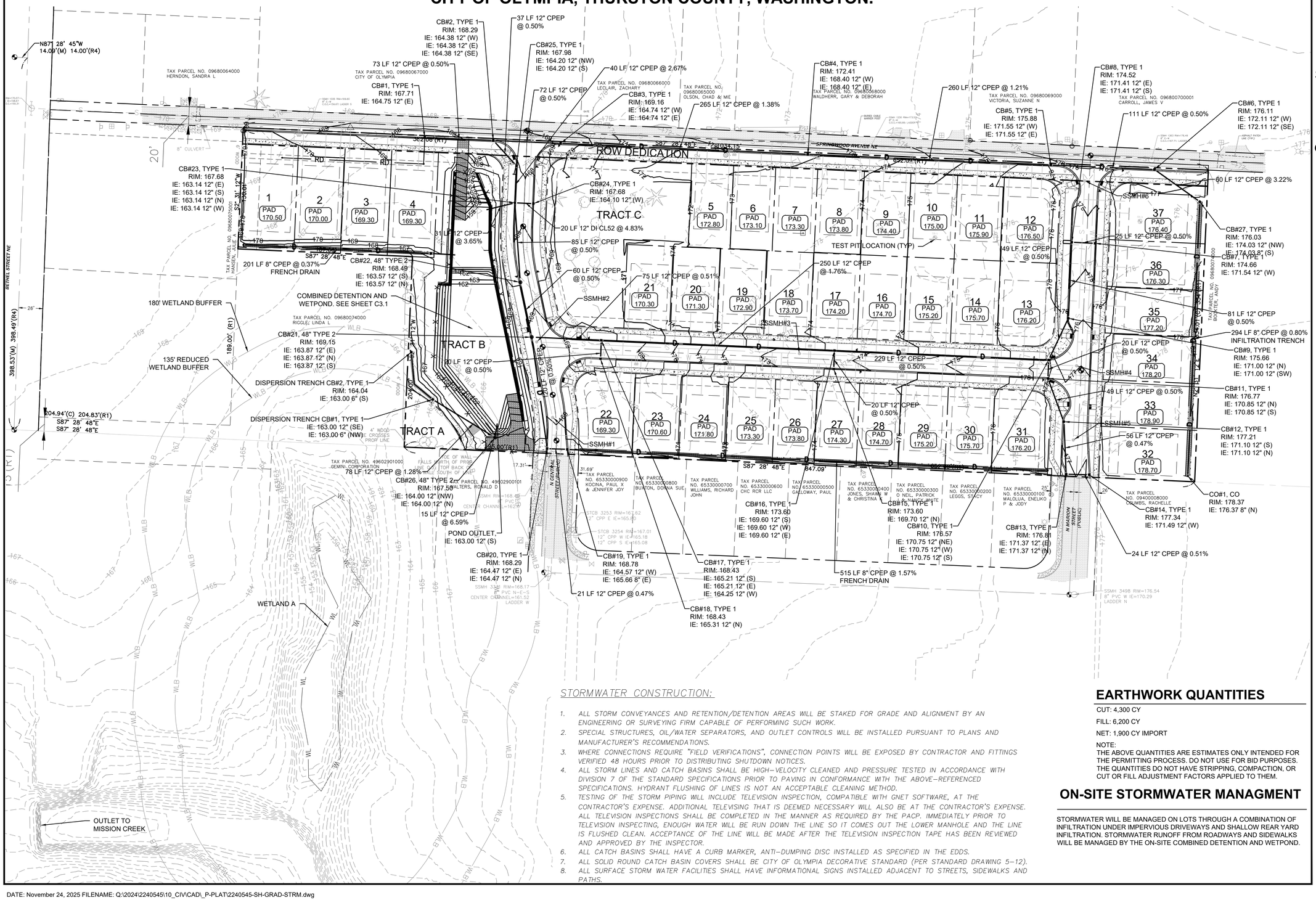
Know what's **below.** **Call** before you dig.

SPRINGWOOD GARDEN

A PORTION OF THE O'BRYANT D.L.C. NO. 40, LYING WITHIN THE NW 1/4 AND SW 1/4 OF SECTION 12, TWN. 18 N., RGE. 2 W., W.M., CITY OF OLYMPIA, THURSTON COUNTY, WASHINGTON.

GRAPHIC SCALE 0 25 50 100 — 1" = 50 FEET

N



STORMWATER CONSTRUCTION:

1. ALL STORM CONVEYANCES AND RETENTION/DETENTION AREAS WILL BE STAKED FOR GRADE AND ALIGNMENT BY AN ENGINEERING OR SURVEYING FIRM CAPABLE OF PERFORMING SUCH WORK.
2. SPECIAL STRUCTURES, OIL/WATER SEPARATORS, AND OUTLET CONTROLS WILL BE INSTALLED PURSUANT TO PLANS AND MANUFACTURER'S RECOMMENDATIONS.
3. WHERE CONNECTIONS REQUIRE "FIELD VERIFICATIONS", CONNECTION POINTS WILL BE EXPOSED BY CONTRACTOR AND FITTINGS VERIFIED 48 HOURS PRIOR TO DISTRIBUTING SHUTDOWN NOTICES.
4. ALL STORM LINES AND CATCH BASINS SHALL BE HIGH-VELOCITY CLEANED AND PRESSURE TESTED IN ACCORDANCE WITH DIVISION 7 OF THE STANDARD SPECIFICATIONS PRIOR TO PAVING IN CONFORMANCE WITH THE ABOVE-REFERENCED SPECIFICATIONS. HYDRANT FLUSHING OF LINES IS NOT AN ACCEPTABLE CLEANING METHOD.
5. TESTING OF THE STORM PIPING WILL INCLUDE TELEVISION INSPECTION, COMPATIBLE WITH GNET SOFTWARE, AT THE CONTRACTOR'S EXPENSE. ADDITIONAL TELEVISING THAT IS DEEMED NECESSARY WILL ALSO BE AT THE CONTRACTOR'S EXPENSE. ALL TELEVISION INSPECTIONS SHALL BE COMPLETED IN THE MANNER AS REQUIRED BY THE PACP. IMMEDIATELY PRIOR TO TELEVISION INSPECTING, ENOUGH WATER WILL BE RUN DOWN THE LINE SO IT COMES OUT THE LOWER MANHOLE AND THE LINE IS FLUSHED CLEAN. ACCEPTANCE OF THE LINE WILL BE MADE AFTER THE TELEVISION INSPECTION TAPE HAS BEEN REVIEWED AND APPROVED BY THE INSPECTOR.
6. ALL CATCH BASINS SHALL HAVE A CURB MARKER, ANTI-DUMPING DISC INSTALLED AS SPECIFIED IN THE EDDS.
7. ALL SOLID ROUND CATCH BASIN COVERS SHALL BE CITY OF OLYMPIA DECORATIVE STANDARD (PER STANDARD DRAWING 5-12).
8. ALL SURFACE STORM WATER FACILITIES SHALL HAVE INFORMATIONAL SIGNS INSTALLED ADJACENT TO STREETS, SIDEWALKS AND PATHS.

EARTHWORK QUANTITIES

CUT: 4,300 CY

FILL: 6,200 CY

NET: 1,900 CY IMPORT

NOTE:
THE ABOVE QUANTITIES ARE ESTIMATES ONLY INTENDED FOR THE PERMITTING PROCESS. DO NOT USE FOR BID PURPOSES. THE QUANTITIES DO NOT HAVE STRIPPING, COMPACTION, OR CUT OR FILL ADJUSTMENT FACTORS APPLIED TO THEM.

ON-SITE STORMWATER MANAGMENT

STORMWATER WILL BE MANAGED ON LOTS THROUGH A COMBINATION OF INFILTRATION UNDER IMPERVIOUS DRIVEWAYS AND SHALLOW REAR YARD INFILTRATION. STORMWATER RUNOFF FROM ROADWAYS AND SIDEWALKS WILL BE MANAGED BY THE ON-SITE COMBINED DETENTION AND WETPOND.

AHBL
TACOMA • SEATTLE • SPOKANE • TRI-CITIES
2215 North 30th Street, Suite 300 Tacoma, WA 98403
253.383.2422 TEL 253.383.2572 FAX www.ahbl.com WEB

Project Title:
SPRINGWOOD GARDEN PRELIMINARY PLAT

Client:
GARRETTE CUSTOM HOMES PUGET SOUND, INC.

4802 TACOMA MALL BOULEVARD
TACOMA, WA 98409

CONTACT: MATT LEWIS, PRESIDENT

Project No.
2240545.10

Issue Set & Date:
PRELIMINARY PLAT
11/24/2025

J. MATTHEW WEBER — STATE OF WASHINGTON — 24858 — REGISTERED PROFESSIONAL ENGINEER

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4
3
2
1 CITY COMMENTS - 5/21/2025

Revisions:

Sheet Title:
GRADING AND STORM DRAINAGE PLAN

Designed by:	Drawn by:	Checked by:
CF	CR	JMW

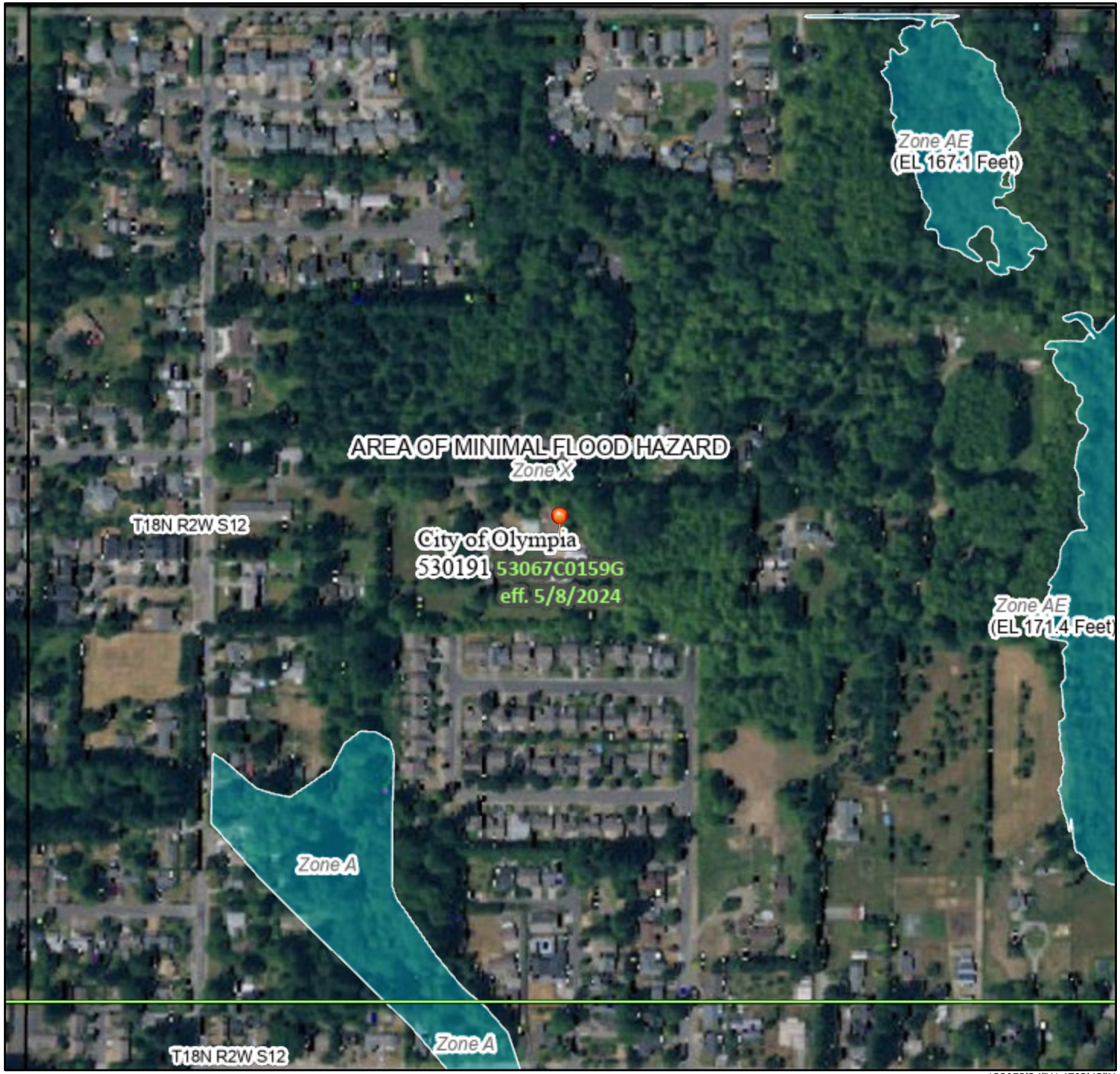
Sheet No.
C3.0
6 of 16 Sheets

DATE: November 24, 2025 FILENAME: Q:\2024\2240545\10_CIV\CAD_P-PLAT\2240545-SH-GRAD-STRM.dwg

National Flood Hazard Layer FIRMette

FEMA

122°53'12"W 47°4'8"N



122°52'34"W 47°3'43"N

Feet

0 250 500 1,000 1,500 2,000

1:6,000

Basemap Imagery Source: USGS National Map 2023

Legend

Attachment 5

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

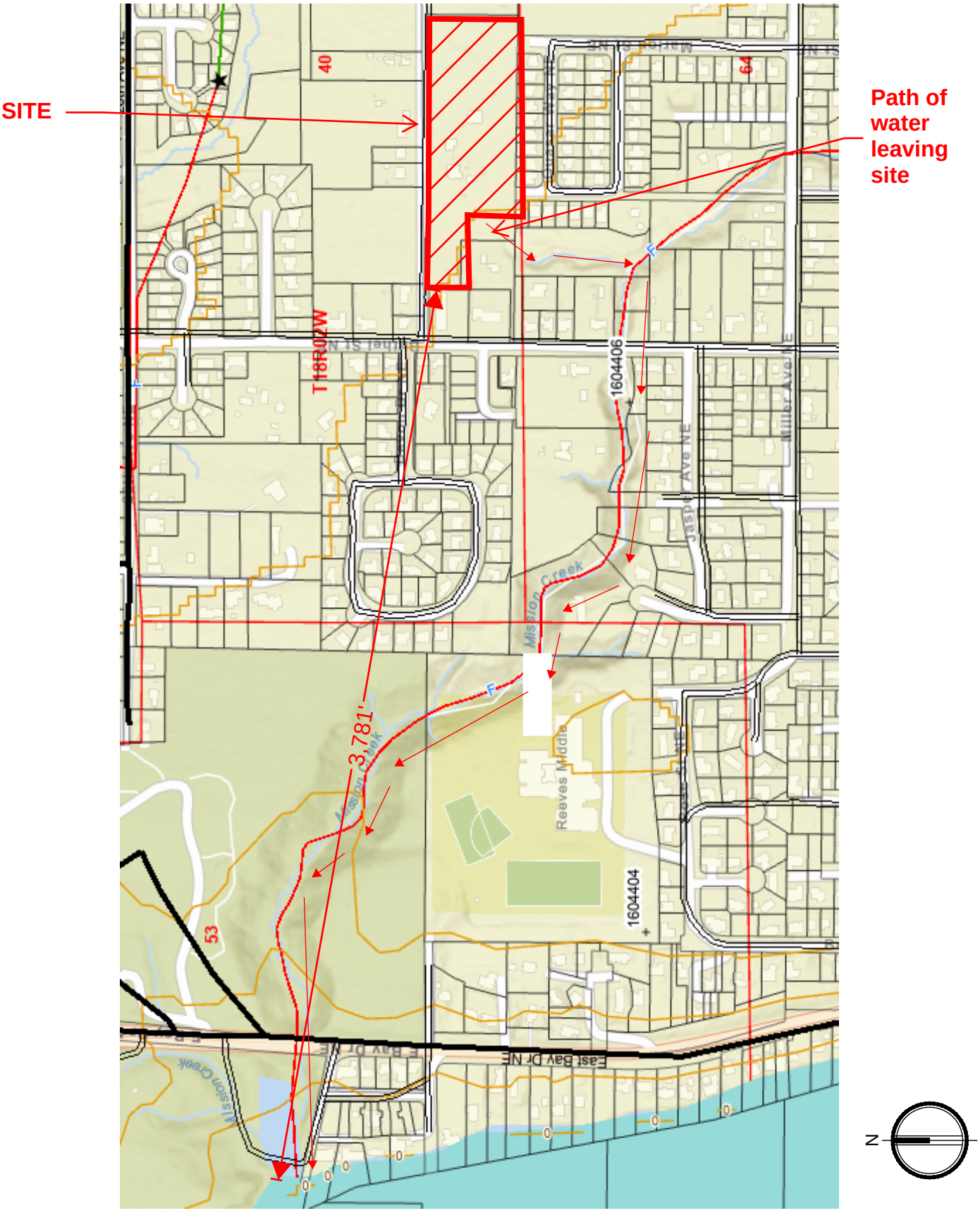
N

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 1/23/2025 at 7:00 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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

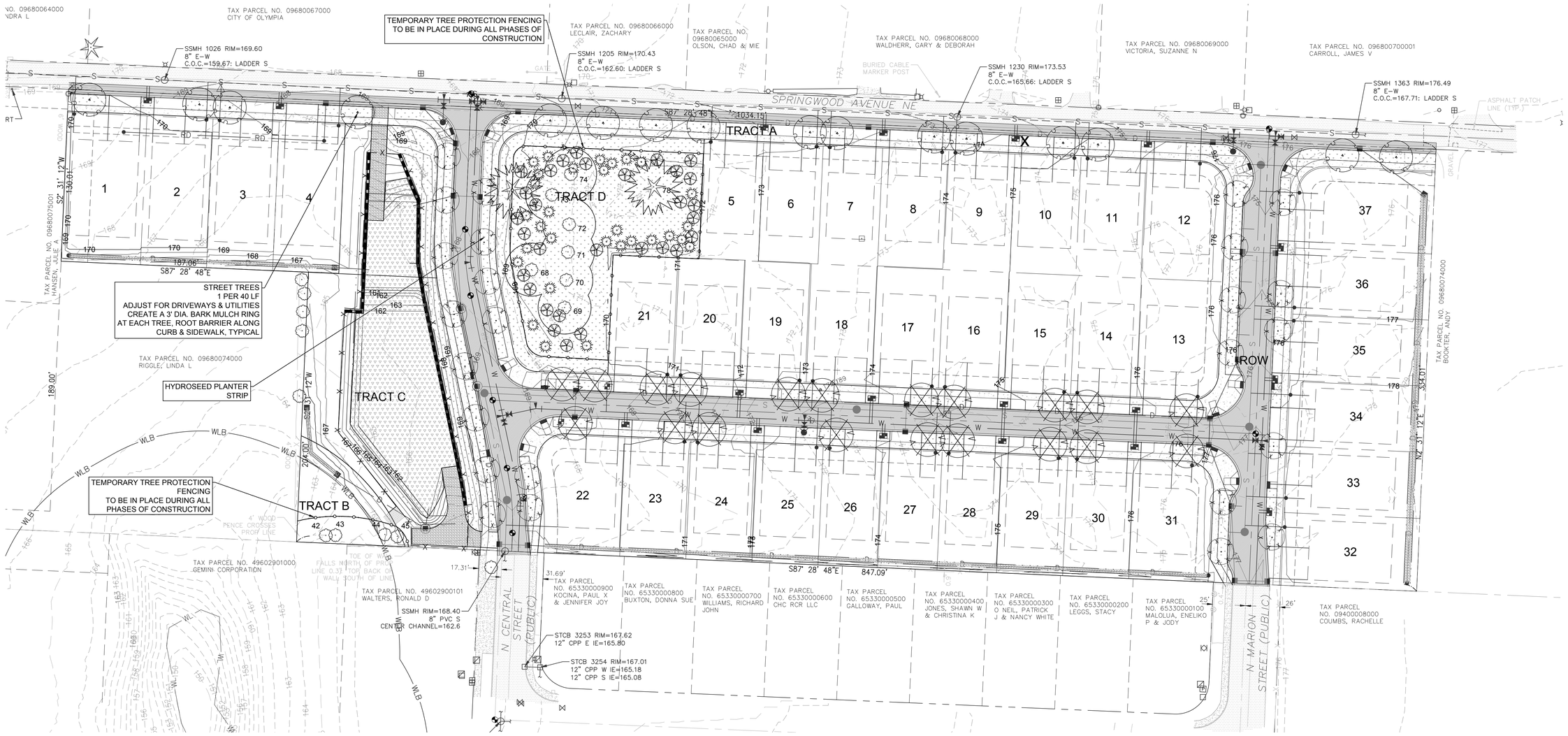


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SPRINGWOOD GARDEN PLAT
2240545.10

DOWNSTREAM DRAINAGE MAP

A-5



LANDSCAPE PLAN

N

PLANT SCHEDULE

TREES	QTY	BOTANICAL / COMMON NAME	SIZE AT TIME OF PLANTING	NATIVE (N), NON-NATIVE (NN), DROUGHT TOLERANT (DT)	LOCATION
	20	Ginko biloba 'Princeton Sentry' Princeton Sentry Ginko	2" Cal. Min. Well Formed.	NN, DT	INTERNAL
	25	Acer griseum Paperbark Maple	2" Cal. Min. Well Formed.	NN, DT	INTERNAL
	19	Carpinus betulus 'Fastigiata' Pyramidal European Hornbeam	2" Cal. Min. Well Formed.	NN,DT	ROW
TOTAL	64				
REPLACEMENT TREES					
	30	Crataegus douglasii Washington Hawthorne	1" Cal. Min. Well Formed	N, DT	TRACT B & D SVPA
	30	Pseudotsuga menziesii Douglas Fir	3' Ht. Min. Full/Compact	N, DT	TRACT B & D SVPA
TOTAL REPLACEMENT TREES	60				
GROUND COVERS	QTY	BOTANICAL / COMMON NAME	SIZE		
		Hydroseed for Typical Lawn Areas (27,241 SF) SUNMARK **NATIVE** ECOTURF- Sunmark Seeds www.sunmarkseeds.com Botanical Name — Common Name — % by Weight Festuca rubra — Native Red Fescue — 45% Bouteloua gracilis — Blue Grama — 25% Buchate dactyloides — Buffalograss — 20% Koeleria macrantha — Prairie Junegrass — 7% Trifolium fragiferum — Strawberry Clover — 3% 1 lbs per 1,000 SF or 43.67 lbs per acre		N, DT	INTERNAL
		Nuphar polysepalum - Spatterdock (in 3 to 7' of water) Nymphaea odorata - White Water Lily (upd to 6' of water) per City of Olympia - Inundated water ponds			

PER ARBORISTS REPORT PAGE 11

V. Tree Density Calculations

The City of Olympia requires a minimum of 30 tree units per buildable acre. All trees within the SVPA and Tract B will be retained. The following summary presents the tree density calculations.

Minimum Tree Density Required
Total Acreage = 7.06-acres
Buildable Area (7.06-acres minus 1.35-acre ROW & .10-acre wetland buffer) =5.61-acres
Required Units (30 units/acre x 5.61-ac buildable area) = 168 Units
Required Minimum Units to be Retained within SVPA = 126 Units
Units to be Retained within SVPA = 67 Units
Units to be Retained outside SVPA = 17 Units
Total Units to be Retained = 84 Units
Overall Shortfall = 84 Units
Shortfall within SVPA = 59 Units

This project does not meet the minimum tree density as specified by the City of Olympia. Replanting will be required to make up the overall shortfall and that within the SVPA

IN THE OLYMPIA URBAN FORESTRY MANUAL ON PAGE 8-1 TABLE B MINIMUM SIZE REQUIREMENTS FOR REPLACEMENT TREES IN THE SVPA ARE AS FOLLOWS:
DECIDUOUS - 1" CALIPER MIN. - 1 TREE UNIT VALUE
CONIFER - 3' TALL MIN. - 1 TREE UNIT VALUE
REQUIRED TREE UNITS TO BE REPLANTED
60 REPLACEMENT TREES


PRINCETON SENTRY GINKO


PAPER BARK MAPLE


PYRAMIDAL EUROPEAN HORNBEAM


WASHINGTON HAWTHORNE


DOUGLAS FIR

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

LANDSCAPE SHEET INDEX

L1 LANDSCAPE PLAN
L2 DETAILS AND NOTES

Nature By Design
Landscape Architecture
1320 Alameda Avenue, Suite B, Fircrest, WA 98466
www.naturebydesigninc.com
253.460.6067

SPRINGWOOD PLAT
1609 SPRINGWOOD
OLYMPIA, WA
GARRETTE CUSTOM HOMES - PUGET SOUND
4802 TACOMA MALL BLVD
TACOMA, WA

REVISIONS:
E. NEW SITE LAYOUT
F. REVISED WITH NEW CIVIL BASE

DRAWING ISSUED FOR:
AGENCY REVIEW
DATE: NOVEMBER 24, 2025

STATE OF WASHINGTON · CATHERINE OWENS · NO. 992 · EXP. APRIL 2027 · LICENSED LANDSCAPE ARCHITECT

PROJECT NO:	25022
FILE NAME:	25022LSF
DRAWN BY:	KLO
CHECKED BY:	KLO
X-REFS:	CIVIL
PLOT SCALE:	1:1
DRAWING SCALES:	1:30

DRAWING CONTENTS
LANDSCAPE PLAN

DRAWING NO.:
L1
1 OF 2

ORIG. SHEET SIZE 22X34

GENERAL LANDSCAPE NOTES

1. Contractor is responsible for obtaining all necessary permits from the appropriate agency prior to commencing work. Contractor shall contact Line Locators (811) a min. of 48 hours prior to any digging or trenching. If there are any discrepancies with existing lines and landscaping, it is the contractor's responsibility to contact the landscape architect and request a site visit to address the conflicts. Contractor shall comply and conform to any and all local and state codes for work, schedules and any other project related requirements.

2. Contractor shall coordinate directly with the landscape architect for all landscape related issues, concerns, inspections and approvals. Contractor shall provide the landscape architect with a written request for a site visit to address any related items.

3. Scope of work shall include any and all specified and unspecified but related incidental work to achieve the design indicated on the landscape plans. All labor, materials, subcontractors, equipment, and related incidental items shall be supplied and installed to achieve a complete project, unless directed otherwise by the general contractor or landscape architect.

4. Contractor to verify all sub grades are set below required amendments to insure the finished grade will match what is intended by civil or drainage design. All sub grades and finished or final grades shall be graded to drain to the designed drainage system with positive drainage away from all structures.

5. **Grade Preparation:**

a. Slopes used for grass plantings or turf shall be less than 3:1 or 33 percent. Otherwise plantings should not require mechanized mowing equipment.
b. Finish grade shall be 1" below concrete surfaces (walks, curbs, patios, etc). Allow for topsoil depth and 3 inches of mulch to be placed throughout planting areas and topsoil alone for lawn areas.

Soil Preparation. Per soils report - existing site soils contain adequate topsoil layer 12" depth and sandy glacial till below.

a. Where soils are compacted due to construction activity, any compacted / gravel areas (like in parking areas) shall be excavated 24" depth with new 5-way topsoil placed to ensure plant viability. Topsoil in planting beds to be left 3 inches below finish grade to allow for mulch placement. Remove and Haul away all debris and concrete waste from planter strips.
b. Where soils are not disturbed, a minimum depth of 6 (six) inches of 5 -Way topsoil should be tilled into the soil to a depth of 12 inches through all planting areas.
c. For all newly planted foundation areas, three cubic yards of composted organic matter per 1,000 square feet of landscape area should be added to a depth of 12 inches to the top of the soil and Tilled in 24 inches.
d. Seeded areas shall be fine graded and rolled. New Soil depths in lawn areas shall be 4 Inches.
e. Earthworks contractor shall prep subgrade for landscape contractor with correct grade elevations to accommodate finish top soils to be added.

6. Mulching of Newly Planted or Replanted Areas.

a. Mulches must be applied to the following depths: **a minimum 4 (Four) inches over top soil.** Taper mulch out to meet top of planting root balls.
b. Mulches must include organic materials, such as wood chips and shredded bark.
c. Nonporous materials, such as plastic sheeting, shall not be used in any area of the landscape because of down-slope erosion and potential soil contamination from herbicide washing.
d. Mulch should be applied regularly to and maintained in all planting areas to assist soils in retaining moisture, reducing weed growth, and minimizing erosion.

7. Contractor shall field layout all plant material and contact the landscape architect for a site visit to approve the layout. Any field modifications shall be done by the landscape architect prior to planting.

8. Contractor shall immediately notify the landscape architect of any poor drainage condition in landscape areas. No standing water shall be permitted in any landscape areas - either on the surface or below the topsoil. The landscape architect shall coordinate the drainage solution with the general contractor and civil engineer. Once the concerns have been remedied planting shall commence.

9. All groundcover to be planted in a triangular spacing formation, equal in all directions to the centers of the groundcovers in distances indicated in the legend. Contractor shall verify all quantities of groundcovers by area calculations and spacing requirements.

10. Landscaping is to be per plan. Plant substitutions due to availability or otherwise will be allowed only with landscape architect, owner and agency approval. Any substitutions will be with material of similar size, growth characteristics, and quality.

11. All trees must be staked as necessary so as to maintain material in a healthy, vigorous growing condition.

12. Landscaping shall be installed in a professional workmanlike manner that is consistent and accepted throughout the industry. All landscape and irrigation work shall be performed by experienced persons familiar with scope of project.

13. All landscape material and labor is to be guaranteed for a period of one full year from the time of completion.

14. When planting 'Balled and Burlapped' product, remove all burlap, string & wire from any B&B plant material, cut and remove jute strings. Gently place in tact Rootbal into planting pit. If rootball breaks or is not solid - the plant is unacceptable and shall be replaced.

15. Street trees shall be high branching with canopy that starts at least 6' above finish grade.

16. All plant I.D. tags are to remain on the plant material until final inspection has been completed. Once approved all plant I.D. tags shall be removed and discarded appropriately.

17. Trees shall be cared for in accordance with the American National Standards Institute (ANSI) standard practices for trees, shrubs and other woody plant maintenance (ANSI 300) in order to allow them to reach there mature height and form.

18. Pruning of street trees shall be performed per the ANSI 300 standards so as to maintain the natural form of the tree, encourage vigorous growth to a mature spread and height, and avoid weakening the tree to create a hazard. Street trees shall not be topped pollarded, or otherwise pruned in a manner contrary to these goals, unless there is no practicable alternative that would preserve essential utility services.

19. Plant material selected is drought tolerant or native species. The project proponent shall be responsible for maintaining and watering all plant material throughout the first growing season and in times of drought. A PERMANENT irrigation system shall be designed and installed at Building Permit stage.

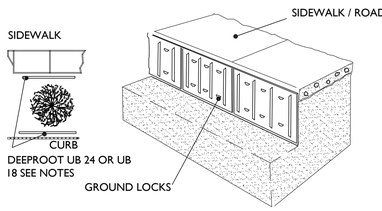
20. Planting Timeline: It is recommended to install the landscaping in the Spring (February - April) or Fall (October - December)when dormant but before hard freeze.

21. Landscaping areas are designed to reach 80% coverage within 3 years. Landscaping inspection by City may require additional planting. OMC 18.36.060.d.

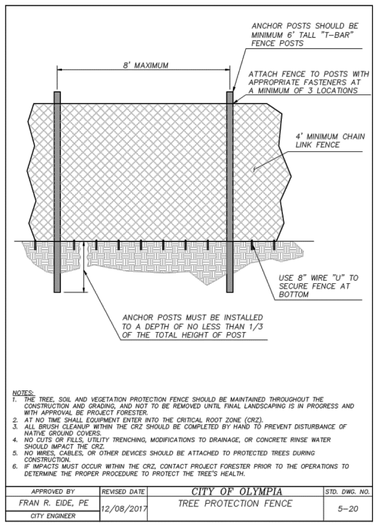
LINEAR STYLE PLANTING WITH DEEPROOT BARRIERS

A. DIG THE TRENCH TO THE DEPTH BASED UPON THE PARTICULAR BARRIER CHOSEN.
B. INSTALL THE BARRIER. WHEN USING DEEP ROOT LINEAR BARRIERS, SIMPLY PULL THE APPROPRIATE NUMBER OF PANELS OUT OF THE BOX AND SEPARATE THE JOINER AT THE CORRECT LENGTH. WHEN INSTALLING DEEPROOT UNIVERSAL BARRIERS IN A LINEAR FASHION, YOU WILL NEED TO JOIN THE APPROPRIATE NUMBER OF PANELS TOGETHER.
C. NEXT PLACE THE BARRIER IN THE TRENCH WITH THE VERTICAL RIBS FACING TOWARD THE TREE AND ALIGN IN A STRAIGHT FASHION. IT IS HELPFUL TO PLACE THE BARRIER AGAINST THE HARD SCAPE. USE THE HARD SCAPE AS A GUIDE AND BACKFILL AGAINST THE BARRIERS TO PROMOTE A CLEAN SMOOTH FIT TO THE HARD SCAPE. BE SURE TO KEEP THE BARRIER'S DOUBLE TOP EDGE AT LEAST 1/2" ABOVE GRADE TO ENSURE ROOTS DO NOT GROW OVER THE TOP.
D. PLANT THE TREE. THE LINEAR STYLE OFFERS A MORE EXPANSIVE ROOTING GROWTH AREA. HOWEVER, ADVERSE SOIL AND DRAINAGE CONDITIONS MAY EXIST IN THE ACTUAL PLANTING AREA. TAKE STEPS TO ENSURE HEALTHY GROWTH OF THE TREE AT PLANTING.

FOR INFORMATION REGARDING PRODUCT CALL: 1 800 ILV ROOT (458-7668).

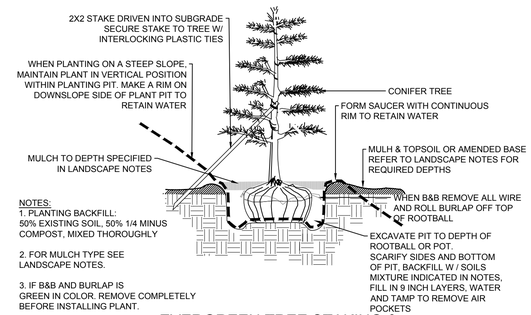


Tree Protection Fence Detail



NOTES:
1. THE TREE, SOIL AND VEGETATION PROTECTION FENCE SHOULD BE MAINTAINED THROUGHOUT THE CONSTRUCTION AND GRADING, AND NOT TO BE REMOVED UNTIL FINAL LANDSCAPING IS IN PROGRESS AND WITH APPROVAL BE PROJECT FORESTER.
2. AT NO TIME SHALL EQUIPMENT ENTER INTO THE CRITICAL ROOT ZONE (CRZ).
3. ALL BRUSH CLEANUP WITHIN THE CRZ SHOULD BE COMPLETED BY HAND TO PREVENT DISTURBANCE OF NATIVE GROUND COVERS.
4. NO CUTS OR FILLS, UTILITY TRENCHING, MODIFICATIONS TO DRAINAGE, OR CONCRETE RINSE WATER SHOULD IMPACT THE CRZ.
5. NO WIRES, CABLES, OR OTHER DEVICES SHOULD BE ATTACHED TO PROTECTED TREES DURING CONSTRUCTION.
6. IF IMPACTS MUST OCCUR WITHIN THE CRZ, CONTACT PROJECT FORESTER PRIOR TO THE OPERATIONS TO DETERMINE THE PROPER PROCEDURE TO PROTECT THE TREE'S HEALTH.

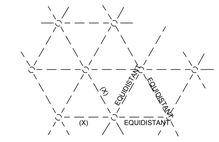
APPROVED BY	REVISED DATE	CITY OF OLYMPIA	STD. DWG. NO.
FRAN R. EIDE, PE	12/08/2017	TREE PROTECTION FENCE	5-20
CITY ENGINEER			



NOTES:
1. PLANTING BACKFILL: 50% EXISTING SOIL, 50% 1/4 MINUS COMPOST, MIXED THOROUGHLY
2. FOR MULCH TYPE SEE LANDSCAPE NOTES.
3. IF B&B AND BURLAP IS GREEN IN COLOR. REMOVE COMPLETELY BEFORE INSTALLING PLANT.

EVERGREEN TREE STAKING & PLANTING DETAIL

No Scale



DISTANCE (X) PER PLANT LEGEND

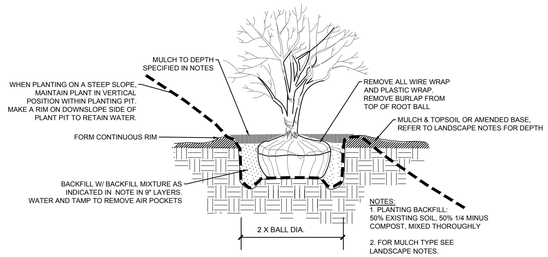
NOTES:

ALL GROUNDCOVER SHALL BE PLANTED AT EQUAL TRIANGULAR SPACING AS SPECIFIED IN THE PLANT LEGEND.

LOCATE GROUNDCOVER ONE-HALF OF SPECIFIED ON-CENTER SPACING FROM ANY CURB, SIDEWALK OR OTHER HARD SURFACE.

GROUNDCOVER PLANTING DETAIL

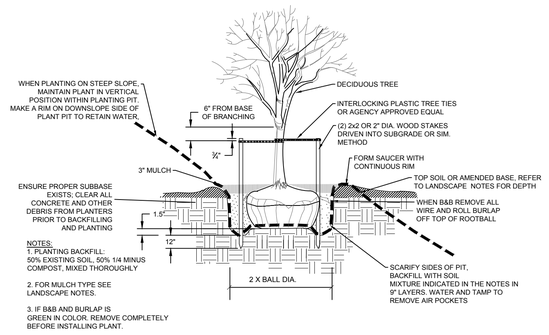
No Scale



NOTES:
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2. FOR MULCH TYPE SEE LANDSCAPE NOTES.
3. IF B&B AND BURLAP IS GREEN IN COLOR. REMOVE COMPLETELY BEFORE INSTALLING PLANT.

SHRUB PLANTING DETAIL

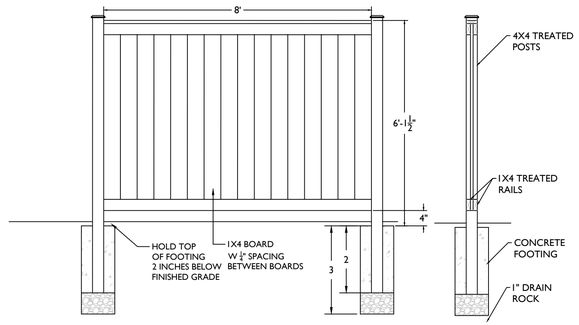
No Scale



NOTES:
1. PLANTING BACKFILL: 50% EXISTING SOIL, 50% 1/4 MINUS COMPOST, MIXED THOROUGHLY
2. FOR MULCH TYPE SEE LANDSCAPE NOTES.
3. IF B&B AND BURLAP IS GREEN IN COLOR. REMOVE COMPLETELY BEFORE INSTALLING PLANT.

DECIDUOUS TREE PLANTING & STAKING DETAIL

No Scale



6 FOOT FENCE DETAIL

SCALE: N.T.S.

NOTES:
1. TOP RAIL TO BE HORIZONTAL WITH MAX 12" STEPS AT POSTS AS NEEDED FOR GRADE - VERIFY WITH SUPERINTENDENT ON STEEP GRADES.
2. 2X4" RAIL SIDE TO FACE INTO THE FENCE OWNER'S PROPSERTY EXCEPT AT STREET OR PARK LOCATIONS.
3. WITH GRADE DIFFERENCES OF MORE THAN 6" BETWEEN POSTS - SLOPE BOTTOM RAIL TO CONFORM.
4. STAIN ALL WOOD WITH SEMI TRANSPARENT STAIN, COLOR TO MATCH ARCHITECTURE STAIN TO BE SELECTED BY OWNER.

Nature By Design
Landscape Architecture
1320 Alameda Avenue, Suite B, Fircrest, WA 98466
www.naturebydesigninc.com
253.460.6067

SPRINGWOOD PLAT
1609 SPRINGWOOD
OLYMPIA, WA

GARRETTE CUSTOM HOMES - PUGET SOUND
4802 TACOMA MALL BLVD
TACOMA, WA

REVISIONS:
E. NEW SITE LAYOUT
F. REVISED WITH NEW CIVIL BASE

DRAWING ISSUED FOR:
AGENCY REVIEW
DATE: NOVEMBER 24, 2025

STATE OF WASHINGTON · KATHERINE OWENS · NO. 4892 · EXP. APRIL 9, 2027 · LICENSED LANDSCAPE ARCHITECT

PROJECT NO:	25022
FILE NAME:	25022LSF
DRAWN BY:	KLO
CHECKED BY:	KLO
X-REFS:	NONE
PLOT SCALE:	1:1
DRAWING SCALES:	N.T.S.

DRAWING CONTENTS

LANDSCAPE DETAILS & NOTES

DRAWING NO.:

L2

2 OF 2

ORIG. SHEET SIZE 22X34

STORM STRUCTURE TABLE	
STRUCTURE NAME	STRUCTURE DETAILS
CB#1 TYPE 1	RIM = 167.71 IE = 164.75 (12" E)
CB#2 TYPE 1	RIM = 168.29 IE = 164.38 (12" W) IE = 164.38 (12" E) IE = 164.38 (12" SE)
CB#3 TYPE 1	RIM = 169.16 IE = 164.74 (12" W) IE = 164.74 (12" E)
CB#4 TYPE 1	RIM = 172.41 IE = 168.40 (12" W) IE = 168.40 (12" E)
CB#5 TYPE 1	RIM = 175.88 IE = 171.55 (12" W) IE = 171.55 (12" E)
CB#6 TYPE 1	RIM = 176.11 IE = 172.11 (12" W) IE = 172.11 (12" SE)
CB#7 TYPE 1	RIM = 174.66 IE = 171.54 (12" W)
CB#8 TYPE 1	RIM = 174.52 IE = 171.41 (12" E) IE = 171.41 (12" S)
CB#9 TYPE 1	RIM = 175.66 IE = 171.00 (12" N) IE = 171.00 (12" SW)

STORM STRUCTURE TABLE	
STRUCTURE NAME	STRUCTURE DETAILS
CB#10 TYPE 1	RIM = 176.57 IE = 170.75 (12" NE) IE = 170.75 (12" W) IE = 170.75 (12" S)
CB#11 TYPE 1	RIM = 176.77 IE = 170.85 (12" N) IE = 170.85 (12" S)
CB#12 TYPE 1	RIM = 177.21 IE = 171.10 (12" S) IE = 171.10 (12" N)
CB#13 TYPE 1	RIM = 176.81 IE = 171.37 (12" E) IE = 171.37 (12" N)
CB#14 TYPE 1	RIM = 177.34 IE = 171.49 (12" W)
CB#15 TYPE 1	RIM = 173.60 IE = 169.70 (12" N)
CB#16 TYPE 1	RIM = 173.60 IE = 169.60 (12" S) IE = 169.60 (12" W) IE = 169.60 (12" E)
CB#17 TYPE 1	RIM = 168.43 IE = 165.21 (12" S) IE = 165.21 (12" E) IE = 164.25 (12" W)
CB#18 TYPE 1	RIM = 168.43 IE = 165.31 (12" N)

STORM STRUCTURE TABLE	
STRUCTURE NAME	STRUCTURE DETAILS
CB#19 TYPE 1	RIM = 168.78 IE = 164.57 (12" W) IE = 165.66 (8" E)
CB#20 TYPE 1	RIM = 168.29 IE = 164.47 (12" E) IE = 164.47 (12" N)
CB#21 48" TYPE 2	RIM = 169.15 IE = 163.87 (12" E) IE = 163.87 (12" N) IE = 163.87 (12" S)
CB#22 48" TYPE 2	RIM = 168.49 IE = 163.57 (12" S) IE = 163.57 (12" N)
CB#23 TYPE 1	RIM = 167.68 IE = 163.14 (12" E) IE = 163.14 (12" S) IE = 163.14 (12" N) IE = 163.14 (12" W)
CB#24 TYPE 1	RIM = 167.68 IE = 164.10 (12" W)
CB#25 TYPE 1	RIM = 167.98 IE = 164.20 (12" NW) IE = 164.20 (12" S)
CB#26 48" TYPE 2	RIM = 167.50 IE = 164.00 (12" NW) IE = 164.00 (12" N)
CB#27 TYPE 1	RIM = 176.03 IE = 174.03 (12" NW) IE = 174.03 (8" S)

STORM STRUCTURE TABLE	
STRUCTURE NAME	STRUCTURE DETAILS
CB#28 TYPE 1	RIM = 167.52 IE = 165.52 (8" W) IE = 165.52 (8" E)
CO#1 CO	RIM = 178.37 IE = 176.37 (8" N)
CO#2 CO	RIM = 176.76 IE = 173.75 (8" W)
CO#3 CO	RIM = 168.26 IE = 166.26 (8" E)
DISPERSION TRENCH CB#1 TYPE 1	RIM = 164.55 IE = 163.00 (12" SE) IE = 163.00 (6" NW)
DISPERSION TRENCH CB#2 TYPE 1	RIM = 164.04 IE = 163.00 (6" S)
POND INLET #1	RIM = 164.10 IE = 162.00 (12" E)
POND INLET #2	RIM = 160.41 IE = 162.00 (8" W)
POND OUTLET	RIM = 165.10 IE = 163.00 (12" S)

PIPE TABLE				
NAME	SIZE	LENGTH	SLOPE	MATERIAL
P - (36)	6"	34.16'	0.00%	CPEP
P - (37)	6"	25.92'	0.00%	CPEP
Pipe - (1)	12"	73.43'	0.50%	CPEP
Pipe - (2)	12"	72.00'	0.50%	CPEP
Pipe - (3)	12"	265.00'	1.38%	CPEP
Pipe - (4)	12"	260.42'	1.21%	CPEP
Pipe - (5)	12"	111.10'	0.50%	CPEP
Pipe - (6)	12"	24.84'	0.50%	CPEP
Pipe - (7)	12"	81.40'	0.50%	CPEP
Pipe - (8)	12"	49.37'	0.50%	CPEP
Pipe - (9)	12"	19.84'	0.50%	CPEP
Pipe - (10)	12"	49.37'	0.50%	CPEP
Pipe - (11)	12"	56.27'	0.47%	CPEP
Pipe - (12)	12"	24.46'	0.51%	CPEP
Pipe - (13)	12"	229.46'	0.50%	CPEP
Pipe - (14)	12"	19.84'	0.50%	CPEP
Pipe - (15)	12"	250.05'	1.76%	CPEP

PIPE TABLE				
NAME	SIZE	LENGTH	SLOPE	MATERIAL
Pipe - (16)	12"	19.84'	0.50%	CPEP
Pipe - (17)	12"	74.54'	0.51%	CPEP
Pipe - (18)	12"	120.43'	0.50%	CPEP
Pipe - (19)	12"	21.45'	0.47%	CPEP
Pipe - (20)	12"	60.02'	0.50%	CPEP
Pipe - (21)	12"	31.27'	3.65%	CPEP
Pipe - (22)	12"	85.32'	0.50%	CPEP
Pipe - (23)	12"	19.86'	4.83%	DI CL52
Pipe - (24)	12"	39.61'	2.67%	CPEP
Pipe - (25)	12"	36.88'	0.50%	CPEP
Pipe - (26)	12"	15.18'	6.59%	CPEP
Pipe - (27)	12"	78.09'	1.28%	CPEP
Pipe - (28)	12"	59.61'	3.22%	CPEP
Pipe - (29)	8"	201.06'	0.37%	CPEP
Pipe - (30)	8"	26.16'	13.46%	CPEP
Pipe - (31)	8"	514.82'	1.57%	CPEP
Pipe - (32)	8"	293.89'	0.80%	CPEP

AHBL
2215 North 30th Street,
Suite 300,
Tacoma, WA 98403
253.383.2422 TEL
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SPRINGWOOD PLAT

STORM STRUCTURE AND PIPE SCHEDULE

JOB NO. 2240545.10

DATE: 11/25/2025

A-7

Appendix B

Storm Facility Sizing

B-1.....Pre-Developed Basin Map
B-2.....Post-Developed Basin Map
B-3.....WWHM Report

N

GRAPHIC SCALE

0 40 80 160

1" = 80 FEET

OFFSITE-1

ONSITE BASIN

OFFSITE-2

09680073000

BASINS						
BASINS	FOREST (AC)	LAWN (AC)	ROOF (AC)	DRIVEWAYS (AC)	ROAD (AC)	COMBINED (AC)
ONSITE	3.33	3.24		0.48	0.47	7.52
OFFSITE-1	1.31	1.68		0.55	0.08	3.62
OFFSITE-2	0	1.20		0.25	-	1.45

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SPRINGWOOD GARDEN

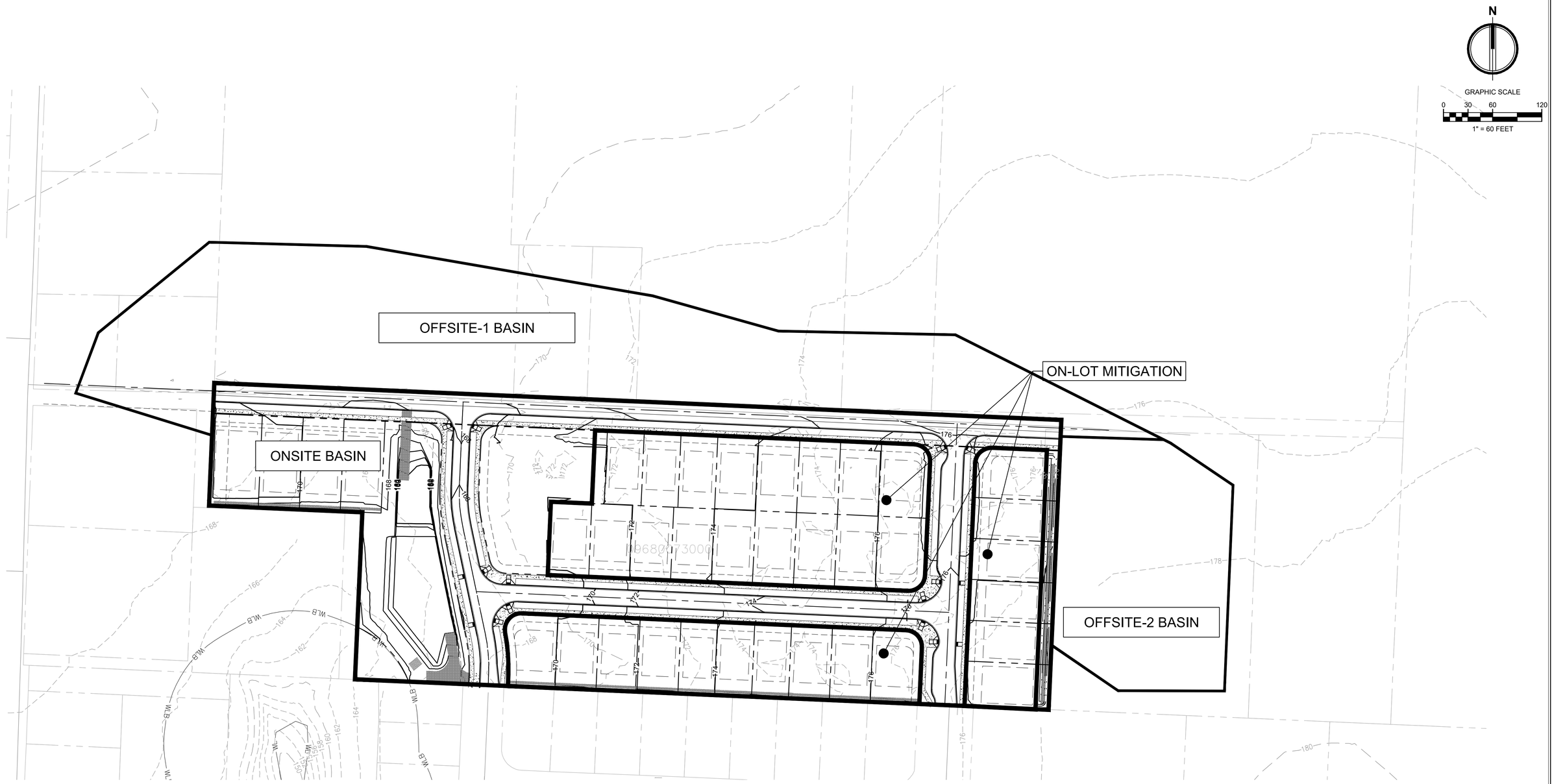
PREDEVELOPED BASIN MAP

JOB NO. 2240545.10

DATE: 11/25/2025

B-1

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BASINS							
BASINS	FOREST (AC)	LAWN (AC)	ROOF (AC)	DRIVEWAYS (AC)	ROAD (AC)	SIDEWALKS (AC)	COMBINED (AC)
ONSITE	0.46	*2.21	0.28	0.07	1.26	0.36	4.64
ON-LOT MITIGATION	-	*0.98	1.50	**0.62	-	-	3.10
OFFSITE-1	1.31	1.68	0.55		0.08	-	3.62
OFFSITE-2	-	1.20	0.25		-	-	1.45

* LAWN AREAS MODELED AS PASTURE, PER POST-CONSTRUCTION SOIL QUALITY AND DEPTH BMP T5.13 RUNOFF MODEL REPRESENTATION CRITERIA.
** PERMEABLE DRIVEWAYS

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SPRINGWOOD PLAT

BASIN MAP

JOB NO. 2240545.10

DATE: 11/25/2025

B-2

Q:\2024\2240545\10_CIV\CAD\EXHIBITS\Basin Map.dwg

WWHM2025

PROJECT REPORT

General Model Information

WWHM2012 Project Name: Springwood Detention Wetpond test

Site Name:	Springwood
Site Address:	
City:	
Report Date:	11/25/2025
Gage:	Woodard Creek
Data Start:	1955/10/01
Data End:	2011/09/30
Timestep:	15 Minute
Precip Scale:	1.125
Version Date:	2025/05/13
Version:	4.3.2

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year
Low Flow Threshold for POC2:	50 Percent of the 2 Year
High Flow Threshold for POC2:	50 Year

Landuse Basin Data

Predeveloped Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Flat	7.52
Pervious Total	7.52
Impervious Land Use	acre
Impervious Total	0
Basin Total	7.52

Element Flow Componants:

Surface	Interflow	Groundwater
Componant Flows To:		
POC 1	POC 1	

Offsite

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Forest, Flat	1.31
C, Lawn, Flat	1.68
Pervious Total	2.99

Impervious Land Use	acre
ROADS FLAT	0.08
ROOF TOPS FLAT	0.55
Impervious Total	0.63
Basin Total	3.62

Element Flow Componants:

Surface	Interflow	Groundwater
Componant Flows To:		
POC 1	POC 1	

Offsite 2

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Lawn, Flat	1.2
Pervious Total	1.2
Impervious Land Use	acre
ROOF TOPS FLAT	0.25
Impervious Total	0.25
Basin Total	1.45

Element Flow Componants:

Surface	Interflow	Groundwater
Componant Flows To:		
POC 2	POC 2	

Mitigated Land Use

Onsite to Detention

Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Forest, Flat	0.46
C, Lawn, Flat	1.66
Pervious Total	2.12

Impervious Land Use	acre
ROADS FLAT	1.26
ROOF TOPS FLAT	0.28
DRIVEWAYS FLAT	0.07
SIDEWALKS FLAT	0.36
Impervious Total	1.97

Basin Total	4.09

Element Flow Componants:

Surface	Interflow	Groundwater

Componant Flows To:

Trapezoidal Pond 1	Trapezoidal Pond 1

On-Lot Roofs

Bypass:	No
Impervious Land Use	acre
ROOF TOPS FLAT	1.5

Element Flow Componant:
Surface
Componant Flows To:
Permeable Pavement 1

On-lot Lawn (Model as pasture)

Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Pasture, Flat	.98

Element Flow Componants:

Surface	Interflow	Groundwater
Componant Flows To:		
Permeable Pavement 2	Permeable Pavement 1	

Lot 22-31 Rear Yard

Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Pasture, Flat	.55

Element Flow Componants:
Surface Interflow Groundwater
Componant Flows To:
Gravel Trench Bed 1

Offsite-1

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Forest, Flat	1.31
C, Lawn, Flat	1.68
Pervious Total	2.99

Impervious Land Use	acre
ROADS FLAT	0.08
ROOF TOPS FLAT	0.55
Impervious Total	0.63
Basin Total	3.62

Element Flow Componants:
Surface Interflow Groundwater
Componant Flows To:
Trapezoidal Pond 1

Offsite 2

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Lawn, Flat	1.2
Pervious Total	1.2

Impervious Land Use	acre
ROOF TOPS FLAT	0.25
Impervious Total	0.25
Basin Total	1.45

Element Flow Componants:
Surface Interflow Groundwater
Componant Flows To:
Gravel Trench Bed 2

Routing Elements
Predeveloped Routing

Mitigated Routing

Permeable Pavement 1

Pavement Area:0.6198 acre.Pavement Length:450.00 ft.
Pavement Width: 60.00 ft.
Pavement slope 1:0 To 1
Pavement thickness: 0.5
Pour Space of Pavement: 0.4
Material thickness of second layer: 2
Pour Space of material for second layer: 0.4
Material thickness of third layer: 0
Pour Space of material for third layer: 0
Infiltration On
Infiltration rate: 1.18
Infiltration safety factor: 1
Total Volume Infiltrated (ac-ft.): 515.192
Total Volume Through Riser (ac-ft.): 0
Total Volume Through Facility (ac-ft.): 515.192
Percent Infiltrated: 100
Total Precip Applied to Facility: 0
Total Evap From Facility: 12.995
Discharge Structure
Riser Height: 2.5 ft.
Riser Diameter: 720 in.
Notch Type: Rectangular
Notch Width: 6.000 ft.
Notch Height: -0.080 ft.
Element Outlets:
Outlet 1 Outlet 2
Outlet Flows To:

Permeable Pavement Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.619	0.000	0.000	0.000
0.0278	0.619	0.006	0.000	0.737
0.0556	0.619	0.013	0.000	0.737
0.0833	0.619	0.020	0.000	0.737
0.1111	0.619	0.027	0.000	0.737
0.1389	0.619	0.034	0.000	0.737
0.1667	0.619	0.041	0.000	0.737
0.1944	0.619	0.048	0.000	0.737
0.2222	0.619	0.055	0.000	0.737
0.2500	0.619	0.062	0.000	0.737
0.2778	0.619	0.068	0.000	0.737
0.3056	0.619	0.075	0.000	0.737
0.3333	0.619	0.082	0.000	0.737
0.3611	0.619	0.089	0.000	0.737
0.3889	0.619	0.096	0.000	0.737
0.4167	0.619	0.103	0.000	0.737
0.4444	0.619	0.110	0.000	0.737
0.4722	0.619	0.117	0.000	0.737
0.5000	0.619	0.124	0.000	0.737
0.5278	0.619	0.130	0.000	0.737
0.5556	0.619	0.137	0.000	0.737
0.5833	0.619	0.144	0.000	0.737

0.6111	0.619	0.151	0.000	0.737
0.6389	0.619	0.158	0.000	0.737
0.6667	0.619	0.165	0.000	0.737
0.6944	0.619	0.172	0.000	0.737
0.7222	0.619	0.179	0.000	0.737
0.7500	0.619	0.186	0.000	0.737
0.7778	0.619	0.192	0.000	0.737
0.8056	0.619	0.199	0.000	0.737
0.8333	0.619	0.206	0.000	0.737
0.8611	0.619	0.213	0.000	0.737
0.8889	0.619	0.220	0.000	0.737
0.9167	0.619	0.227	0.000	0.737
0.9444	0.619	0.234	0.000	0.737
0.9722	0.619	0.241	0.000	0.737
1.0000	0.619	0.247	0.000	0.737
1.0278	0.619	0.254	0.000	0.737
1.0556	0.619	0.261	0.000	0.737
1.0833	0.619	0.268	0.000	0.737
1.1111	0.619	0.275	0.000	0.737
1.1389	0.619	0.282	0.000	0.737
1.1667	0.619	0.289	0.000	0.737
1.1944	0.619	0.296	0.000	0.737
1.2222	0.619	0.303	0.000	0.737
1.2500	0.619	0.309	0.000	0.737
1.2778	0.619	0.316	0.000	0.737
1.3056	0.619	0.323	0.000	0.737
1.3333	0.619	0.330	0.000	0.737
1.3611	0.619	0.337	0.000	0.737
1.3889	0.619	0.344	0.000	0.737
1.4167	0.619	0.351	0.000	0.737
1.4444	0.619	0.358	0.000	0.737
1.4722	0.619	0.365	0.000	0.737
1.5000	0.619	0.371	0.000	0.737
1.5278	0.619	0.378	0.000	0.737
1.5556	0.619	0.385	0.000	0.737
1.5833	0.619	0.392	0.000	0.737
1.6111	0.619	0.399	0.000	0.737
1.6389	0.619	0.406	0.000	0.737
1.6667	0.619	0.413	0.000	0.737
1.6944	0.619	0.420	0.000	0.737
1.7222	0.619	0.427	0.000	0.737
1.7500	0.619	0.433	0.000	0.737
1.7778	0.619	0.440	0.000	0.737
1.8056	0.619	0.447	0.000	0.737
1.8333	0.619	0.454	0.000	0.737
1.8611	0.619	0.461	0.000	0.737
1.8889	0.619	0.468	0.000	0.737
1.9167	0.619	0.475	0.000	0.737
1.9444	0.619	0.482	0.000	0.737
1.9722	0.619	0.489	0.000	0.737
2.0000	0.619	0.495	0.000	0.737
2.0278	0.619	0.502	0.000	0.737
2.0556	0.619	0.509	0.000	0.737
2.0833	0.619	0.516	0.000	0.737
2.1111	0.619	0.523	0.000	0.737
2.1389	0.619	0.530	0.000	0.737
2.1667	0.619	0.537	0.000	0.737
2.1944	0.619	0.544	0.000	0.737

2.2222	0.619	0.551	0.000	0.737
2.2500	0.619	0.557	0.000	0.737
2.2778	0.619	0.564	0.000	0.737
2.3056	0.619	0.571	0.000	0.737
2.3333	0.619	0.578	0.000	0.737
2.3611	0.619	0.585	0.000	0.737
2.3889	0.619	0.592	0.000	0.737
2.4167	0.619	0.599	0.000	0.737
2.4444	0.619	0.606	0.000	0.737
2.4722	0.619	0.612	0.000	0.737
2.5000	0.619	0.619	0.000	0.737

Trapezoidal Pond 1

Bottom Length: 155.00 ft.
Bottom Width: 75.00 ft.
Depth: 3 ft.
Volume at riser head: 0.5337 acre-feet.
Side slope 1: 0 To 1
Side slope 2: 0 To 1
Side slope 3: 0 To 1
Side slope 4: 0 To 1
Discharge Structure
Riser Height: 2 ft.
Riser Diameter: 18 in.
Notch Type: Rectangular
Notch Width: 0.500 ft.
Notch Height: 0.900 ft.
Orifice 1 Diameter: 6.700 in. Elevation:0 ft.
Element Outlets:
Outlet 1 Outlet 2
Outlet Flows To:

Pond Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.266	0.000	0.000	0.000
0.0333	0.266	0.008	0.222	0.000
0.0667	0.266	0.017	0.314	0.000
0.1000	0.266	0.026	0.385	0.000
0.1333	0.266	0.035	0.444	0.000
0.1667	0.266	0.044	0.497	0.000
0.2000	0.266	0.053	0.544	0.000
0.2333	0.266	0.062	0.588	0.000
0.2667	0.266	0.071	0.629	0.000
0.3000	0.266	0.080	0.667	0.000
0.3333	0.266	0.089	0.703	0.000
0.3667	0.266	0.097	0.737	0.000
0.4000	0.266	0.106	0.770	0.000
0.4333	0.266	0.115	0.801	0.000
0.4667	0.266	0.124	0.832	0.000
0.5000	0.266	0.133	0.861	0.000
0.5333	0.266	0.142	0.889	0.000
0.5667	0.266	0.151	0.917	0.000
0.6000	0.266	0.160	0.943	0.000
0.6333	0.266	0.169	0.969	0.000
0.6667	0.266	0.177	0.994	0.000
0.7000	0.266	0.186	1.019	0.000
0.7333	0.266	0.195	1.043	0.000
0.7667	0.266	0.204	1.066	0.000
0.8000	0.266	0.213	1.089	0.000
0.8333	0.266	0.222	1.112	0.000
0.8667	0.266	0.231	1.134	0.000
0.9000	0.266	0.240	1.155	0.000
0.9333	0.266	0.249	1.176	0.000
0.9667	0.266	0.258	1.197	0.000
1.0000	0.266	0.266	1.218	0.000
1.0333	0.266	0.275	1.238	0.000
1.0667	0.266	0.284	1.258	0.000

1.1000	0.266	0.293	1.277	0.000
1.1333	0.266	0.302	1.307	0.000
1.1667	0.266	0.311	1.344	0.000
1.2000	0.266	0.320	1.387	0.000
1.2333	0.266	0.329	1.433	0.000
1.2667	0.266	0.338	1.484	0.000
1.3000	0.266	0.346	1.537	0.000
1.3333	0.266	0.355	1.594	0.000
1.3667	0.266	0.364	1.653	0.000
1.4000	0.266	0.373	1.714	0.000
1.4333	0.266	0.382	1.778	0.000
1.4667	0.266	0.391	1.845	0.000
1.5000	0.266	0.400	1.913	0.000
1.5333	0.266	0.409	1.983	0.000
1.5667	0.266	0.418	2.055	0.000
1.6000	0.266	0.427	2.129	0.000
1.6333	0.266	0.435	2.205	0.000
1.6667	0.266	0.444	2.282	0.000
1.7000	0.266	0.453	2.362	0.000
1.7333	0.266	0.462	2.443	0.000
1.7667	0.266	0.471	2.525	0.000
1.8000	0.266	0.480	2.609	0.000
1.8333	0.266	0.489	2.695	0.000
1.8667	0.266	0.498	2.782	0.000
1.9000	0.266	0.507	2.870	0.000
1.9333	0.266	0.516	2.960	0.000
1.9667	0.266	0.524	3.051	0.000
2.0000	0.266	0.533	3.144	0.000
2.0333	0.266	0.542	3.255	0.000
2.0667	0.266	0.551	3.446	0.000
2.1000	0.266	0.560	3.689	0.000
2.1333	0.266	0.569	3.972	0.000
2.1667	0.266	0.578	4.289	0.000
2.2000	0.266	0.587	4.632	0.000
2.2333	0.266	0.596	4.998	0.000
2.2667	0.266	0.604	5.379	0.000
2.3000	0.266	0.613	5.770	0.000
2.3333	0.266	0.622	6.164	0.000
2.3667	0.266	0.631	6.557	0.000
2.4000	0.266	0.640	6.941	0.000
2.4333	0.266	0.649	7.310	0.000
2.4667	0.266	0.658	7.660	0.000
2.5000	0.266	0.667	7.986	0.000
2.5333	0.266	0.676	8.284	0.000
2.5667	0.266	0.685	8.551	0.000
2.6000	0.266	0.693	8.787	0.000
2.6333	0.266	0.702	8.990	0.000
2.6667	0.266	0.711	9.165	0.000
2.7000	0.266	0.720	9.315	0.000
2.7333	0.266	0.729	9.449	0.000
2.7667	0.266	0.738	9.652	0.000
2.8000	0.266	0.747	9.798	0.000
2.8333	0.266	0.756	9.941	0.000
2.8667	0.266	0.765	10.08	0.000
2.9000	0.266	0.773	10.21	0.000
2.9333	0.266	0.782	10.35	0.000
2.9667	0.266	0.791	10.48	0.000
3.0000	0.266	0.800	10.61	0.000

3.0333	0.266	0.809	10.74	0.000

Gravel Trench Bed 1

Bottom Length:	500.00 ft.
Bottom Width:	2.00 ft.
Trench bottom slope 1:	0 To 1
Trench Left side slope 0:	0 To 1
Trench right side slope 2:	0 To 1
Material thickness of first layer:	1
Pour Space of material for first layer:	0.33
Material thickness of second layer:	1
Pour Space of material for second layer:	0.33
Material thickness of third layer:	0
Pour Space of material for third layer:	0
Infiltration On	
Infiltration rate:	1.18
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft.):	0.63
Total Volume Through Riser (ac-ft.):	0.044
Total Volume Through Facility (ac-ft.):	0.674
Percent Infiltrated:	93.47
Total Precip Applied to Facility:	0
Total Evap From Facility:	0
Discharge Structure	
Riser Height:	1 ft.
Riser Diameter:	18 in.
Element Outlets:	
Outlet 1	Outlet 2
Outlet Flows To:	
Trapezoidal Pond 1	

Gravel Trench Bed Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.023	0.000	0.000	0.000
0.0222	0.023	0.000	0.000	0.027
0.0444	0.023	0.000	0.000	0.027
0.0667	0.023	0.000	0.000	0.027
0.0889	0.023	0.000	0.000	0.027
0.1111	0.023	0.000	0.000	0.027
0.1333	0.023	0.001	0.000	0.027
0.1556	0.023	0.001	0.000	0.027
0.1778	0.023	0.001	0.000	0.027
0.2000	0.023	0.001	0.000	0.027
0.2222	0.023	0.001	0.000	0.027
0.2444	0.023	0.001	0.000	0.027
0.2667	0.023	0.002	0.000	0.027
0.2889	0.023	0.002	0.000	0.027
0.3111	0.023	0.002	0.000	0.027
0.3333	0.023	0.002	0.000	0.027
0.3556	0.023	0.002	0.000	0.027
0.3778	0.023	0.002	0.000	0.027
0.4000	0.023	0.003	0.000	0.027
0.4222	0.023	0.003	0.000	0.027
0.4444	0.023	0.003	0.000	0.027
0.4667	0.023	0.003	0.000	0.027
0.4889	0.023	0.003	0.000	0.027
0.5111	0.023	0.003	0.000	0.027
0.5333	0.023	0.004	0.000	0.027

0.5556	0.023	0.004	0.000	0.027
0.5778	0.023	0.004	0.000	0.027
0.6000	0.023	0.004	0.000	0.027
0.6222	0.023	0.004	0.000	0.027
0.6444	0.023	0.004	0.000	0.027
0.6667	0.023	0.005	0.000	0.027
0.6889	0.023	0.005	0.000	0.027
0.7111	0.023	0.005	0.000	0.027
0.7333	0.023	0.005	0.000	0.027
0.7556	0.023	0.005	0.000	0.027
0.7778	0.023	0.005	0.000	0.027
0.8000	0.023	0.006	0.000	0.027
0.8222	0.023	0.006	0.000	0.027
0.8444	0.023	0.006	0.000	0.027
0.8667	0.023	0.006	0.000	0.027
0.8889	0.023	0.006	0.000	0.027
0.9111	0.023	0.006	0.000	0.027
0.9333	0.023	0.007	0.000	0.027
0.9556	0.023	0.007	0.000	0.027
0.9778	0.023	0.007	0.000	0.027
1.0000	0.023	0.007	0.000	0.027
1.0222	0.023	0.007	0.052	0.027
1.0444	0.023	0.007	0.149	0.027
1.0667	0.023	0.008	0.273	0.027
1.0889	0.023	0.008	0.421	0.027
1.1111	0.023	0.008	0.587	0.027
1.1333	0.023	0.008	0.771	0.027
1.1556	0.023	0.008	0.970	0.027
1.1778	0.023	0.008	1.181	0.027
1.2000	0.023	0.009	1.404	0.027
1.2222	0.023	0.009	1.636	0.027
1.2444	0.023	0.009	1.877	0.027
1.2667	0.023	0.009	2.123	0.027
1.2889	0.023	0.009	2.374	0.027
1.3111	0.023	0.009	2.628	0.027
1.3333	0.023	0.010	2.882	0.027
1.3556	0.023	0.010	3.135	0.027
1.3778	0.023	0.010	3.386	0.027
1.4000	0.023	0.010	3.632	0.027
1.4222	0.023	0.010	3.871	0.027
1.4444	0.023	0.010	4.103	0.027
1.4667	0.023	0.011	4.326	0.027
1.4889	0.023	0.011	4.537	0.027
1.5111	0.023	0.011	4.737	0.027
1.5333	0.023	0.011	4.924	0.027
1.5556	0.023	0.011	5.097	0.027
1.5778	0.023	0.012	5.256	0.027
1.6000	0.023	0.012	5.401	0.027
1.6222	0.023	0.012	5.532	0.027
1.6444	0.023	0.012	5.649	0.027
1.6667	0.023	0.012	5.754	0.027
1.6889	0.023	0.012	5.848	0.027
1.7111	0.023	0.013	5.934	0.027
1.7333	0.023	0.013	6.014	0.027
1.7556	0.023	0.013	6.159	0.027
1.7778	0.023	0.013	6.249	0.027
1.8000	0.023	0.013	6.338	0.027
1.8222	0.023	0.013	6.425	0.027

1.8444	0.023	0.014	6.512	0.027
1.8667	0.023	0.014	6.597	0.027
1.8889	0.023	0.014	6.681	0.027
1.9111	0.023	0.014	6.764	0.027
1.9333	0.023	0.014	6.846	0.027
1.9556	0.023	0.014	6.927	0.027
1.9778	0.023	0.015	7.007	0.027
2.0000	0.023	0.015	7.086	0.027

Gravel Trench Bed 2

Bottom Length:	300.00 ft.
Bottom Width:	5.00 ft.
Trench bottom slope 1:	0 To 1
Trench Left side slope 0:	0 To 1
Trench right side slope 2:	0 To 1
Material thickness of first layer:	1
Pour Space of material for first layer:	0.33
Material thickness of second layer:	1
Pour Space of material for second layer:	0.33
Material thickness of third layer:	0
Pour Space of material for third layer:	0
Infiltration On	
Infiltration rate:	1.18
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft.):	60.289
Total Volume Through Riser (ac-ft.):	3.742
Total Volume Through Facility (ac-ft.):	64.03
Percent Infiltrated:	94.16
Total Precip Applied to Facility:	0
Total Evap From Facility:	0
Discharge Structure	
Riser Height:	1 ft.
Riser Diameter:	18 in.
Element Outlets:	
Outlet 1	Outlet 2
Outlet Flows To:	

Gravel Trench Bed Hydraulic Table

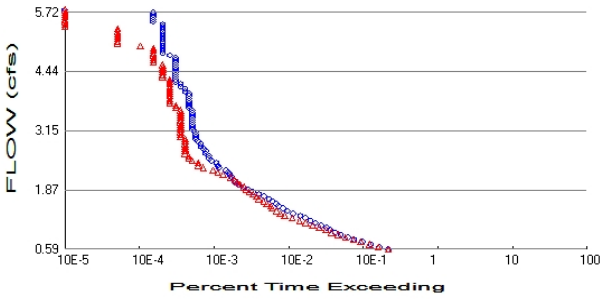
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.034	0.000	0.000	0.000
0.0222	0.034	0.000	0.000	0.041
0.0444	0.034	0.000	0.000	0.041
0.0667	0.034	0.000	0.000	0.041
0.0889	0.034	0.001	0.000	0.041
0.1111	0.034	0.001	0.000	0.041
0.1333	0.034	0.001	0.000	0.041
0.1556	0.034	0.001	0.000	0.041
0.1778	0.034	0.002	0.000	0.041
0.2000	0.034	0.002	0.000	0.041
0.2222	0.034	0.002	0.000	0.041
0.2444	0.034	0.002	0.000	0.041
0.2667	0.034	0.003	0.000	0.041
0.2889	0.034	0.003	0.000	0.041
0.3111	0.034	0.003	0.000	0.041
0.3333	0.034	0.003	0.000	0.041
0.3556	0.034	0.004	0.000	0.041
0.3778	0.034	0.004	0.000	0.041
0.4000	0.034	0.004	0.000	0.041
0.4222	0.034	0.004	0.000	0.041
0.4444	0.034	0.005	0.000	0.041
0.4667	0.034	0.005	0.000	0.041
0.4889	0.034	0.005	0.000	0.041
0.5111	0.034	0.005	0.000	0.041
0.5333	0.034	0.006	0.000	0.041

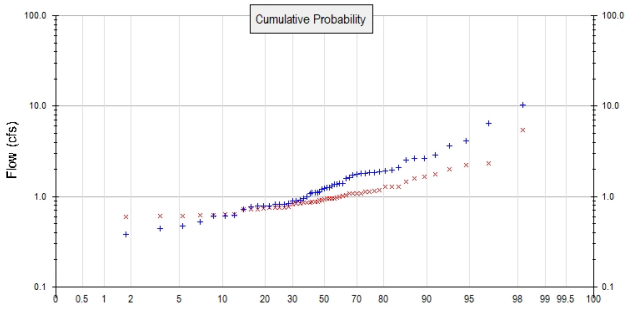
0.5556	0.034	0.006	0.000	0.041
0.5778	0.034	0.006	0.000	0.041
0.6000	0.034	0.006	0.000	0.041
0.6222	0.034	0.007	0.000	0.041
0.6444	0.034	0.007	0.000	0.041
0.6667	0.034	0.007	0.000	0.041
0.6889	0.034	0.007	0.000	0.041
0.7111	0.034	0.008	0.000	0.041
0.7333	0.034	0.008	0.000	0.041
0.7556	0.034	0.008	0.000	0.041
0.7778	0.034	0.008	0.000	0.041
0.8000	0.034	0.009	0.000	0.041
0.8222	0.034	0.009	0.000	0.041
0.8444	0.034	0.009	0.000	0.041
0.8667	0.034	0.009	0.000	0.041
0.8889	0.034	0.010	0.000	0.041
0.9111	0.034	0.010	0.000	0.041
0.9333	0.034	0.010	0.000	0.041
0.9556	0.034	0.010	0.000	0.041
0.9778	0.034	0.011	0.000	0.041
1.0000	0.034	0.011	0.000	0.041
1.0222	0.034	0.011	0.052	0.041
1.0444	0.034	0.011	0.149	0.041
1.0667	0.034	0.012	0.273	0.041
1.0889	0.034	0.012	0.421	0.041
1.1111	0.034	0.012	0.587	0.041
1.1333	0.034	0.012	0.771	0.041
1.1556	0.034	0.013	0.970	0.041
1.1778	0.034	0.013	1.181	0.041
1.2000	0.034	0.013	1.404	0.041
1.2222	0.034	0.013	1.636	0.041
1.2444	0.034	0.014	1.877	0.041
1.2667	0.034	0.014	2.123	0.041
1.2889	0.034	0.014	2.374	0.041
1.3111	0.034	0.014	2.628	0.041
1.3333	0.034	0.015	2.882	0.041
1.3556	0.034	0.015	3.135	0.041
1.3778	0.034	0.015	3.386	0.041
1.4000	0.034	0.015	3.632	0.041
1.4222	0.034	0.016	3.871	0.041
1.4444	0.034	0.016	4.103	0.041
1.4667	0.034	0.016	4.326	0.041
1.4889	0.034	0.016	4.537	0.041
1.5111	0.034	0.017	4.737	0.041
1.5333	0.034	0.017	4.924	0.041
1.5556	0.034	0.017	5.097	0.041
1.5778	0.034	0.017	5.256	0.041
1.6000	0.034	0.018	5.401	0.041
1.6222	0.034	0.018	5.532	0.041
1.6444	0.034	0.018	5.649	0.041
1.6667	0.034	0.018	5.754	0.041
1.6889	0.034	0.019	5.848	0.041
1.7111	0.034	0.019	5.934	0.041
1.7333	0.034	0.019	6.014	0.041
1.7556	0.034	0.019	6.159	0.041
1.7778	0.034	0.020	6.249	0.041
1.8000	0.034	0.020	6.338	0.041
1.8222	0.034	0.020	6.425	0.041

1.8444	0.034	0.021	6.512	0.041
1.8667	0.034	0.021	6.597	0.041
1.8889	0.034	0.021	6.681	0.041
1.9111	0.034	0.021	6.764	0.041
1.9333	0.034	0.022	6.846	0.041
1.9556	0.034	0.022	6.927	0.041
1.9778	0.034	0.022	7.007	0.041
2.0000	0.034	0.022	7.086	0.041

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 10.51
Total Impervious Area: 0.63

Mitigated Landuse Totals for POC #1
Total Pervious Area: 5.66
Total Impervious Area: 2.6

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	1.185504
5 year	2.129482
10 year	2.986707
25 year	4.392923
50 year	5.715925
100 year	7.312628

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.933345
5 year	1.345575
10 year	1.68217
25 year	2.189193
50 year	2.632716
100 year	3.138478

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1956	1.092	0.955
1957	2.547	1.988
1958	0.791	0.726
1959	1.381	0.880
1960	3.635	1.088
1961	1.366	0.766
1962	0.385	0.623
1963	2.871	1.591
1964	1.831	0.853
1965	1.241	1.130

1966	0.621	0.597
1967	1.096	0.955
1968	0.793	0.814
1969	1.791	0.741
1970	0.811	0.747
1971	1.214	0.910
1972	1.880	1.164
1973	1.133	0.839
1974	1.631	0.841
1975	1.097	0.728
1976	1.320	0.937
1977	1.260	0.856
1978	1.384	1.029
1979	0.828	0.865
1980	2.100	0.916
1981	1.789	1.133
1982	1.236	0.943
1983	1.754	1.286
1984	0.909	0.758
1985	0.614	0.750
1986	1.574	1.289
1987	1.962	1.275
1988	0.728	0.634
1989	0.767	0.715
1990	1.923	2.218
1991	2.626	2.344
1992	10.353	5.401
1993	0.822	0.749
1994	0.883	0.943
1995	0.821	1.184
1996	1.852	0.968
1997	6.490	1.646
1998	2.634	1.073
1999	0.784	0.872
2000	0.441	0.596
2001	0.324	0.608
2002	0.885	1.086
2003	0.604	0.605
2004	0.954	1.085
2005	0.474	0.629
2006	1.070	0.862
2007	0.990	1.013
2008	1.710	1.744
2009	1.368	1.470
2010	4.107	0.998
2011	0.523	0.624

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	10.3525	5.4012
2	6.4896	2.3438
3	4.1074	2.2180
4	3.6351	1.9883
5	2.8712	1.7444
6	2.6338	1.6464
7	2.6258	1.5907
8	2.5469	1.4703

9	2.1004	1.2891
10	1.9618	1.2861
11	1.9230	1.2753
12	1.8800	1.1840
13	1.8516	1.1636
14	1.8311	1.1326
15	1.7907	1.1304
16	1.7890	1.0883
17	1.7540	1.0864
18	1.7099	1.0847
19	1.6312	1.0730
20	1.5740	1.0294
21	1.3842	1.0135
22	1.3809	0.9976
23	1.3676	0.9682
24	1.3659	0.9550
25	1.3199	0.9546
26	1.2598	0.9433
27	1.2412	0.9429
28	1.2362	0.9374
29	1.2140	0.9158
30	1.1331	0.9098
31	1.0965	0.8801
32	1.0962	0.8716
33	1.0924	0.8647
34	1.0698	0.8618
35	0.9902	0.8561
36	0.9539	0.8526
37	0.9092	0.8406
38	0.8848	0.8389
39	0.8830	0.8140
40	0.8280	0.7662
41	0.8222	0.7582
42	0.8208	0.7499
43	0.8109	0.7487
44	0.7932	0.7465
45	0.7911	0.7408
46	0.7843	0.7278
47	0.7675	0.7258
48	0.7285	0.7151
49	0.6208	0.6344
50	0.6145	0.6290
51	0.6043	0.6240
52	0.5225	0.6233
53	0.4741	0.6082
54	0.4411	0.6053
55	0.3849	0.5973
56	0.3236	0.5960

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.5928	4194	4230	100	Pass
0.6445	3183	3130	98	Pass
0.6963	2464	2378	96	Pass
0.7480	1915	1815	94	Pass
0.7997	1476	1436	97	Pass
0.8515	1206	1136	94	Pass
0.9032	972	907	93	Pass
0.9550	814	740	90	Pass
1.0067	706	618	87	Pass
1.0585	626	507	80	Pass
1.1102	527	412	78	Pass
1.1620	443	335	75	Pass
1.2137	382	273	71	Pass
1.2655	326	219	67	Pass
1.3172	279	173	62	Pass
1.3690	223	151	67	Pass
1.4207	187	136	72	Pass
1.4725	163	117	71	Pass
1.5242	143	113	79	Pass
1.5760	132	99	75	Pass
1.6277	119	91	76	Pass
1.6795	107	78	72	Pass
1.7312	91	72	79	Pass
1.7830	78	65	83	Pass
1.8347	65	58	89	Pass
1.8865	56	52	92	Pass
1.9382	49	50	102	Pass
1.9900	42	44	104	Pass
2.0417	38	40	105	Pass
2.0935	36	37	102	Pass
2.1452	34	33	97	Pass
2.1970	32	26	81	Pass
2.2487	30	22	73	Pass
2.3005	28	19	67	Pass
2.3522	23	14	60	Pass
2.4040	22	12	54	Pass
2.4557	21	12	57	Pass
2.5075	18	10	55	Pass
2.5592	17	9	52	Pass
2.6110	17	9	52	Pass
2.6627	15	8	53	Pass
2.7145	15	8	53	Pass
2.7662	14	8	57	Pass
2.8180	13	8	61	Pass
2.8697	13	8	61	Pass
2.9215	12	8	66	Pass
2.9732	11	8	72	Pass
3.0250	11	7	63	Pass
3.0767	11	7	63	Pass
3.1285	11	7	63	Pass
3.1802	10	7	70	Pass
3.2320	10	7	70	Pass
3.2837	10	7	70	Pass

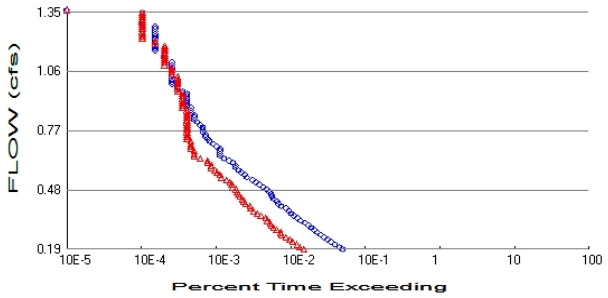
3.3355	10	7	70	Pass
3.3872	10	7	70	Pass
3.4390	10	7	70	Pass
3.4907	10	7	70	Pass
3.5425	10	7	70	Pass
3.5942	10	7	70	Pass
3.6460	9	6	66	Pass
3.6977	9	6	66	Pass
3.7495	9	5	55	Pass
3.8012	9	5	55	Pass
3.8530	9	5	55	Pass
3.9047	9	5	55	Pass
3.9565	9	5	55	Pass
4.0082	8	5	62	Pass
4.0599	8	5	62	Pass
4.1117	7	5	71	Pass
4.1634	7	5	71	Pass
4.2152	6	5	83	Pass
4.2669	6	5	83	Pass
4.3187	6	4	66	Pass
4.3704	6	4	66	Pass
4.4222	6	4	66	Pass
4.4739	6	4	66	Pass
4.5257	6	4	66	Pass
4.5774	6	4	66	Pass
4.6292	6	3	50	Pass
4.6809	6	3	50	Pass
4.7327	6	3	50	Pass
4.7844	5	3	60	Pass
4.8362	4	3	75	Pass
4.8879	4	3	75	Pass
4.9397	4	3	75	Pass
4.9914	4	2	50	Pass
5.0432	4	1	25	Pass
5.0949	4	1	25	Pass
5.1467	4	1	25	Pass
5.1984	4	1	25	Pass
5.2502	4	1	25	Pass
5.3019	4	1	25	Pass
5.3537	4	1	25	Pass
5.4054	4	0	0	Pass
5.4572	4	0	0	Pass
5.5089	3	0	0	Pass
5.5607	3	0	0	Pass
5.6124	3	0	0	Pass
5.6642	3	0	0	Pass
5.7159	3	0	0	Pass

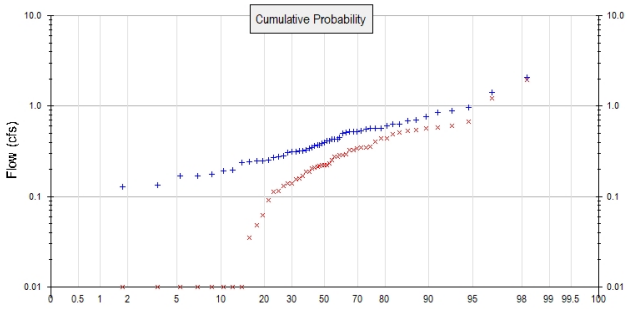
Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0.3734 acre-feet
On-line facility target flow:	0.6388 cfs.
Adjusted for 15 min:	0.6388 cfs.
Off-line facility target flow:	0.3475 cfs.
Adjusted for 15 min:	0.3475 cfs.

POC 2





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #2
Total Pervious Area: 1.2
Total Impervious Area: 0.25

Mitigated Landuse Totals for POC #2
Total Pervious Area: 1.2
Total Impervious Area: 0.25

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #2

Return Period	**Flow(cfs)**
2 year	0.383986
5 year	0.630127
10 year	0.825352
25 year	1.109896
50 year	1.350235
100 year	1.615635

Flow Frequency Return Periods for Mitigated. POC #2

Return Period	**Flow(cfs)**
2 year	0.360846
5 year	0.614982
10 year	0.767156
25 year	0.933591
50 year	1.038971
100 year	1.129917

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #2

Year	**Predeveloped**	**Mitigated**
1956	0.361	0.205
1957	0.763	0.563
1958	0.267	0.140
1959	0.412	0.131
1960	0.891	0.533
1961	0.344	0.209
1962	0.169	0.000
1963	0.853	0.672
1964	0.535	0.221
1965	0.410	0.294
1966	0.169	0.000

1967	0.329	0.188
1968	0.244	0.092
1969	0.525	0.211
1970	0.236	0.035
1971	0.310	0.169
1972	0.570	0.490
1973	0.320	0.139
1974	0.574	0.324
1975	0.375	0.115
1976	0.373	0.235
1977	0.523	0.287
1978	0.504	0.253
1979	0.430	0.224
1980	0.514	0.341
1981	0.609	0.350
1982	0.446	0.326
1983	0.522	0.350
1984	0.320	0.154
1985	0.191	0.000
1986	0.429	0.274
1987	0.627	0.512
1988	0.253	0.000
1989	0.194	0.048
1990	0.552	0.409
1991	0.691	0.604
1992	2.093	1.953
1993	0.311	0.113
1994	0.350	0.274
1995	0.276	0.188
1996	0.630	0.440
1997	1.412	1.212
1998	0.708	0.545
1999	0.248	0.063
2000	0.116	0.000
2001	0.128	0.000
2002	0.311	0.219
2003	0.246	0.000
2004	0.282	0.158
2005	0.135	0.000
2006	0.390	0.222
2007	0.392	0.286
2008	0.567	0.436
2009	0.434	0.356
2010	0.959	0.582
2011	0.177	0.000

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #2

Rank	Predeveloped	Mitigated
1	2.0928	1.9532
2	1.4117	1.2123
3	0.9588	0.6720
4	0.8909	0.6035
5	0.8532	0.5819
6	0.7628	0.5626
7	0.7083	0.5451
8	0.6909	0.5332
9	0.6295	0.5121

10	0.6266	0.4898
11	0.6093	0.4398
12	0.5744	0.4358
13	0.5699	0.4086
14	0.5669	0.3562
15	0.5523	0.3500
16	0.5346	0.3499
17	0.5249	0.3412
18	0.5229	0.3259
19	0.5215	0.3242
20	0.5142	0.2938
21	0.5040	0.2870
22	0.4456	0.2857
23	0.4336	0.2745
24	0.4302	0.2744
25	0.4293	0.2532
26	0.4121	0.2347
27	0.4103	0.2237
28	0.3921	0.2222
29	0.3902	0.2207
30	0.3749	0.2194
31	0.3733	0.2112
32	0.3610	0.2087
33	0.3496	0.2054
34	0.3438	0.1884
35	0.3288	0.1881
36	0.3199	0.1685
37	0.3197	0.1575
38	0.3111	0.1541
39	0.3107	0.1398
40	0.3097	0.1394
41	0.2820	0.1311
42	0.2764	0.1152
43	0.2673	0.1135
44	0.2531	0.0919
45	0.2476	0.0627
46	0.2456	0.0479
47	0.2444	0.0350
48	0.2363	0.0000
49	0.1939	0.0000
50	0.1907	0.0000
51	0.1771	0.0000
52	0.1694	0.0000
53	0.1686	0.0000
54	0.1348	0.0000
55	0.1281	0.0000
56	0.1156	0.0000

Duration Flows

The Duration Matching Failed

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.1920	974	295	30	Pass
0.2037	873	259	29	Pass
0.2154	768	238	30	Pass
0.2271	679	209	30	Pass
0.2388	605	189	31	Pass
0.2505	544	169	31	Pass
0.2622	492	148	30	Pass
0.2739	451	144	31	Pass
0.2856	404	127	31	Pass
0.2973	369	116	31	Pass
0.3090	342	108	31	Pass
0.3207	304	104	34	Pass
0.3324	266	96	36	Pass
0.3441	242	91	37	Pass
0.3558	218	78	35	Pass
0.3675	199	70	35	Pass
0.3792	186	62	33	Pass
0.3909	171	57	33	Pass
0.4026	146	56	38	Pass
0.4143	135	49	36	Pass
0.4260	129	46	35	Pass
0.4377	116	44	37	Pass
0.4494	111	41	36	Pass
0.4611	107	39	36	Pass
0.4728	102	38	37	Pass
0.4845	93	36	38	Pass
0.4962	84	33	39	Pass
0.5079	74	32	43	Pass
0.5196	67	30	44	Pass
0.5313	60	27	45	Pass
0.5430	51	23	45	Pass
0.5547	47	22	46	Pass
0.5664	43	20	46	Pass
0.5781	39	19	48	Pass
0.5898	36	17	47	Pass
0.6015	36	17	47	Pass
0.6132	33	15	45	Pass
0.6249	29	15	51	Pass
0.6366	25	12	48	Pass
0.6483	22	10	45	Pass
0.6600	22	10	45	Pass
0.6717	22	10	45	Pass
0.6834	22	9	40	Pass
0.6951	20	9	45	Pass
0.7068	18	9	50	Pass
0.7185	16	9	56	Pass
0.7302	15	8	53	Pass
0.7419	14	8	57	Pass
0.7536	14	8	57	Pass
0.7653	13	8	61	Pass
0.7770	13	8	61	Pass
0.7887	13	8	61	Pass
0.8004	12	8	66	Pass
0.8121	11	8	72	Pass

0.8238	10	8	80	Pass
0.8355	10	8	80	Pass
0.8472	10	8	80	Pass
0.8589	9	8	88	Pass
0.8706	9	8	88	Pass
0.8823	9	7	77	Pass
0.8940	8	7	87	Pass
0.9057	8	7	87	Pass
0.9174	8	7	87	Pass
0.9291	8	7	87	Pass
0.9408	8	7	87	Pass
0.9525	8	7	87	Pass
0.9642	7	6	85	Pass
0.9759	6	6	100	Pass
0.9876	6	6	100	Pass
0.9993	5	6	120	Fail
1.0110	5	6	120	Fail
1.0227	5	6	120	Fail
1.0344	5	6	120	Fail
1.0461	5	5	100	Pass
1.0577	5	5	100	Pass
1.0694	5	5	100	Pass
1.0811	5	5	100	Pass
1.0928	5	4	80	Pass
1.1045	5	4	80	Pass
1.1162	4	4	100	Pass
1.1279	4	4	100	Pass
1.1396	4	4	100	Pass
1.1513	4	4	100	Pass
1.1630	3	4	133	Fail
1.1747	3	4	133	Fail
1.1864	3	4	133	Fail
1.1981	3	3	100	Pass
1.2098	3	3	100	Pass
1.2215	3	2	66	Pass
1.2332	3	2	66	Pass
1.2449	3	2	66	Pass
1.2566	3	2	66	Pass
1.2683	3	2	66	Pass
1.2800	3	2	66	Pass
1.2917	2	2	100	Pass
1.3034	2	2	100	Pass
1.3151	2	2	100	Pass
1.3268	2	2	100	Pass
1.3385	2	2	100	Pass
1.3502	2	2	100	Pass

The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.

Water Quality

Water Quality BMP Flow and Volume for POC #2
On-line facility volume: 0 acre-feet
On-line facility target flow: 0 cfs.
Adjusted for 15 min: 0 cfs.
Off-line facility target flow: 0 cfs.
Adjusted for 15 min: 0 cfs.

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

No PERLND changes have been made.

IMPLND Changes

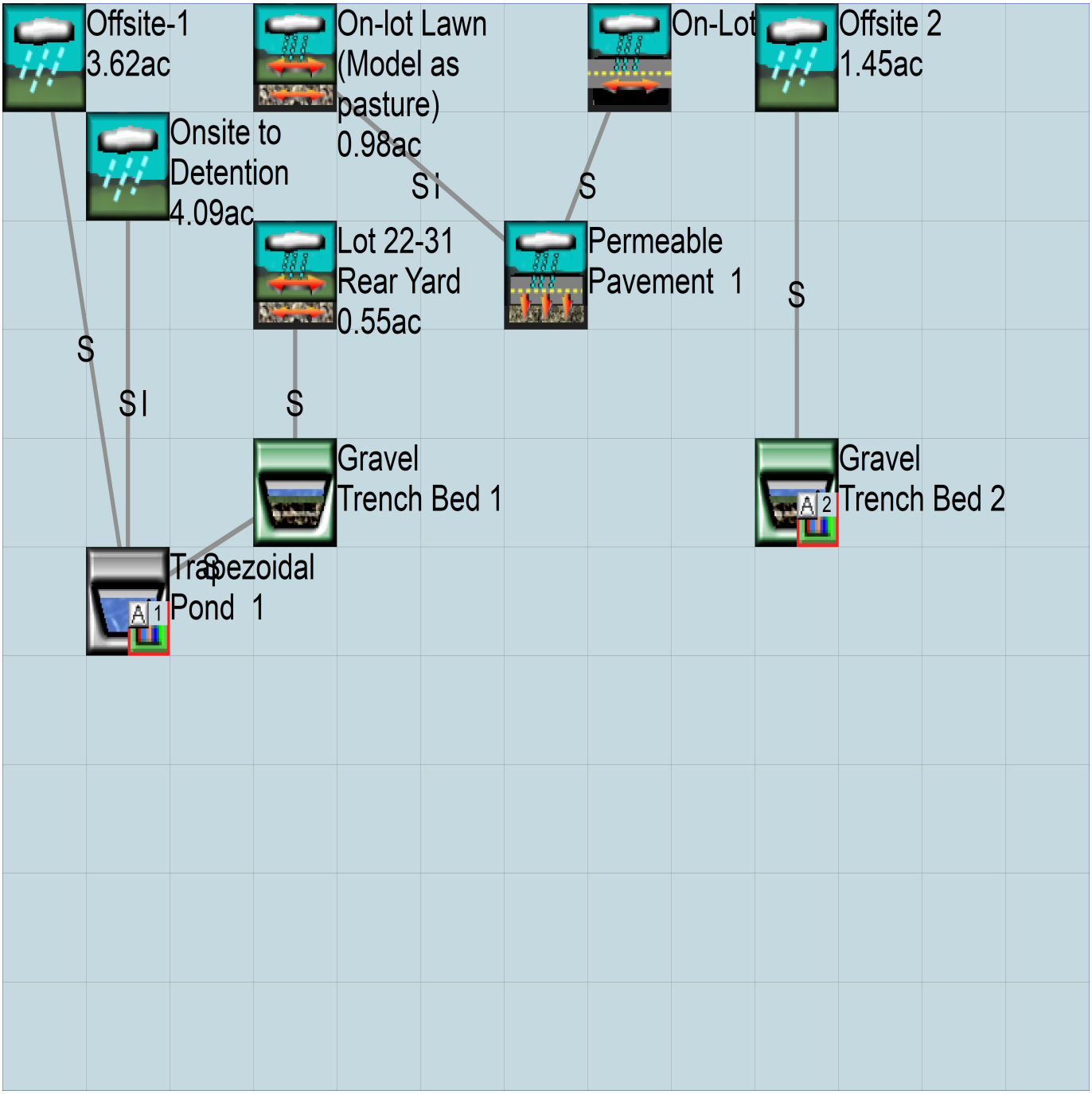
No IMPLND changes have been made.

Appendix

Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1955 10 01        END    2011 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   Springwood Detention Wetpond test.wdm
MESSU       25   PreSpringwood Detention Wetpond test.MES
            27   PreSpringwood Detention Wetpond test.L61
            28   PreSpringwood Detention Wetpond test.L62
            30   POCSpringwood Detention Wetpond test1.dat
            31   POCSpringwood Detention Wetpond test2.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:15
      PERLND      10
      PERLND      16
      IMPLND       1
      IMPLND       4
      COPY       501
      COPY       502
      DISPLY       1
      DISPLY       2
    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
    2        Offsite 2                 MAX                    1    2   31    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  502         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           ***
   10     C, Forest, Flat         1    1    1    1   27    0
   16     C, Lawn, Flat           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 ***
```

```
   10         0    0    1    0    0    0    0    0    0    0    0    0
   16         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  *********
   10         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   16         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 ***
   10         0    0    0    0    0    0    0    0    0    0    0
   16         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
   10              0       4.5      0.08       400      0.05       0.5     0.996
   16              0       4.5      0.03       400      0.05       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   10              0         0         2         2         0         0         0
   16              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                          ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   10            0.2       0.5      0.35         6       0.5       0.7
   16            0.1      0.25      0.25         6       0.5      0.25
  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
   10              0         0         0         0       2.5          1         0
   16              0         0         0         0       2.5          1         0
  END PWAT-STATE1

END PERLND

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

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

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    1         0    0    4    0    0    4    1    9
    4         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     ***
    1         0    0    0    0    0
    4         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            400      0.01       0.1       0.1
    4            400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1              0         0
    4              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1              0         0
    4              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                 <--Area-->     <-Target->   MBLK   ***
<Name>   #                 <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  10                       7.52     COPY   501     12
PERLND  10                       7.52     COPY   501     13
Offsite***
PERLND  10                       1.31     COPY   501     12
PERLND  10                       1.31     COPY   501     13
PERLND  16                       1.68     COPY   501     12
PERLND  16                       1.68     COPY   501     13
IMPLND   1                       0.08     COPY   501     15
IMPLND   4                       0.55     COPY   501     15
Offsite 2***
PERLND  16                        1.2     COPY   502     12
PERLND  16                        1.2     COPY   502     13
IMPLND   4                       0.25     COPY   502     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
COPY   502 OUTPUT MEAN   1 1   48.4        DISPLY   2     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    1.125          PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1.125          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
COPY   502 OUTPUT MEAN   1 1     48.4      WDM    502 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

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

```
END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1955 10 01        END    2011 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   Springwood Detention Wetpond test.wdm
MESSU       25   MitSpringwood Detention Wetpond test.MES
            27   MitSpringwood Detention Wetpond test.L61
            28   MitSpringwood Detention Wetpond test.L62
            31   POCSpringwood Detention Wetpond test2.dat
            30   POCSpringwood Detention Wetpond test1.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:15
      PERLND      10
      PERLND      16
      IMPLND       1
      IMPLND       4
      IMPLND       5
      IMPLND       8
      IMPLND      20
      PERLND      43
      PERLND      47
      RCHRES       1
      RCHRES       2
      IMPLND      21
      RCHRES       3
      RCHRES       4
      COPY         2
      COPY       502
      COPY         1
      COPY       501
      DISPLY       2
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title---------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    2        Gravel Trench Bed 2         MAX                    1    2   31    9
    1        Trapezoidal Pond  1         MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
    2         1    1
  502         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           ***
   10     C, Forest, Flat         1    1    1    1   27    0
   16     C, Lawn, Flat           1    1    1    1   27    0
   43     C, Pasture, Flat        1    1    1    1   27    0
   47     C, Pasture, Flat        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 ***
   10         0    0    1    0    0    0    0    0    0    0    0    0
   16         0    0    1    0    0    0    0    0    0    0    0    0
   43         0    0    1    0    0    0    0    0    0    0    0    0
   47         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  *********
   10         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   16         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   43         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   47         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 ***
   10         0    0    0    0    0    0    0    0    0    0    0
   16         0    0    0    0    0    0    0    0    0    0    0
   43         0    0    0    0    0    0    0    0    0    0    0
   47         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
   10              0       4.5      0.08       400      0.05       0.5     0.996
   16              0       4.5      0.03       400      0.05       0.5     0.996
   43              0       4.5      0.06       400      0.05       0.5     0.996
   47              0       4.5      0.06       400      0.05       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   10              0         0         2         2         0         0         0
   16              0         0         2         2         0         0         0
   43              0         0         2         2         0         0         0
   47              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   10            0.2       0.5      0.35         6       0.5       0.7
   16            0.1      0.25      0.25         6       0.5      0.25
   43           0.15       0.4       0.3         6       0.5       0.4
   47           0.15       0.4       0.3         6       0.5       0.4
  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
   10              0         0         0          0       2.5          1          0
```

```
   16             0         0         0         0       2.5         1         0
   43             0         0         0         0       2.5         1         0
   47             0         0         0         0       2.5         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                      in  out           ***
    1      ROADS/FLAT             1    1    1   27    0
    4      ROOF TOPS/FLAT         1    1    1   27    0
    5      DRIVEWAYS/FLAT         1    1    1   27    0
    8      SIDEWALKS/FLAT         1    1    1   27    0
   20      ROOF TOPS/FLAT         1    1    1   27    0
   21      Porous Pavement        1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    1         0    0    1    0    0    0
    4         0    0    1    0    0    0
    5         0    0    1    0    0    0
    8         0    0    1    0    0    0
   20         0    0    1    0    0    0
   21         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    1         0    0    4    0    0    4    1    9
    4         0    0    4    0    0    0    1    9
    5         0    0    4    0    0    0    1    9
    8         0    0    4    0    0    0    1    9
   20         0    0    4    0    0    0    1    9
   21         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     ***
    1         0    0    0    0    0
    4         0    0    0    0    0
    5         0    0    0    0    0
    8         0    0    0    0    0
   20         0    0    0    0    0
   21         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1           400      0.01       0.1       0.1
    4           400      0.01       0.1       0.1
    5           400      0.01       0.1       0.1
    8           400      0.01       0.1       0.1
   20           400      0.01       0.1       0.1
   21           400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1             0         0
    4             0         0
```

```
    5              0         0
    8              0         0
   20              0         0
   21              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1              0         0
    4              0         0
    5              0         0
    8              0         0
   20              0         0
   21              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Onsite to Detention ***
PERLND  10                        0.46     RCHRES   4      2
PERLND  10                        0.46     RCHRES   4      3
PERLND  16                        1.66     RCHRES   4      2
PERLND  16                        1.66     RCHRES   4      3
IMPLND   1                        1.26     RCHRES   4      5
IMPLND   4                        0.28     RCHRES   4      5
IMPLND   5                        0.07     RCHRES   4      5
IMPLND   8                        0.36     RCHRES   4      5
On-Lot Roofs***
IMPLND  20                        2.42     IMPLND  21     53
On-lot Lawn (Model as pasture) ***
PERLND  43                       0.484     IMPLND  21     54
PERLND  43                       0.484     IMPLND  21     55
Lateral Basin  2***
PERLND  47                        0.55     RCHRES   1      2
Basin  2***
PERLND  10                        1.31     RCHRES   4      2
PERLND  16                        1.68     RCHRES   4      2
IMPLND   1                        0.08     RCHRES   4      5
IMPLND   4                        0.55     RCHRES   4      5
Offsite 2***
PERLND  16                         1.2     RCHRES   2      2
IMPLND   4                        0.25     RCHRES   2      5
IMPLND  21                      0.6198     RCHRES   3      5

******Routing******
PERLND  10                        0.46     COPY     1     12
PERLND  16                        1.66     COPY     1     12
IMPLND   1                        1.26     COPY     1     15
IMPLND   4                        0.28     COPY     1     15
IMPLND   5                        0.07     COPY     1     15
IMPLND   8                        0.36     COPY     1     15
PERLND  10                        0.46     COPY     1     13
PERLND  16                        1.66     COPY     1     13
RCHRES   1                           1     RCHRES   4      7
RCHRES   1                                 COPY     1     17
PERLND  10                        1.31     COPY     1     12
PERLND  16                        1.68     COPY     1     12
IMPLND   1                        0.08     COPY     1     15
IMPLND   4                        0.55     COPY     1     15
PERLND  16                         1.2     COPY     2     12
IMPLND   4                        0.25     COPY     2     15
RCHRES   4                           1     COPY   501     16
RCHRES   2                           1     COPY   502     17
END SCHEMATIC

NETWORK
```

```
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   502 OUTPUT MEAN   1 1   48.4        DISPLY   2     INPUT  TIMSER 1
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     Gravel Trench Be-044    2    1    1    1   28    0    1
    2     Gravel Trench Be-050    2    1    1    1   28    0    1
    3     Permeable Paveme-028    2    1    1    1   28    0    1
    4     Trapezoidal Pond-035    1    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
    2         1    0    0    0    0    0    0    0    0    0
    3         1    0    0    0    0    0    0    0    0    0
    4         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
    2         4    0    0    0    0    0    0    0    0    0    1    9
    3         4    0    0    0    0    0    0    0    0    0    1    9
    4         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
    2      0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
    3      0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
    4      0  1  0  0    4  0  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      0.09       0.0       0.0       0.5       0.0
    2             2      0.06       0.0       0.0       0.5       0.0
    3             3      0.09       0.0       0.0       0.5       0.0
    4             4      0.03       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
    2            0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    3            0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    4            0         4.0  0.0  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      3
   91    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)     (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.619835  0.000000  0.000000  0.000000
  0.027778  0.619835  0.006887  0.000000  0.737500
  0.055556  0.619835  0.013774  0.000000  0.737500
  0.083333  0.619835  0.020661  0.000000  0.737500
  0.111111  0.619835  0.027548  0.000000  0.737500
  0.138889  0.619835  0.034435  0.000000  0.737500
  0.166667  0.619835  0.041322  0.000000  0.737500
  0.194444  0.619835  0.048209  0.000000  0.737500
  0.222222  0.619835  0.055096  0.000000  0.737500
  0.250000  0.619835  0.061983  0.000000  0.737500
  0.277778  0.619835  0.068871  0.000000  0.737500
  0.305556  0.619835  0.075758  0.000000  0.737500
  0.333333  0.619835  0.082645  0.000000  0.737500
  0.361111  0.619835  0.089532  0.000000  0.737500
  0.388889  0.619835  0.096419  0.000000  0.737500
  0.416667  0.619835  0.103306  0.000000  0.737500
  0.444444  0.619835  0.110193  0.000000  0.737500
  0.472222  0.619835  0.117080  0.000000  0.737500
  0.500000  0.619835  0.123967  0.000000  0.737500
  0.527778  0.619835  0.130854  0.000000  0.737500
  0.555556  0.619835  0.137741  0.000000  0.737500
  0.583333  0.619835  0.144628  0.000000  0.737500
  0.611111  0.619835  0.151515  0.000000  0.737500
  0.638889  0.619835  0.158402  0.000000  0.737500
  0.666667  0.619835  0.165289  0.000000  0.737500
  0.694444  0.619835  0.172176  0.000000  0.737500
  0.722222  0.619835  0.179063  0.000000  0.737500
  0.750000  0.619835  0.185950  0.000000  0.737500
  0.777778  0.619835  0.192837  0.000000  0.737500
  0.805556  0.619835  0.199725  0.000000  0.737500
  0.833333  0.619835  0.206612  0.000000  0.737500
  0.861111  0.619835  0.213499  0.000000  0.737500
  0.888889  0.619835  0.220386  0.000000  0.737500
  0.916667  0.619835  0.227273  0.000000  0.737500
  0.944444  0.619835  0.234160  0.000000  0.737500
  0.972222  0.619835  0.241047  0.000000  0.737500
  1.000000  0.619835  0.247934  0.000000  0.737500
  1.027778  0.619835  0.254821  0.000000  0.737500
  1.055556  0.619835  0.261708  0.000000  0.737500
  1.083333  0.619835  0.268595  0.000000  0.737500
  1.111111  0.619835  0.275482  0.000000  0.737500
  1.138889  0.619835  0.282369  0.000000  0.737500
  1.166667  0.619835  0.289256  0.000000  0.737500
  1.194444  0.619835  0.296143  0.000000  0.737500
  1.222222  0.619835  0.303030  0.000000  0.737500
  1.250000  0.619835  0.309917  0.000000  0.737500
  1.277778  0.619835  0.316804  0.000000  0.737500
  1.305556  0.619835  0.323691  0.000000  0.737500
  1.333333  0.619835  0.330579  0.000000  0.737500
  1.361111  0.619835  0.337466  0.000000  0.737500
  1.388889  0.619835  0.344353  0.000000  0.737500
  1.416667  0.619835  0.351240  0.000000  0.737500
  1.444444  0.619835  0.358127  0.000000  0.737500
  1.472222  0.619835  0.365014  0.000000  0.737500
  1.500000  0.619835  0.371901  0.000000  0.737500
  1.527778  0.619835  0.378788  0.000000  0.737500
  1.555556  0.619835  0.385675  0.000000  0.737500
  1.583333  0.619835  0.392562  0.000000  0.737500
  1.611111  0.619835  0.399449  0.000000  0.737500
  1.638889  0.619835  0.406336  0.000000  0.737500
  1.666667  0.619835  0.413223  0.000000  0.737500
```

```
1.694444  0.619835  0.420110  0.000000  0.737500
1.722222  0.619835  0.426997  0.000000  0.737500
1.750000  0.619835  0.433884  0.000000  0.737500
1.777778  0.619835  0.440771  0.000000  0.737500
1.805556  0.619835  0.447658  0.000000  0.737500
1.833333  0.619835  0.454545  0.000000  0.737500
1.861111  0.619835  0.461433  0.000000  0.737500
1.888889  0.619835  0.468320  0.000000  0.737500
1.916667  0.619835  0.475207  0.000000  0.737500
1.944444  0.619835  0.482094  0.000000  0.737500
1.972222  0.619835  0.488981  0.000000  0.737500
2.000000  0.619835  0.495868  0.000000  0.737500
2.027778  0.619835  0.502755  0.000000  0.737500
2.055556  0.619835  0.509642  0.000000  0.737500
2.083333  0.619835  0.516529  0.000000  0.737500
2.111111  0.619835  0.523416  0.000000  0.737500
2.138889  0.619835  0.530303  0.000000  0.737500
2.166667  0.619835  0.537190  0.000000  0.737500
2.194444  0.619835  0.544077  0.000000  0.737500
2.222222  0.619835  0.550964  0.000000  0.737500
2.250000  0.619835  0.557851  0.000000  0.737500
2.277778  0.619835  0.564738  0.000000  0.737500
2.305556  0.619835  0.571625  0.000000  0.737500
2.333333  0.619835  0.578512  0.000000  0.737500
2.361111  0.619835  0.585399  0.000000  0.737500
2.388889  0.619835  0.592287  0.000000  0.737500
2.416667  0.619835  0.599174  0.000000  0.737500
2.444444  0.619835  0.606061  0.000000  0.737500
2.472222  0.619835  0.612948  0.000000  0.737500
2.500000  0.619835  0.619835  0.000000  0.737500
END FTABLE  3
FTABLE      4
 91    4
   Depth      Area    Volume  Outflow1 Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
0.000000  0.266873  0.000000  0.000000
0.033333  0.266873  0.008896  0.222407
0.066667  0.266873  0.017792  0.314530
0.100000  0.266873  0.026687  0.385220
0.133333  0.266873  0.035583  0.444813
0.166667  0.266873  0.044479  0.497316
0.200000  0.266873  0.053375  0.544783
0.233333  0.266873  0.062270  0.588433
0.266667  0.266873  0.071166  0.629061
0.300000  0.266873  0.080062  0.667220
0.333333  0.266873  0.088958  0.703311
0.366667  0.266873  0.097854  0.737639
0.400000  0.266873  0.106749  0.770439
0.433333  0.266873  0.115645  0.801898
0.466667  0.266873  0.124541  0.832169
0.500000  0.266873  0.133437  0.861377
0.533333  0.266873  0.142332  0.889626
0.566667  0.266873  0.151228  0.917006
0.600000  0.266873  0.160124  0.943591
0.633333  0.266873  0.169020  0.969448
0.666667  0.266873  0.177916  0.994633
0.700000  0.266873  0.186811  1.019195
0.733333  0.266873  0.195707  1.043179
0.766667  0.266873  0.204603  1.066625
0.800000  0.266873  0.213499  1.089565
0.833333  0.266873  0.222394  1.112033
0.866667  0.266873  0.231290  1.134056
0.900000  0.266873  0.240186  1.155659
0.933333  0.266873  0.249082  1.176865
0.966667  0.266873  0.257978  1.197696
1.000000  0.266873  0.266873  1.218171
1.033333  0.266873  0.275769  1.238308
1.066667  0.266873  0.284665  1.258122
1.100000  0.266873  0.293561  1.277629
1.133333  0.266873  0.302456  1.306975
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1.166667  0.266873  0.311352  1.344435
1.200000  0.266873  0.320248  1.387092
1.233333  0.266873  0.329144  1.433910
1.266667  0.266873  0.338039  1.484295
1.300000  0.266873  0.346935  1.537851
1.333333  0.266873  0.355831  1.594286
1.366667  0.266873  0.364727  1.653378
1.400000  0.266873  0.373623  1.714947
1.433333  0.266873  0.382518  1.778847
1.466667  0.266873  0.391414  1.844955
1.500000  0.266873  0.400310  1.913164
1.533333  0.266873  0.409206  1.983385
1.566667  0.266873  0.418101  2.055535
1.600000  0.266873  0.426997  2.129545
1.633333  0.266873  0.435893  2.205350
1.666667  0.266873  0.444789  2.282893
1.700000  0.266873  0.453685  2.362123
1.733333  0.266873  0.462580  2.442992
1.766667  0.266873  0.471476  2.525456
1.800000  0.266873  0.480372  2.609475
1.833333  0.266873  0.489268  2.695014
1.866667  0.266873  0.498163  2.782036
1.900000  0.266873  0.507059  2.870510
1.933333  0.266873  0.515955  2.960407
1.966667  0.266873  0.524851  3.051698
2.000000  0.266873  0.533747  3.144356
2.033333  0.266873  0.542642  3.255506
2.066667  0.266873  0.551538  3.446529
2.100000  0.266873  0.560434  3.689078
2.133333  0.266873  0.569330  3.972320
2.166667  0.266873  0.578225  4.288971
2.200000  0.266873  0.587121  4.632906
2.233333  0.266873  0.596017  4.998328
2.266667  0.266873  0.604913  5.379437
2.300000  0.266873  0.613809  5.770311
2.333333  0.266873  0.622704  6.164909
2.366667  0.266873  0.631600  6.557138
2.400000  0.266873  0.640496  6.940986
2.433333  0.266873  0.649392  7.310671
2.466667  0.266873  0.658287  7.660842
2.500000  0.266873  0.667183  7.986792
2.533333  0.266873  0.676079  8.284695
2.566667  0.266873  0.684975  8.551872
2.600000  0.266873  0.693871  8.787064
2.633333  0.266873  0.702766  8.990732
2.666667  0.266873  0.711662  9.165362
2.700000  0.266873  0.720558  9.315795
2.733333  0.266873  0.729454  9.449569
2.766667  0.266873  0.738349  9.652874
2.800000  0.266873  0.747245  9.798500
2.833333  0.266873  0.756141  9.941302
2.866667  0.266873  0.765037  10.08144
2.900000  0.266873  0.773933  10.21908
2.933333  0.266873  0.782828  10.35433
2.966667  0.266873  0.791724  10.48734
3.000000  0.266873  0.800620  10.61820
END FTABLE  4
FTABLE      1
 92    5
   Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
0.000000  0.022957  0.000000  0.000000  0.000000
0.022222  0.022957  0.000168  0.000000  0.027315
0.044444  0.022957  0.000337  0.000000  0.027315
0.066667  0.022957  0.000505  0.000000  0.027315
0.088889  0.022957  0.000673  0.000000  0.027315
0.111111  0.022957  0.000842  0.000000  0.027315
0.133333  0.022957  0.001010  0.000000  0.027315
0.155556  0.022957  0.001178  0.000000  0.027315
0.177778  0.022957  0.001347  0.000000  0.027315
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0.200000	0.022957	0.001515	0.000000	0.027315
0.222222	0.022957	0.001684	0.000000	0.027315
0.244444	0.022957	0.001852	0.000000	0.027315
0.266667	0.022957	0.002020	0.000000	0.027315
0.288889	0.022957	0.002189	0.000000	0.027315
0.311111	0.022957	0.002357	0.000000	0.027315
0.333333	0.022957	0.002525	0.000000	0.027315
0.355556	0.022957	0.002694	0.000000	0.027315
0.377778	0.022957	0.002862	0.000000	0.027315
0.400000	0.022957	0.003030	0.000000	0.027315
0.422222	0.022957	0.003199	0.000000	0.027315
0.444444	0.022957	0.003367	0.000000	0.027315
0.466667	0.022957	0.003535	0.000000	0.027315
0.488889	0.022957	0.003704	0.000000	0.027315
0.511111	0.022957	0.003872	0.000000	0.027315
0.533333	0.022957	0.004040	0.000000	0.027315
0.555556	0.022957	0.004209	0.000000	0.027315
0.577778	0.022957	0.004377	0.000000	0.027315
0.600000	0.022957	0.004545	0.000000	0.027315
0.622222	0.022957	0.004714	0.000000	0.027315
0.644444	0.022957	0.004882	0.000000	0.027315
0.666667	0.022957	0.005051	0.000000	0.027315
0.688889	0.022957	0.005219	0.000000	0.027315
0.711111	0.022957	0.005387	0.000000	0.027315
0.733333	0.022957	0.005556	0.000000	0.027315
0.755556	0.022957	0.005724	0.000000	0.027315
0.777778	0.022957	0.005892	0.000000	0.027315
0.800000	0.022957	0.006061	0.000000	0.027315
0.822222	0.022957	0.006229	0.000000	0.027315
0.844444	0.022957	0.006397	0.000000	0.027315
0.866667	0.022957	0.006566	0.000000	0.027315
0.888889	0.022957	0.006734	0.000000	0.027315
0.911111	0.022957	0.006902	0.000000	0.027315
0.933333	0.022957	0.007071	0.000000	0.027315
0.955556	0.022957	0.007239	0.000000	0.027315
0.977778	0.022957	0.007407	0.000000	0.027315
1.000000	0.022957	0.007576	0.000000	0.027315
1.022222	0.022957	0.007744	0.052737	0.027315
1.044444	0.022957	0.007912	0.149070	0.027315
1.066667	0.022957	0.008081	0.273695	0.027315
1.088889	0.022957	0.008249	0.421060	0.027315
1.111111	0.022957	0.008418	0.587805	0.027315
1.133333	0.022957	0.008586	0.771465	0.027315
1.155556	0.022957	0.008754	0.970000	0.027315
1.177778	0.022957	0.008923	1.181580	0.027315
1.200000	0.022957	0.009091	1.404464	0.027315
1.222222	0.022957	0.009259	1.636945	0.027315
1.244444	0.022957	0.009428	1.877310	0.027315
1.266667	0.022957	0.009596	2.123824	0.027315
1.288889	0.022957	0.009764	2.374724	0.027315
1.311111	0.022957	0.009933	2.628224	0.027315
1.333333	0.022957	0.010101	2.882519	0.027315
1.355556	0.022957	0.010269	3.135803	0.027315
1.377778	0.022957	0.010438	3.386283	0.027315
1.400000	0.022957	0.010606	3.632201	0.027315
1.422222	0.022957	0.010774	3.871856	0.027315
1.444444	0.022957	0.010943	4.103633	0.027315
1.466667	0.022957	0.011111	4.326027	0.027315
1.488889	0.022957	0.011279	4.537676	0.027315
1.511111	0.022957	0.011448	4.737392	0.027315
1.533333	0.022957	0.011616	4.924197	0.027315
1.555556	0.022957	0.011785	5.097354	0.027315
1.577778	0.022957	0.011953	5.256407	0.027315
1.600000	0.022957	0.012121	5.401220	0.027315
1.622222	0.022957	0.012290	5.532017	0.027315
1.644444	0.022957	0.012458	5.649420	0.027315
1.666667	0.022957	0.012626	5.754494	0.027315
1.688889	0.022957	0.012795	5.848795	0.027315
1.711111	0.022957	0.012963	5.934405	0.027315
1.733333	0.022957	0.013131	6.013989	0.027315

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1.755556  0.022957  0.013300  6.159923  0.027315
1.777778  0.022957  0.013468  6.249853  0.027315
1.800000  0.022957  0.013636  6.338508  0.027315
1.822222  0.022957  0.013805  6.425940  0.027315
1.844444  0.022957  0.013973  6.512198  0.027315
1.866667  0.022957  0.014141  6.597328  0.027315
1.888889  0.022957  0.014310  6.681374  0.027315
1.911111  0.022957  0.014478  6.764376  0.027315
1.933333  0.022957  0.014646  6.846371  0.027315
1.955556  0.022957  0.014815  6.927396  0.027315
1.977778  0.022957  0.014983  7.007484  0.027315
2.000000  0.022957  0.015152  7.086668  0.027315
2.022222  0.022957  0.015662  7.164976  0.027315
END FTABLE  1
FTABLE      2
 92    5
   Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
0.000000  0.034435  0.000000  0.000000  0.000000
0.022222  0.034435  0.000253  0.000000  0.040972
0.044444  0.034435  0.000505  0.000000  0.040972
0.066667  0.034435  0.000758  0.000000  0.040972
0.088889  0.034435  0.001010  0.000000  0.040972
0.111111  0.034435  0.001263  0.000000  0.040972
0.133333  0.034435  0.001515  0.000000  0.040972
0.155556  0.034435  0.001768  0.000000  0.040972
0.177778  0.034435  0.002020  0.000000  0.040972
0.200000  0.034435  0.002273  0.000000  0.040972
0.222222  0.034435  0.002525  0.000000  0.040972
0.244444  0.034435  0.002778  0.000000  0.040972
0.266667  0.034435  0.003030  0.000000  0.040972
0.288889  0.034435  0.003283  0.000000  0.040972
0.311111  0.034435  0.003535  0.000000  0.040972
0.333333  0.034435  0.003788  0.000000  0.040972
0.355556  0.034435  0.004040  0.000000  0.040972
0.377778  0.034435  0.004293  0.000000  0.040972
0.400000  0.034435  0.004545  0.000000  0.040972
0.422222  0.034435  0.004798  0.000000  0.040972
0.444444  0.034435  0.005051  0.000000  0.040972
0.466667  0.034435  0.005303  0.000000  0.040972
0.488889  0.034435  0.005556  0.000000  0.040972
0.511111  0.034435  0.005808  0.000000  0.040972
0.533333  0.034435  0.006061  0.000000  0.040972
0.555556  0.034435  0.006313  0.000000  0.040972
0.577778  0.034435  0.006566  0.000000  0.040972
0.600000  0.034435  0.006818  0.000000  0.040972
0.622222  0.034435  0.007071  0.000000  0.040972
0.644444  0.034435  0.007323  0.000000  0.040972
0.666667  0.034435  0.007576  0.000000  0.040972
0.688889  0.034435  0.007828  0.000000  0.040972
0.711111  0.034435  0.008081  0.000000  0.040972
0.733333  0.034435  0.008333  0.000000  0.040972
0.755556  0.034435  0.008586  0.000000  0.040972
0.777778  0.034435  0.008838  0.000000  0.040972
0.800000  0.034435  0.009091  0.000000  0.040972
0.822222  0.034435  0.009343  0.000000  0.040972
0.844444  0.034435  0.009596  0.000000  0.040972
0.866667  0.034435  0.009848  0.000000  0.040972
0.888889  0.034435  0.010101  0.000000  0.040972
0.911111  0.034435  0.010354  0.000000  0.040972
0.933333  0.034435  0.010606  0.000000  0.040972
0.955556  0.034435  0.010859  0.000000  0.040972
0.977778  0.034435  0.011111  0.000000  0.040972
1.000000  0.034435  0.011364  0.000000  0.040972
1.022222  0.034435  0.011616  0.052737  0.040972
1.044444  0.034435  0.011869  0.149070  0.040972
1.066667  0.034435  0.012121  0.273695  0.040972
1.088889  0.034435  0.012374  0.421060  0.040972
1.111111  0.034435  0.012626  0.587805  0.040972
1.133333  0.034435  0.012879  0.771465  0.040972
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  1.155556  0.034435  0.013131  0.970000  0.040972
  1.177778  0.034435  0.013384  1.181580  0.040972
  1.200000  0.034435  0.013636  1.404464  0.040972
  1.222222  0.034435  0.013889  1.636945  0.040972
  1.244444  0.034435  0.014141  1.877310  0.040972
  1.266667  0.034435  0.014394  2.123824  0.040972
  1.288889  0.034435  0.014646  2.374724  0.040972
  1.311111  0.034435  0.014899  2.628224  0.040972
  1.333333  0.034435  0.015152  2.882519  0.040972
  1.355556  0.034435  0.015404  3.135803  0.040972
  1.377778  0.034435  0.015657  3.386283  0.040972
  1.400000  0.034435  0.015909  3.632201  0.040972
  1.422222  0.034435  0.016162  3.871856  0.040972
  1.444444  0.034435  0.016414  4.103633  0.040972
  1.466667  0.034435  0.016667  4.326027  0.040972
  1.488889  0.034435  0.016919  4.537676  0.040972
  1.511111  0.034435  0.017172  4.737392  0.040972
  1.533333  0.034435  0.017424  4.924197  0.040972
  1.555556  0.034435  0.017677  5.097354  0.040972
  1.577778  0.034435  0.017929  5.256407  0.040972
  1.600000  0.034435  0.018182  5.401220  0.040972
  1.622222  0.034435  0.018434  5.532017  0.040972
  1.644444  0.034435  0.018687  5.649420  0.040972
  1.666667  0.034435  0.018939  5.754494  0.040972
  1.688889  0.034435  0.019192  5.848795  0.040972
  1.711111  0.034435  0.019444  5.934405  0.040972
  1.733333  0.034435  0.019697  6.013989  0.040972
  1.755556  0.034435  0.019949  6.159923  0.040972
  1.777778  0.034435  0.020202  6.249853  0.040972
  1.800000  0.034435  0.020455  6.338508  0.040972
  1.822222  0.034435  0.020707  6.425940  0.040972
  1.844444  0.034435  0.020960  6.512198  0.040972
  1.866667  0.034435  0.021212  6.597328  0.040972
  1.888889  0.034435  0.021465  6.681374  0.040972
  1.911111  0.034435  0.021717  6.764376  0.040972
  1.933333  0.034435  0.021970  6.846371  0.040972
  1.955556  0.034435  0.022222  6.927396  0.040972
  1.977778  0.034435  0.022475  7.007484  0.040972
  2.000000  0.034435  0.022727  7.086668  0.040972
  2.022222  0.034435  0.023493  7.164976  0.040972
  END FTABLE  2
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    1.125          PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1.125          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
WDM      2 PREC     ENGL    1.125          RCHRES   4     EXTNL  PREC
WDM      1 EVAP     ENGL    0.76           RCHRES   3     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.76           RCHRES   4     EXTNL  POTEV

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   4 HYDR   RO     1 1        1      WDM   1000 FLOW     ENGL       REPL
RCHRES   4 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
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RCHRES   2 HYDR   O      1 1        1      WDM   1007 FLOW     ENGL       REPL
RCHRES   2 HYDR   O      2 1        1      WDM   1008 FLOW     ENGL       REPL
RCHRES   2 HYDR   STAGE  1 1        1      WDM   1009 STAG     ENGL       REPL
COPY     2 OUTPUT MEAN   1 1     48.4      WDM    702 FLOW     ENGL       REPL
COPY   502 OUTPUT MEAN   1 1     48.4      WDM    802 FLOW     ENGL       REPL
END EXT TARGETS
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<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
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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        7
RCHRES     OFLOW  OVOL   1                 RCHRES         INFLOW IVOL
  END MASS-LINK    7

  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       16
RCHRES     ROFLOW                          COPY           INPUT  MEAN
  END MASS-LINK   16

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

  MASS-LINK       53
IMPLND     IWATER SURO                     IMPLND         EXTNL  SURLI
  END MASS-LINK   53

  MASS-LINK       54
PERLND     PWATER SURO                     IMPLND         EXTNL  SURLI
  END MASS-LINK   54

  MASS-LINK       55
PERLND     PWATER IFWO                     IMPLND         EXTNL  SURLI
  END MASS-LINK   55


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

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Appendix C

Geotechnical Report

C-1.....Geotechnical Report by GeoResources, dated August 6, 2025

GEORESOURCES
earth science & geotechnical engineering
4809 Pacific Hwy. E. | Fife, Washington 98424 | 253.896.1011 | www. georesources.rocks

August 6, 2025

Garrette Custom Homes
11815 NE 99th St #1200
Vancouver, WA 98682
(253) 328-5371

Attn: Jessica Estrada
JessicaE@buildgcg.com

Stormwater Soils Report
Proposed Residential Plat
1609 Springwood Avenue Northeast
Olympia, Washington
PN: 0968007300
Doc ID: GCH.SpringwoodAveNE.SR

INTRODUCTION

This *Stormwater Soils Report* presents the results of our literature review, subsurface explorations and laboratory test results, and provides geotechnical conclusions regarding the feasibility of site soils to support infiltration of stormwater runoff from the proposed residential plat to be constructed at 1609 Springwood Avenue Northeast in Olympia, Washington. The approximate site location is shown on the attached Site Location Map, Figure 1. Our understanding of the project is based on our discussions with you, our review of the available geologic and soils data, our review of the *Springwood Garden Preliminary Plat* prepared by AHBL dated February 13, 2025, our multiple visits to the site that included subsurface explorations and in-situ infiltration testing, our understanding of the geologic and geotechnical aspects of the Olympia Municipal development code, and our experience in the area.

The site is currently developed with an existing single-family residence, several detached outbuildings, a paved driveway, and associated utilities. You propose to demolish the existing buildings and constructing a residential plat consisting of up to 39 lots, stormwater tract, and a soil and vegetation protection area. We anticipate that the proposed residences will consist of one- to two-story, wood-framed structures supported by conventional shallow foundations. An excerpt of the *Grading and Storm Drainage Plan* is included on the Site & Exploration Plan, Figure 2.

Because of the amount of proposed hard surfacing associated with the proposed plat, the City of Olympia (the City) requires a site characterization study be prepared to address the potential of the soils to support infiltration of stormwater run-off per Volume 5, Section V-5.5 of the 2022 City of Olympia Drainage Design and Erosion Control Manual (COO DDECM). If infiltration is feasible and infiltration facilities are proposed, the City may require wet season groundwater monitoring in addition to the in-situ infiltration testing within the area of proposed infiltration facilities, and cation exchange capacity and organic content testing to determine the treatment capacity of the soils for stormwater runoff from pollution generating surfaces. We have prepared this *Preliminary Soils Report* that partially satisfies the character study requirements of the COO DDECM.

PURPOSE & SCOPE

The purpose of our scope of our services was to evaluate the surface and subsurface conditions across the site as a basis for developing geotechnical recommendations and conclusions for the proposed plat. Specifically, the scope of services included the following:

1. Reviewing the available geologic, hydrogeologic, and geotechnical data for the site area;
2. Exploring surface and subsurface conditions by reconnoitering the site and monitoring the excavation of a series of 7 test pits at select locations across the site;
3. Performing 2 small-scale Pilot Infiltration Tests and 6 shallow EPA Falling Head Infiltration Tests at locations and elevations coordinated with the project team;
4. Describing surface and subsurface conditions, including soil type, and an estimate of seasonal high groundwater levels;
5. Providing our opinion about the feasibility of onsite infiltration, including a design infiltration rate based on in-situ testing, as applicable; and,
6. Preparing this *Soils Report* that summarizes our site observations and conclusions, and our geotechnical recommendations, along with the supporting data.

The above scope of work was completed in accordance with our *Proposal for Geotechnical Engineering Services* dated September 11, 2024. We received written authorization to proceed from you the following day.

SITE CONDITIONS

Surface Conditions

The site is located at 1609 Springwood Avenue Northeast in Olympia, Washington, within an area of existing suburban residential development. Based on the Thurston County Assessor's website, the parcel is irregular in shape, measures approximately 340 feet wide (north to south) by 855 to 1,035 feet long (east to west), and encompasses about 7.06 acres. The site is bounded by Springwood Avenue Northeast to the north and existing single-family residences to the east, south, and west.

Our site description is based on 1-foot topographic contours on the *Conceptual Site Plan* and our site observations. The ground surface across the site generally slopes down at about 2 percent towards a drainage about 30 feet to the southwest of the site. The total topographic relief across the site is on the order of 16 feet. The existing site configuration and topography are shown on the Site Vicinity Map, Figure 3.

Vegetation across the western portion of the site generally consists of grass lawn and scattered mature alder, bigleaf maple, redwood, and Douglas fir trees. The eastern portion of the site is vegetated with a stand of mature alder and bigleaf maple trees with a moderately dense understory of Himalayan blackberry, sword fern, knotweed, and other low growing native and invasive species. No groundwater seeps, springs, standing water, or evidence of soil erosion were observed at the time of our site visit.

Site Soils

The USDA Natural Resources Conservation Service (NRCS) Web Soil Survey maps the surficial soils at the site as Yelm fine sandy loam (126). An excerpt of the NRCS soils map for the site area is included as Figure 4, and the mapped soil type is described in detail below.

- *Yelm fine sandy loam (126)*: Mapped across the entirety of the site, the Yelm soils are derived from glacial outwash and are included in hydrologic soil group B. Soil type 126 forms on slopes of 0 to 3 percent and is listed as a "slight" erosion hazard when exposed.

Site Geology

The *Geologic Map of the Tumwater 7.5-minute Quadrangle, Thurston County, Washington* (Walsh et al., 2003) maps the shallow geology in the site area as Recessional sand (Qgos), which commonly overlies glacial till, which is mapped to the southwest and northwest of the site. These glacial units were deposited during the Vashon Stade of the Fraser Glaciation, approximately 12,000 to 15,000 years ago. No landslides, alluvial fans, or other deposits of mass wasting are mapped on the site or within the site vicinity. An excerpt of the referenced geologic map is included as Figure 5, and detailed descriptions of the mapped geologic units are included below.

- *Recessional sand (Qgos)*: Recessional outwash was deposited during the end stages of the Vashon Stade of the Fraser Glaciation by meltwater streams flowing from the retreating continental ice mass. The outwash sands are typically lightly stratified silty sand and gravel with some silt deposited in recessional lake deposits and channels from meltwater emitting from the continental ice mass as it retreated north. The outwash sand is considered normally consolidated, generally encountered in a loose to medium dense condition, and exhibits low to moderate strength and moderate compressibility characteristics when undisturbed. The infiltration of stormwater into outwash sand is generally favorable, as this deposit is typically granular and exhibits high permeability.
- *Glacial till (Qgt)*: Glacial till typically consists of a heterogeneous mixture of clay, silt, sand, and gravel that was deposited at the base of the continental ice mass. Following and during deposition, these sediments were overridden by the ice mass and as such are typically considered over-consolidated. Glacial till exhibits high strength and low compressibility characteristics where undisturbed. The infiltration potential of glacial till is typically unfavorable due to its overconsolidated and silty nature.

Subsurface Explorations

On September 17, 2024, we visited the site and monitored the excavation of 7 test pits to depths of about 6.0 to 10.0 feet below the existing ground surface, logged the subsurface conditions encountered in each test pit, and obtained representative soil samples. We returned to the site on June 17, 2025 and monitored the excavation of eight additional test pits, performed Pilot Infiltration Tests (PITs) within two of the test pits, and installed four open standpipes in four of the test pits. We returned to the site on June 26 and 27, 2025 and performed shallow falling head percolation testing at select areas across the site. Table 1, below, summarizes the approximate functional locations, surface elevations, and termination depths of our subsurface explorations.

TABLE 1:
APPROXIMATE LOCATIONS, ELEVATIONS, AND DEPTHS OF EXPLORATIONS

Test Pit Number	Functional Location	Surface Elevation[1] (feet)	Termination Depth (feet)	Termination Elevation (feet)
TP-1	Northeast portion of site	174.0	8.0	166.0
TP-2	Southeast portion of site	175.0	7.5	167.5
TP-3	Northeast portion of site	176.0	6.0	170.0
TP-4	Southwest portion of site	167.5	10.0	157.5
TP-5	Southwest portion of site	164.0	10.0	154.0
TP-6	Northwest portion of site	167.0	10.0	157.0
TP-7	Northwest portion of site	167.0	9.0	158.0
TP-101	Proposed Tract C	165.0	9.0	156.0
TP-102 / PIT-1 / OSP-1	Proposed Tract C	166.0	9.0	157.0
TP-103 / OSP-2	Proposed Tract C	166.0	8.0	158.0
TP-104 / OSP-3	Proposed Tract C	166.5	9.5	157.0
TP-105 / PIT-2	Proposed Lots 24 & 25	169.0	10.0	159.0
TP-106 / OSP-4	Proposed Lot 26	170.5	10.0	160.5
TP-107	Proposed Lot 5	166.0	10.0	156.0
TP-108	Proposed Lots 4 & 5	166.5	10.0	156.5
INF-1	Proposed Lot 38	176.0	1.0	175.0
INF-2	Proposed Lot 17	174.0	2.0	172.0
INF-3	Proposed Lot 33	176.0	1.5	174.5
INF-4	Proposed Lot 29	174.0	1.0	173.0
INF-5	Proposed Lot 25	170.0	1.0	169.0
INF-6	Proposed Lot 4	167.0	1.0	166.0

Notes:
1 - Surface elevations estimated by interpolating between contours provided on the *Grading and Storm Drainage Plan* (NAVD88)

The specific number, locations, and depths of our test pits were selected based on the configuration of the proposed development and were adjusted in the field based on consideration for underground utilities, existing site conditions, site access limitations, and encountered stratigraphy. The subsurface explorations completed and logged as part of this evaluation indicate the subsurface conditions at specific locations only, as actual subsurface conditions can vary across the site. The nature and extent of such variation would not become evident until additional explorations are performed or until construction activities have begun.

Test Pits

The test pits were excavated by a small track-mounted excavator operated by a licensed earthwork contractor working for GeoResources. Our field representative logged the subsurface conditions encountered in each test pit and obtained representative soil samples, which were placed in sealed plastic containers and then taken to our laboratory for further examination and

testing as deemed necessary. The soil densities presented on the logs were based on the difficulty of excavation and our experience. The test pits were backfilled with excavated soil and tamped in place, but not otherwise compacted.

Pilot Infiltration Tests (PITs)

We performed two small-scale Pilot Infiltration Tests (PITs) in accordance with Volume V, Section 5.4 of the 2022 COO DDECM. The PITs were performed within test pits TP-102 and TP-105 at about 5 feet below the ground surface. The bottoms of the small-scale PITs were a minimum of 12 square feet (3 feet wide by 4 feet long) and generally rectangular in shape. During testing, a pre-soak period of 6 hours was performed prior to a water level depth of 12 inches being maintained for the steady state period. Following the steady state period, we turned off the water and began recording the rate of infiltration in inches per hour every 15 minutes for one hour using a measuring rod. The tests resulted in measured infiltration rates of 0.25 inches per hour in PIT-1 and PIT-2. We then over excavated the PITs and collected representative soil samples.

EPA Falling Head Infiltration Tests

We performed six modified EPA Falling Head Percolation Tests (EPA) at select locations across the site in accordance with the 2022 COO DDECM. A 6-inch diameter pipe was set into the native soil at depths of about 1.0 to 1.5 feet below existing grades, and about 2 inches of clean drainage gravel was placed at the bottom in the pipe to protect the soil from scouring when water was added. A water depth of 12 inches was maintained for a 4-hour soaking period. Following the soaking period, the water level drop was recorded every 10 minutes starting at a depth of 6 inches. At the locations tested, we measured infiltration rates of 7.68 to 2,025 inches per hour.

Soil Classification

Our field representative logged the subsurface conditions encountered in each exploration. Representative soil samples obtained from the explorations were placed in sealed plastic containers and taken to our laboratory for further examination and testing relevant to the investigation. Soils encountered were visually classified in accordance with the Unified Soil Classification System (USCS), included in Appendix A as Figure A-1. Descriptive logs of the explorations are included as Figures A-2 through A-5. The subsurface explorations completed and logged as part of this evaluation indicate the subsurface conditions at specific locations only, as actual subsurface conditions can vary across the site. The nature and extent of such variation would not become evident until additional explorations are performed or until construction activities have begun.

Subsurface Conditions

At the locations of our test pits, we encountered subsurface conditions that, in our opinion, generally agreed with the mapped stratigraphy. The soil layers observed within our test pits are described below, and depths and elevations of soils encountered within each test pit are included in Table 2.

- *Forest Duff & Topsoil:* At the locations of all test pits except TP-6, we observed 0.25 to 1.0 feet of forest duff and/or topsoil.
- *Recessional Sand:* Underlying the topsoil at the locations of all our test pits except TP-6, TP-7, and TP-108, we observed loose to medium dense, brown, orange-tan, tan, or brownish grey

sand with a variable silt content in a moist condition. These soils ranged in thickness from 1.5 to 5.0 feet.

- *Recessional Silt:* As the surficial soils at the location of test pits TP-6, TP-7, and TP-108, underlying the topsoil at the location of TP-7, and underlying the sandy soils at the locations of all other test pits except TP-3, we observed soft to medium stiff orange-tan to mottled grey to brownish grey sandy silt with pockets of clean sand in a moist condition. These soils were observed to the full depth of exploration within all test pits, where present, except for test pit TP-2.
- *Weathered Glacial Till:* Underlying the recessional soils at the location of test pit TP-3, we observed a medium dense to dense mottled brownish grey silty sand with gravel in a moist condition.
- *Glacial Till:* Underlying the recessional soils within test pit TP-2 and the weathered glacial till within test pit TP-3, we observed dense to very dense grey silty sand with gravel in a moist condition to the full depth of exploration.

TABLE 2:
APPROXIMATE THICKNESS, DEPTHS, AND ELEVATION OF SOIL TYPES ENCOUNTERED IN EXPLORATIONS

Test Pit Number	Thickness of Soil Unit (feet)				Depth to Top of Glacial Till (feet)	Elevation[1] at Top of Glacial Till (feet)
	Forest Duff & Topsoil	Recessional Sand	Recessional Silt	Weathered Glacial Till		
TP-1	1.0	2.0	>5.0	NE	NE	NE
TP-2	1.0	3.5	2.0	0.0	6.5	165.0
TP-3	1.0	2.5	0.0	2.0	5.5	166.5
TP-4	1.0	2.5	>6.5	NE	NE	NE
TP-5	0.5	5.0	>4.5	NE	NE	NE
TP-6	0.0	NE	>10.0	NE	NE	NE
TP-7	0.5	NE	>8.5	NE	NE	NE
TP-101	0.25	6.75	>2.0	NE	NE	NE
TP-102 / PIT-1 / OSP-1	0.25	5.75	2.0	NE	NE	NE
TP-103 / OSP-2	0.25	6.75	>1.0	NE	NE	NE
TP-104 / OSP-3	0.25	7.75	>1.5	NE	NE	NE

Notes:
1 - Surface elevations estimated by interpolating between contours on the *Grading and Storm Drainage Plan* (NAVD88)

TABLE 2 (continued):
APPROXIMATE THICKNESS, DEPTHS, AND ELEVATION OF SOIL TYPES ENCOUNTERED IN EXPLORATIONS

Test Pit Number	Thickness of Soil Unit (feet)				Depth to Top of Glacial Till (feet)	Elevation[1] at Top of Glacial Till (feet)
	Forest Duff & Topsoil	Recessional Sand	Recessional Silt	Weathered Glacial Till		
TP-105 / PIT-2	0.25	8.75	>1.0	NE	NE	NE
TP-106 / OSP-4	0.25	7.75	>2.0	NE	NE	NE
TP-107	0.25	0.75-3.0	1.5-4.5	NE	NE	NE
TP-108	0.25	3.5	3.0	NE	NE	NE

Notes:
1 - Surface elevations estimated by interpolating between contours on the *Grading and Storm Drainage Plan* (NAVD88)

Laboratory Testing

Geotechnical laboratory tests were performed on select samples retrieved from the test pits to estimate index engineering properties of the soils encountered. Soils samples were visually classified per ASTM D2488 and ASTM D2487 standard procedures. Laboratory testing included moisture content determinations per ASTM D2216, percent finer than No. 200 sieve per ASTM D1140, and grain size analyses per ASTM D6913 standard procedures. Test results summarized below in Table 3 and graphical output results are included in Appendix B. Samples were also submitted to an independent laboratory for cation exchange capacity and organic content testing. We will provide these results separately when they become available.

TABLE 3:
LABORATORY TEST RESULTS FOR ON-SITE SOILS

Sample	Soil Type	Lab ID	Gravel Content (percent)	Sand Content (percent)	Silt/Clay Content (percent)	Moisture Content (percent)
TP-2, S-1, D: 2ft	SM	105468	0.1	77.8	22.1	10.8
TP-2, S-2, D: 3ft	SP	105469	0.0	96.9	3.1	4.6
TP-3, S-1, D: 2ft	SM	105470	16.2	68.6	15.2	7.7
TP-6, S-1, D: 3ft	ML	105471	*	*	95.3	33.3
TP-7, S-1, D: 1.5ft	ML	105472	0.6	25.1	74.3	21.5

Notes:
* - ASTM D1140 performed; gravel and sand content not determined

Groundwater Conditions

Groundwater seepage was observed at the time of excavation within test pits TP-102 through TP-108 perching on top of the recessional silt. Mottling consistent with slow percolation of surface

water or seasonal high groundwater was observed at 1.5 to 4.5 feet below the ground surface at the time of excavation. The mottling was observed within the recessional sand in test pits TP-4 and TP-5 at depths of 2.0 to 5.5 feet below the ground surface, and throughout the recessional silt wherever present. Mottling was also observed in the glacial till in test pit TP-3 at depths of 3.5 to 5.5 feet, and throughout the glacial till within test pit TP-2. Below, Table 4 summarizes the depth to and elevation of groundwater encountered in our test pits.

TABLE 4:
APPROXIMATE DEPTHS AND ELEVATIONS OF ENCOUNTERED GROUNDWATER AND MOTTLING

Test Pit Number	Depth to Mottling (feet)	Elevation[1] of Mottling (feet)	Depth to Groundwater (feet)	Elevation[1] of Groundwater (feet)	Date Observed
TP-1	3.0	171.0	NE	NE	09/17/2024 (ATD[2])
TP-2	4.5	170.5	NE	NE	09/17/2024 (ATD[2])
TP-3	3.5	172.5	NE	NE	09/17/2024 (ATD[2])
TP-4	2.0	165.5	NE	NE	09/17/2024 (ATD[2])
TP-5	2.0	162.0	NE	NE	09/17/2024 (ATD[2])
TP-6	1.5	165.5	NE	NE	09/17/2024 (ATD[2])
TP-7	2.5	164.5	NE	NE	09/17/2024 (ATD[2])
TP-101	2.0	163.0	NE	NE	07/17/2025 (ATD[2])
TP-102	1.0	165.0	8.0	158.0	07/17/2025 (ATD[2])
TP-103	1.5	164.5	6.0	160.0	07/17/2025 (ATD[2])
TP-104 / OSP-3	1.0	165.5	8.0	158.5	07/17/2025 (ATD[2])
TP-105	1.0	168.0	9.0	160.0	07/17/2025 (ATD[2])
TP-106 / OSP-4	0.25	170.25	8.0	162.5	07/17/2025 (ATD[2])
TP-107	1.0	165.0	8.5	157.5	07/17/2025 (ATD[2])
TP-108	0.25	166.25	9.0	157.5	07/17/2025 (ATD[2])

Notes:
1 Surface elevations estimated by interpolating between contours on the *Grading and Storm Drainage Plan* (NAVD88)
2 ATD = At time of digging

Perched groundwater develops when a relatively permeable soil type, such as the recessional sand and weathered till, is underlain at depth by a relatively impermeable soil type, such as the recessional silt and glacial till. We anticipate fluctuations in the local groundwater levels may occur in response to precipitation patters, off-site construction activities, and site utilization.

CONCLUSIONS AND RECOMMENDATIONS

Based on our site reconnaissance and subsurface explorations, it is our opinion that the infiltration of stormwater runoff from the proposed residential plat is feasible using relatively shallow Best Management Practices (BMPs) in portions of the site. Deeper infiltration systems do not appear feasible at the site.

Infiltration Recommendations

The City of Olympia has adopted the 2022 City of Olympia Drainage Design and Erosion Control Manual (COO DDECM). We evaluated the infiltration feasibility of stormwater at the site using the simplified approach per Volume V, Section V-5.5.

The soils observed at the locations of our test pits are, in our opinion, consistent with interbedded recessional outwash sands and silts overlying glacial till. At the time of excavation, we observed groundwater at depths of about 6 to 9 feet below the ground surface in test pits TP-102 through TP-108. We observed mottling consistent with perched groundwater within the recessional silt and weathered glacial till at depths ranging between 0.25 and 10.0 feet below the ground surface in all the test pits.

Infiltration Feasibility for Soil Layers

It is our opinion that the shallow weathered recessional sand (SM) deposits observed in our test pits are suitable to support shallow infiltration facilities such as permeable pavement or bioinfiltration, and that the deeper recessional silt (ML) deposits and the glacial till are not suitable for infiltration.

Feasibility of Infiltration BMPs

Per the 2022 COO DDECM, Volume V, Section V-5.6, BMPs T7.10 and T7.20 infiltration basins and trenches are feasible on sites where 5 feet or more of vertical separation is required between the bottom of the facility and seasonal high groundwater or impermeable soils. A separation of 3 feet may be considered if a groundwater mounding analysis, volumetric receptor capacity, and the overlying design are judged to be adequate to prevent overtopping. Based on our subsurface explorations, it is our opinion that infiltration trenches and basins are not feasible for this project due to the limited depth to impermeable glacial till and/or recessional silt deposits.

Feasibility of Low Impact Development (LID) BMPs

LID infiltration BMPs such as pervious pavement or bioinfiltration could be considered to manage stormwater for this project. Per the 2022 COO DDECM, Volume V, Section V-5.6, BMP T5.15, the use of permeable pavement is infeasible if saturated conditions would be created within 1 foot of the bottom elevation of the lowest layer and the seasonal high groundwater table or an underlying impermeable/low permeable layer. Based on our subsurface explorations, laboratory testing, and in-situ testing, shallow LID BMPs appear feasible for this project in the upper recessional sand.

Test Method

The 2022 COO DDECM, Volume V, section V-5.4 provides three approved methods to estimate the design infiltration rate of site soils: 1) soil grain size analysis 2) Large-Scale Pilot Infiltration Test, and 3) Small-Scale Pilot Infiltration Test. Restrictions do apply to the various methods based on soil conditions and type of infiltration facility. We used the small-scale Pilot Infiltration Test to develop an infiltration rate of the deeper recessional outwash deposits, and small-scale falling head infiltration tests to develop an infiltration rate of the shallow weathered recessional outwash deposits.

Design Stormwater Infiltration Rate

As stated, we recorded measured infiltration rates of 0.25 inches per hour in test pits TP-102/PIT-1 and TP-105/PIT-2. This rate was obtained in the recessional outwash deposits encountered at the bottom elevation of the proposed stormwater pond, about 5.0 feet below existing grades. We applied correction factor values for site variability (CF_v = 0.33), test method (CF_t = 0.5 for small-scale PIT), and for potential for siltation (CF_m = 0.9). Applying these correction factors to the measured infiltration rates results in an infiltration rate **of 0.04 inches per hour** for the deeper recessional outwash deposits. Based on the results of the small-scale PITs, it does not appear that infiltration is feasible in the deeper recessional outwash soils.

We performed EPA falling head tests at six locations throughout the project and recorded measured infiltration rates between 7.7 and 2025 inches per hour. The test results are summarized below in Table 5. This rate was obtained in the upper 2 feet of the weathered recessional outwash deposits encountered across the site. We applied correction factor values for site variability (CF_v = 0.33), test method (CF_t = 0.4 for small-scale falling head test method), and for potential for siltation (CF_m = 0.9). Applying these correction factors to the measured infiltration rates results in an infiltration rate of **1.18 inches per hour** for the shallow weathered soils.

TABLE 5:
SHALLOW INFILTRATION TEST RESULTS

Test Number	Geology & USCS	Measured Infiltration Rate (in/hr)	Corrected Infiltration Rate (in/hr)
INF-1	Weathered recessional outwash	7.68	0.91
INF-2		14.00	1.66
INF-3		8.26	0.98
INF-4		2,025	240*
INF-5		33.0	3.92*
INF-6		9.86	1.17
Average corrected infiltration rate			**1.18**

Notes:
* - not included in average

Construction Considerations

If infiltration facilities are proposed, we recommend that a representative from our firm be onsite at the time of excavation of the proposed stormwater management facilities to verify that the soils encountered during construction are consistent with the soils observed in our subsurface explorations. In-situ infiltration testing shall be performed prior to and at the time of construction to verify the recommended infiltration rate and to determine if a different site-specific infiltration rate would be more appropriate for the site.

It should be noted that special care is required during the grading and construction periods to avoid fine sediment contamination. This may be accomplished using an alternative stormwater management location during construction. All contractors, builders, and subcontractors working on the site should be advised to avoid allowing “dirty” stormwater or excess sediment to enter the

stormwater facilities during construction and landscaping activities. No concrete trucks should be washed or cleaned in the vicinity of proposed stormwater systems.

Suspended solids could clog the underlying soil and reduce the infiltration rate of the facilities. To reduce potential clogging of the infiltration systems, the infiltration system should not be connected to the stormwater runoff system until after construction is complete and the site area is landscaped, paved or otherwise protected. Temporary systems may be utilized throughout construction. Periodic sweeping of the paved areas will help extend the life of the infiltration system.

LIMITATIONS

We have prepared this report for use by Garrette Custom Homes and other members of the design team for use in the design of a portion of this project. The data used in preparing this report and this report should be provided to prospective contractors for their bidding or estimating purposes only. Our report, conclusions and interpretations are based on our subsurface explorations, data from others and limited site reconnaissance, and should not be construed as a warranty of the subsurface conditions.

Variations in subsurface conditions are possible between the explorations and may also occur with time. A contingency for unanticipated conditions should be included in the budget and schedule. Sufficient monitoring, testing and consultation should be provided by our firm during construction to confirm that the conditions encountered are consistent with those indicated by the explorations, to provide recommendations for design changes should the conditions revealed during the work differ from those anticipated, and to evaluate whether earthwork and foundation installation activities comply with contract plans and specifications.

The scope of our services does not include services related to environmental remediation and construction safety precautions. Our recommendations are not intended to direct the contractor's methods, techniques, sequences or procedures, except as specifically described in our report for consideration in design.

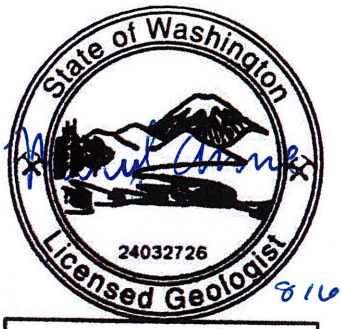
If there are any changes in the loads, grades, locations, configurations or type of facilities to be constructed, the conclusions and recommendations presented in this report may not be fully applicable. If such changes are made, we should be given the opportunity to review our recommendations and provide written modifications or verifications, as appropriate.

◆ ◆ ◆

We have appreciated the opportunity to be of service to you on this project. If you have any questions or comments, please do not hesitate to call at your earliest convenience.

Respectfully submitted,

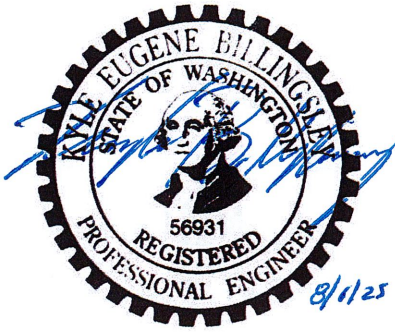
GeoResources, LLC



8/6/2025

Meryl Anne Evans

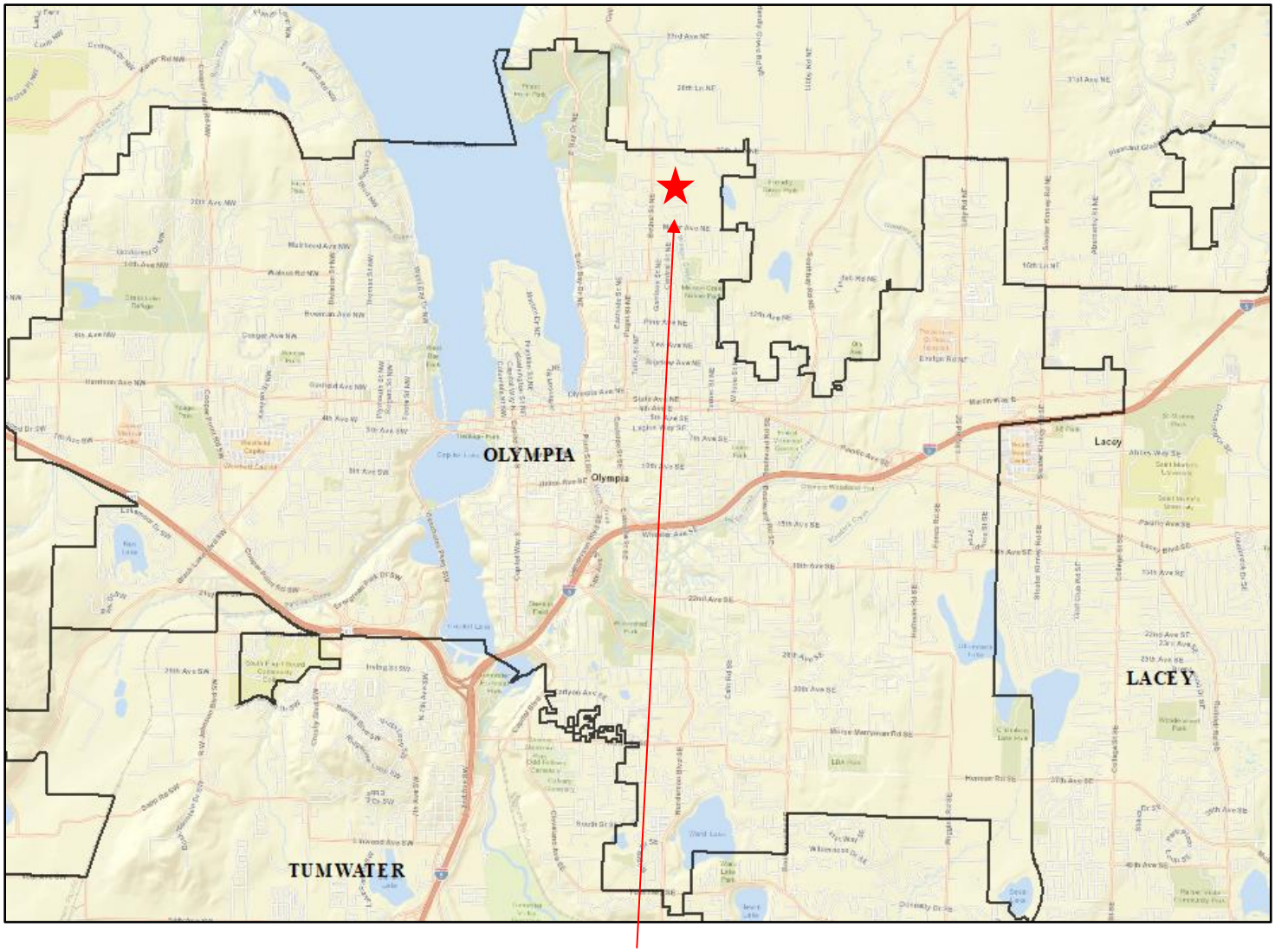
Meryl A. Evans, LG
Senior Staff Geologist



8/1/25

Kyle E. Billingsley, PE
Associate

MAE:KEB /mae
DocID: GCH.SpringwoodAveNE.SR
Attachments:
Figure 1: Site Location Map
Figure 2: Site & Exploration Plan
Figure 3: Site Vicinity Map
Figure 4: NRCS Soils Map
Figure 5: Geologic Map
Appendix A – Subsurface Explorations
Appendix B – Laboratory Test Results



Approximate Site Location

Figure created in Esri ArcMap

Not to Scale

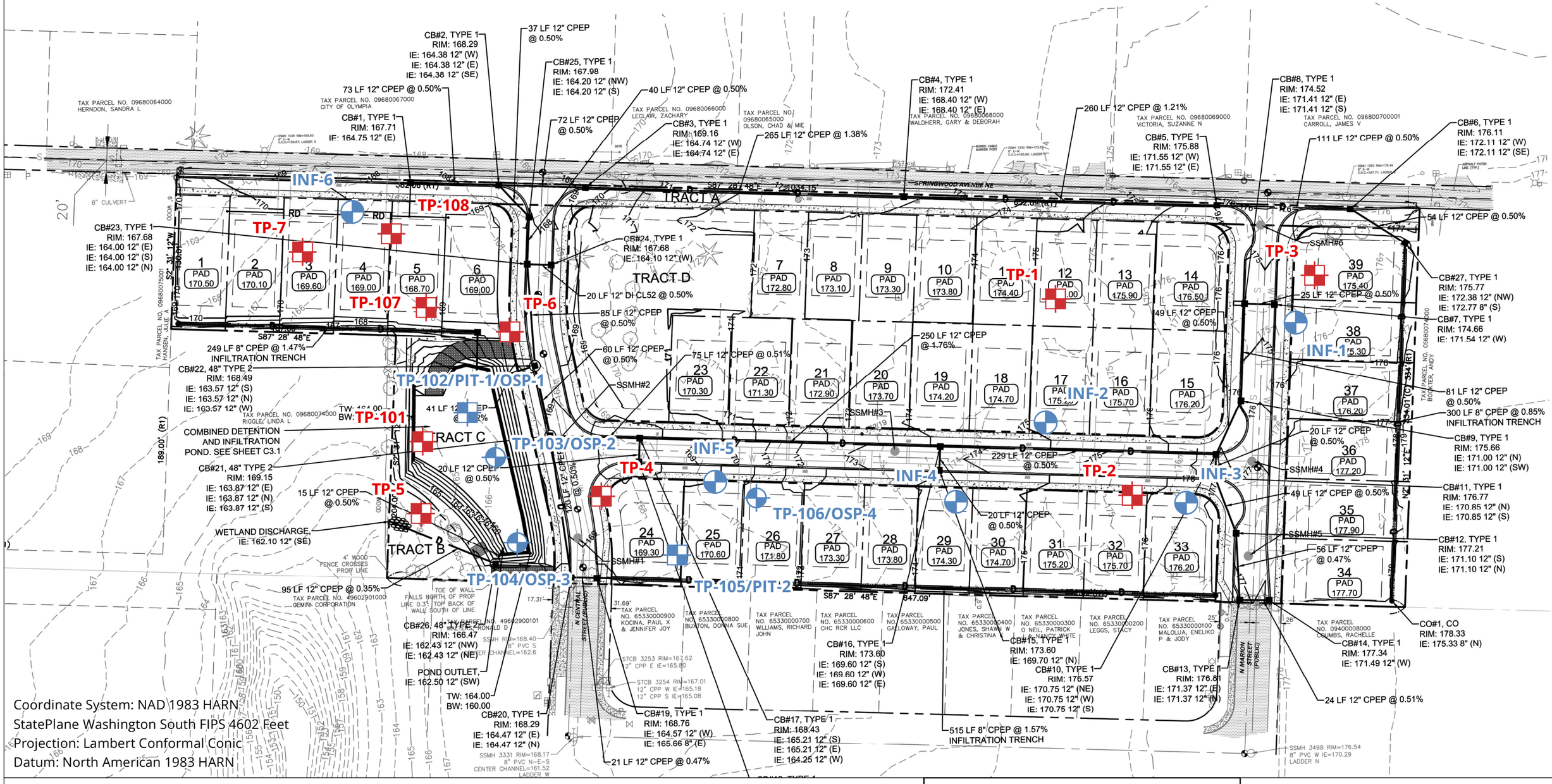
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Site Location Map

Proposed Residential Plat
1609 Springwood Avenue Northeast
Olympia, Washington
PN: 09680073000

Doc ID: GCH.SpringwoodAveNE.F	Aug 2025	Figure 1

Attachment 5



Coordinate System: NAD 1983 HARN
StatePlane Washington South FIPS 4602 Feet
Projection: Lambert Conformal Conic
Datum: North American 1983 HARN

Number and approximate location of exploration

- Test pit
- Pilot Infiltration Test
- Test pit with open standpipe piezometer
- EPA infiltration test

N W E S

0 20 40 80 120 160 Feet

1 inch = 80 feet

Grading and Storm Drainage Plan sheet 5 of 11 from the *Preliminary Plat* drawings prepared by AHBL, dated February 3, 2025.

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Site & Exploration Plan

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Doc ID: GCH.SpringwoodAveNE.F	August 2025	Figure 2



Approximate Site Location

Figure created from the Thurston County Show Me Everything Map
(https://map.co.thurston.wa.us/Html5Viewer/Index.html?viewer=uMap.Main)

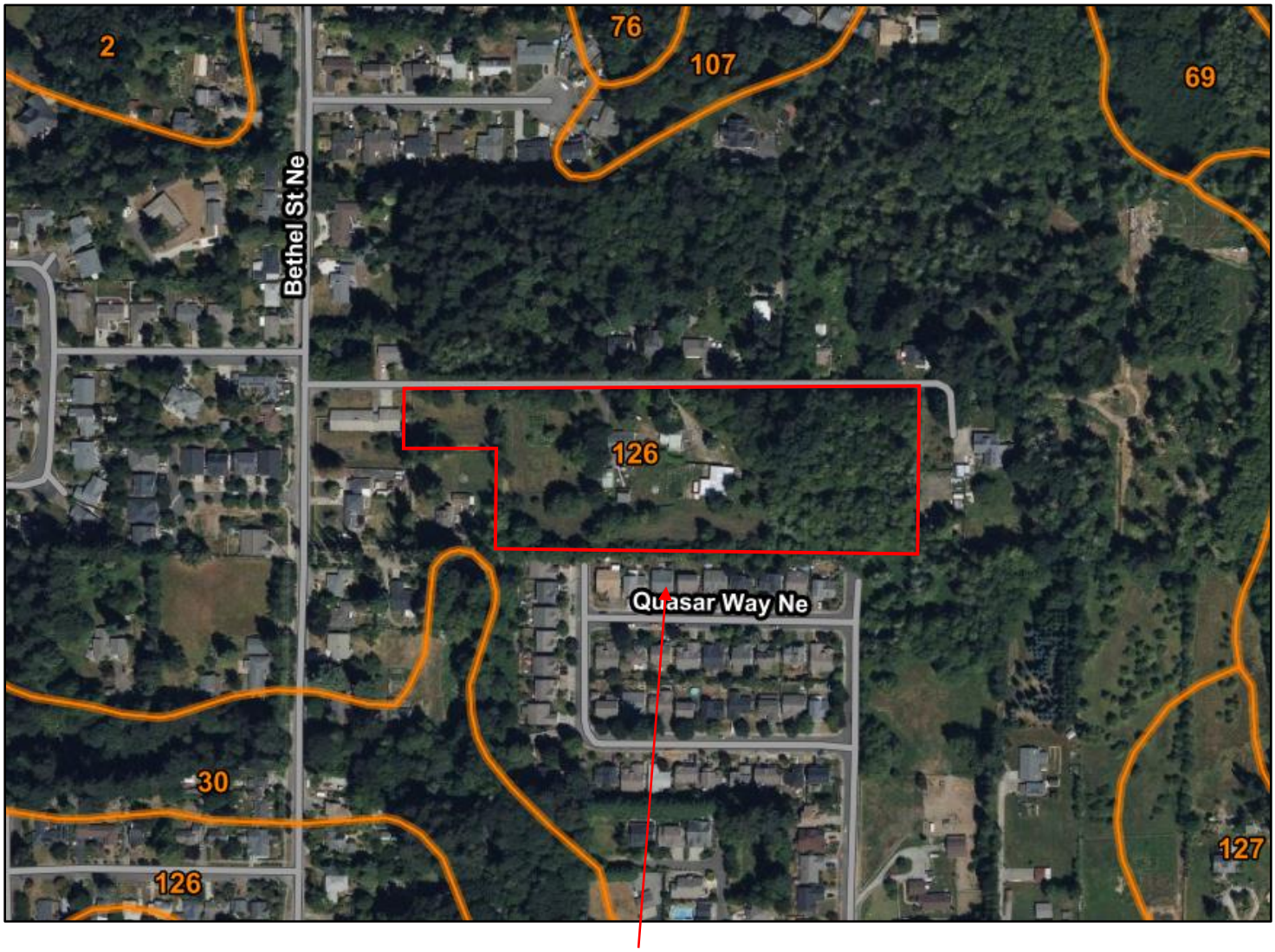
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Site Vicinity Map

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Approximate Site Location

Figure created from the USDA NRCS Web Soil Survey
(http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx)

Soil Type	Soil Name	Parent Material	Slopes	Erosion Hazard	Hydrologic Soil Group
126	Yelm fine sandy loam	Glacial outwash	0 to 3	Slight	B



Not to Scale

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NRCS Soils Map

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Approximate Site Location

An excerpt from the *Geologic Map of the Tumwater 7.5-minute Quadrangle, Thurston County, Washington* by Timothy J. Walch, Robert L. Logan, Henry W. Schasse, and Michael Polenz (2003)

Symbol	Geologic Unit
Qgos	Recessional sand
Qgt	Vashon glacial till



Not to Scale

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Geologic Map

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Doc ID: GCH.SpringwoodAveNE.F	Aug 2025	Figure 5

Appendix A

Subsurface Explorations

SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOL	GROUP NAME
COARSE GRAINED SOILS More than 50% Retained on No. 200 Sieve	GRAVEL More than 50% Of Coarse Fraction Retained on No. 4 Sieve	CLEAN GRAVEL	GW	WELL-GRADED GRAVEL, FINE TO COARSE GRAVEL
			GP	POORLY-GRADED GRAVEL
		GRAVEL WITH FINES	GM	SILTY GRAVEL
			GC	CLAYEY GRAVEL
	SAND More than 50% Of Coarse Fraction Passes No. 4 Sieve	CLEAN SAND	SW	WELL-GRADED SAND, FINE TO COARSE SAND
			SP	POORLY-GRADED SAND
		SAND WITH FINES	SM	SILTY SAND
			SC	CLAYEY SAND
FINE GRAINED SOILS More than 50% Passes No. 200 Sieve	SILT AND CLAY Liquid Limit Less than 50	INORGANIC	ML	SILT
			CL	CLAY
		ORGANIC	OL	ORGANIC SILT, ORGANIC CLAY
	SILT AND CLAY Liquid Limit 50 or more	INORGANIC	MH	SILT OF HIGH PLASTICITY, ELASTIC SILT
			CH	CLAY OF HIGH PLASTICITY, FAT CLAY
		ORGANIC	OH	ORGANIC CLAY, ORGANIC SILT
HIGHLY ORGANIC SOILS			PT	PEAT

NOTES:

1. Field classification is based on visual examination of soil in general accordance with ASTM D2488-90.
2. Soil classification using laboratory tests is based on ASTM D6913.
3. Description of soil density or consistency are based on interpretation of blow count data, visual appearance of soils, and or test data.

SOIL MOISTURE MODIFIERS:

Dry- Absence of moisture, dry to the touch

Moist- Damp, but no visible water

Wet- Visible free water or saturated, usually soil is obtained from below water table

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Unified Soils Classification System

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Test Pit TP-1

Location: Proposed Lot 12

Approximate Elevation: 174 feet (*Grading and Storm Drainage Plan*, NAVD88)

Depth (ft)			Soil Type	Soil Description
0.0	-	1.0	-	Forest duff and topsoil
1.0	-	3.0	SM	Tan silty fine to medium SAND (loose to medium dense, moist) (Recessional sand)
3.0	-	8.0	ML	Mottled brownish grey sandy SILT (soft to medium stiff, moist) (Recessional silt)

Terminated at 8.0 feet below ground surface (BGS).
Mottling observed from 3.0 to 8.0 feet BGS at time of excavation.
No caving or groundwater seepage observed during excavation.

Test Pit TP-2

Location: Proposed Lot 32

Approximate Elevation: 175 feet (*Grading and Storm Drainage Plan*, NAVD88)

Depth (ft)			Soil Type	Soil Description
0.0	-	1.0	-	Forest duff and topsoil
1.0	-	2.5	SM	Tan silty fine to medium SAND (loose to medium dense, moist) (Recessional sand)
2.5	-	4.5	SP	Grey fine SAND with trace silt (loose to medium dense, moist) (Recessional sand)
4.5	-	6.5	ML	Mottled brownish grey sandy SILT with pockets of clean sand; laminated (loose to medium dense, moist) (Recessional silt)
6.5	-	7.5	SM	Mottled grey silty SAND with gravel (dense to very dense, moist) (Glacial till)

Terminated at 7.5 feet BGS.
Mottling observed from 4.5 to 7.5 feet BGS at time of excavation.
No caving or groundwater seepage observed during excavation.

Logged by: MAE **Excavated on: September 17, 2024**

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Test Pit Logs

Proposed Residential Plat
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Test Pit TP-3

Location: Northeast portion of site
Approximate Elevation: 176 feet (*Grading and Storm Drainage Plan*, NAVD88)

Depth (ft)			Soil Type	Soil Description
0.0	-	1.0	-	Forest duff and topsoil
1.0	-	3.5	SM	Brownish grey gravelly silty fine SAND (loose to medium dense, moist) (Recessional sand)
3.5	-	5.5	SM	Mottled brownish grey silty SAND with gravel (medium dense to dense, moist) (Weathered glacial till)
5.5	-	6.0	SM	Grey silty SAND with gravel (dense to very dense, moist) (Glacial till)
				Terminated at 6.0 feet BGS. Mottling observed from 3.5 to 5.5 feet BGS at time of excavation. No caving or groundwater seepage observed during excavation.

Test Pit TP-4

Location: Proposed Lot 24 & roadway
Approximate Elevation: 167.5 feet (*Grading and Storm Drainage Plan*, NAVD88)

Depth (ft)			Soil Type	Soil Description
0.0	-	1.0	-	Topsoil
1.0	-	2.0	SM	Tan to brown silty SAND (loose to medium dense, moist) (Recessional sand)
2.0	-	3.5	SP-SM	Mottled brownish grey SAND with some silt (loose to medium dense, moist) (Recessional sand)
3.5	-	10.0	ML	Mottled grey sandy SILT with pockets of clean sand (soft to medium stiff, moist) (Recessional silt)
				Terminated at 10.0 feet BGS. Mottling observed from 2.0 to 10.0 feet BGS at time of excavation. No caving or groundwater seepage observed during excavation.

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Test Pit Logs

Proposed Residential Plat
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Olympia, Washington
PN: 09680073000

Test Pit TP-5

Location: Proposed Tract B
Approximate Elevation: 164 feet (*Grading and Storm Drainage Plan*, NAVD88)

Depth (ft)			Soil Type	Soil Description
0.0	-	0.5	-	Forest duff and topsoil
0.5	-	2.0	SM	Tan silty SAND (loose to medium dense, moist) (Recessional sand)
2.0	-	5.5	SM	Mottled grey silty SAND (loose to medium dense, moist) (Recessional sand)
5.5	-	10.0	ML	Mottled grey sandy SILT (soft to medium stiff, moist) (Recessional silt)

Terminated at 10.0 feet BGS.
Mottling observed from 2.0 to 10.0 feet BGS at time of excavation.
No caving or groundwater seepage observed during excavation.

Test Pit TP-6

Location: Proposed Lot 6 & roadway
Approximate Elevation: 167 feet (*Grading and Storm Drainage Plan*, NAVD88)

Depth (ft)			Soil Type	Soil Description
0.0	-	10.0	ML	Orange-tan to mottled grey sandy SILT with pockets of clean sand (soft to medium stiff, moist) (Recessional silt)

Terminated at 10.0 feet BGS.
Mottling observed from 1.5 to 10.0 feet BGS at time of excavation.
No caving or groundwater seepage observed during excavation.

Test Pit TP-7

Location: Proposed Lot 3
Approximate Elevation: 167 feet (*Grading and Storm Drainage Plan*, NAVD88)

Depth (ft)			Soil Type	Soil Description
0.0	-	0.5	-	Topsoil
0.5	-	9.0	ML	Orange to mottled tan sandy SILT (soft to medium stiff, moist) (Recessional silt)

Terminated at 9.0 feet BGS.
Mottling observed from 2.5 to 9.0 feet BGS at time of excavation.
No caving or groundwater seepage observed during excavation.

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Test Pit Logs
Proposed Residential Plat
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Olympia, Washington
PN: 09680073000

Test Pit TP-101

Location: Proposed Tract C
Approximate Elevation: 165 feet (*Grading and Storm Drainage Plan*, NAVD88)

Depth (ft)			Soil Type	Soil Description
0.0	-	0.25	-	4 inches topsoil
0.25	-	2.0	SM	Medium brown silty SAND (loose to medium dense, moist) (Recessional sand)
2.0	-	7.0	SM	Mottled brownish grey silty SAND (loose to medium dense, moist) (Recessional sand)
7.0	-	9.0	ML	Mottled grey sandy SILT (soft to medium stiff, moist) (Recessional silt)

Terminated at 9.0 feet BGS.
Mottling observed from 2.0 to 9.0 feet BGS at time of excavation.
No caving or groundwater seepage observed during excavation.

Test Pit TP-102 / PIT-1 / OSP-1

Location: Proposed Tract C
Approximate Elevation: 166 feet (*Grading and Storm Drainage Plan*, NAVD88)

Depth (ft)			Soil Type	Soil Description
0.0	-	0.25	-	3 inches topsoil
0.25	-	1.0	SM	Medium brown silty SAND (loose to medium dense, moist) (Recessional sand)
1.0	-	6.0	SM	Mottled brownish grey silty SAND (loose to medium dense, moist) (Recessional sand)
6.0	-	8.0	ML	Mottled grey sandy SILT (soft to medium stiff, moist) (Recessional silt)
8.0	-	9.0	SM	Blue grey silty SAND (loose to medium dense, moist) (Recessional sand)

Small-scale PIT completed at 5.0 feet BGS. Measured falling head infiltration rate of 0.25 inches/hour.
Overexcavated PIT to termination depth at 9.0 feet BGS.
Observation standpipe installed at 9.0 feet BGS prior to backfilling.
Groundwater observed at 8.0 feet BGS in OSP after backfilling.
Mottling observed from 1.0 to 8.0 feet BGS at time of excavation.
No caving or groundwater seepage observed during excavation.

Logged by: MAE **Excavated on: June 17, 2025**

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Test Pit Logs
Proposed Residential Plat
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Test Pit TP-103 / OSP-2

Location: Proposed Tract C
Approximate Elevation: 166 feet (*Grading and Storm Drainage Plan*, NAVD88)

Depth (ft)			Soil Type	Soil Description
0.0	-	0.25	-	4 inches topsoil
0.25	-	1.5	SM	Medium brown silty SAND (loose to medium dense, moist) (Recessional sand)
1.5	-	7.0	SM	Mottled brownish grey silty SAND (loose to medium dense, moist) (Recessional sand)
7.0	-	8.0	ML	Mottled grey sandy SILT (soft to medium stiff, moist) (Recessional silt)

Terminated at 8.0 feet BGS.
Observation standpipe installed at 7.0 feet BGS prior to backfilling.
Groundwater observed at 6.0 feet BGS in OSP after backfilling.
Mottling observed from 1.5 to 8.0 feet BGS at time of excavation.
No caving observed during excavation.

Test Pit TP-104 / OSP-3

Location: Proposed Tract C
Approximate Elevation: 166.5 feet (*Grading and Storm Drainage Plan*, NAVD88)

Depth (ft)			Soil Type	Soil Description
0.0	-	0.25	-	4 inches topsoil
0.25	-	1.0	SM	Medium brown silty SAND (loose to medium dense, moist) (Recessional sand)
1.0	-	8.0	SM	Mottled brownish grey silty SAND (loose to medium dense, moist) (Recessional sand)
8.0	-	9.5	ML	Mottled grey sandy SILT (soft to medium stiff, moist) (Recessional silt)

Terminated at 9.5.0 feet BGS.
Observation standpipe installed at 7.0 feet BGS prior to backfilling.
Groundwater observed at 8.0 feet BGS in OSP after backfilling.
Mottling observed from 1.0 to 9.5 feet BGS at time of excavation.
No caving observed during excavation.

Logged by: MAE **Excavated on: June 17, 2025**

Test Pit TP-105 / PIT-2

Location: Proposed Lots 24 & 25
Approximate Elevation: 169 feet (*Grading and Storm Drainage Plan*, NAVD88)

Depth (ft)			Soil Type	Soil Description
0.0	-	0.25	-	4 inches topsoil
1.25	-	1.0	SM	Medium brown silty SAND (loose to medium dense, moist) (Recessional sand)
1.0	-	9.0	SM	Mottled brownish grey silty SAND (loose to medium dense, moist) (Recessional sand)
9.0	-	10.0	ML	Mottled grey sandy SILT (soft to medium stiff, moist) (Recessional silt)

Small-scale PIT completed at 5.0 feet BGS. Measured falling head infiltration rate of 0.25 inches/hour.
Overexcavated PIT to termination depth at 10.0 feet BGS.
Mottling observed from 1.0 to 10.0 feet BGS at time of excavation.
Groundwater seepage observed at 9.0 feet BGS during overexcavation of PIT.
Caving observed from 8.0 to 9.0 feet during overexcavation of PIT.

Test Pit TP-106 / OSP-4

Location: Proposed Lot 26
Approximate Elevation: 170.5 feet (*Grading and Storm Drainage Plan*, NAVD88)

Depth (ft)			Soil Type	Soil Description
0.0	-	0.25	-	4 inches topsoil
0.25	-	8.0	SM	Mottled brownish grey silty SAND (loose to medium dense, moist) (Recessional sand)
8.0	-	10.0	ML	Mottled grey sandy SILT (soft to medium stiff, moist) (Recessional silt)

Terminated at 10.0 feet BGS.
Observation standpipe installed at 9.0 feet BGS prior to backfilling.
Groundwater observed at 8.0 feet BGS in OSP after backfilling.
Mottling observed from 0.25 to 10.0 feet BGS at time of excavation.
No caving observed during excavation.

Logged by: MAE **Excavated on: June 17, 2025**

Test Pit TP-107

Location: Proposed Lot 5
Approximate Elevation: 166 feet (*Grading and Storm Drainage Plan*, NAVD88)

Depth (ft)			Soil Type	Soil Description
0.0	-	0.25	-	4 inches topsoil
0.25	-	1.0	SM	Medium brown silty SAND (loose to medium dense, moist) (Recessional sand)
1.0	-	5.5	ML	Mottled grey sandy SILT (soft to medium stiff, moist) (Recessional silt)
5.5	-	8.5	SM	Blue grey silty SAND (loose to medium dense, moist) (Recessional sand)
8.5	-	10.0	ML	Mottled grey sandy SILT (soft to medium stiff, moist) (Recessional silt)

Terminated at 9.5.0 feet BGS.
Mottling observed from 1.0 to 5.5 and from 8.5 to 10.0 feet BGS at time of excavation.
Groundwater seepage observed at 8.5 feet BGS during excavation.
No caving observed during excavation.

Test Pit TP-108

Location: Proposed Lots 4 & 5
Approximate Elevation: 166.5 feet (*Grading and Storm Drainage Plan*, NAVD88)

Depth (ft)			Soil Type	Soil Description
0.0	-	0.25	-	4 inches topsoil
2.5	-	5.5	ML	Mottled grey sandy SILT (soft to medium stiff, moist) (Recessional silt)
5.5	-	9.0	SM	Blue grey silty SAND (loose to medium dense, moist) (Recessional sand)
9.0	-	10.0	ML	Mottled grey sandy SILT (soft to medium stiff, moist) (Recessional silt)

Terminated at 9.5.0 feet BGS.
Mottling observed from 0.25 to 10.0 feet BGS at time of excavation.
Groundwater seepage observed at 9.0 feet BGS during excavation.
No caving observed during excavation.

Logged by: MAE **Excavated on: June 17, 2025**

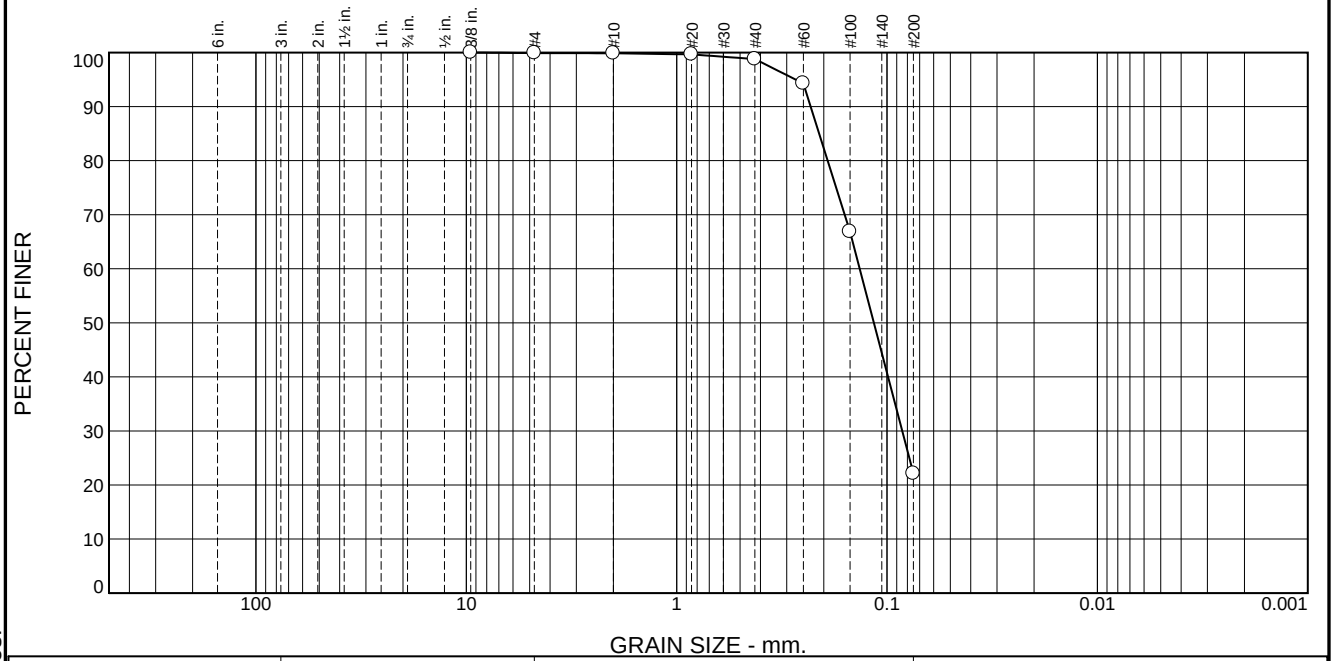
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Test Pit Logs
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Olympia, Washington
PN: 09680073000

Appendix B

Laboratory Test Results

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	0.0	1.1	76.7	22.1	

Test Results (ASTM D 6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
0.375	100.0		
#4	99.9		
#10	99.9		
#20	99.7		
#40	98.8		
#60	94.3		
#100	66.8		
#200	22.1		

* (no specification provided)

Material Description

Silty SAND (SM)

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-2-4(0)

Coefficients

D_{90}= 0.2309 D_{85}= 0.2103 D_{60}= 0.1349
D_{50}= 0.1155 D_{30}= 0.0847 D_{15}=
D_{10}= C_u= C_c=

Remarks

Natural Moisture: 10.8%

Date Received: 9/17/24 **Date Tested:** 9/18/24

Tested By: MAW

Checked By: KEB

Title: PM

Location: TP-2, S-1 **Date Sampled:** 9/17/24
Sample Number: 105468 **Depth:** 2'

GeoResources, LLC

Fife, WA

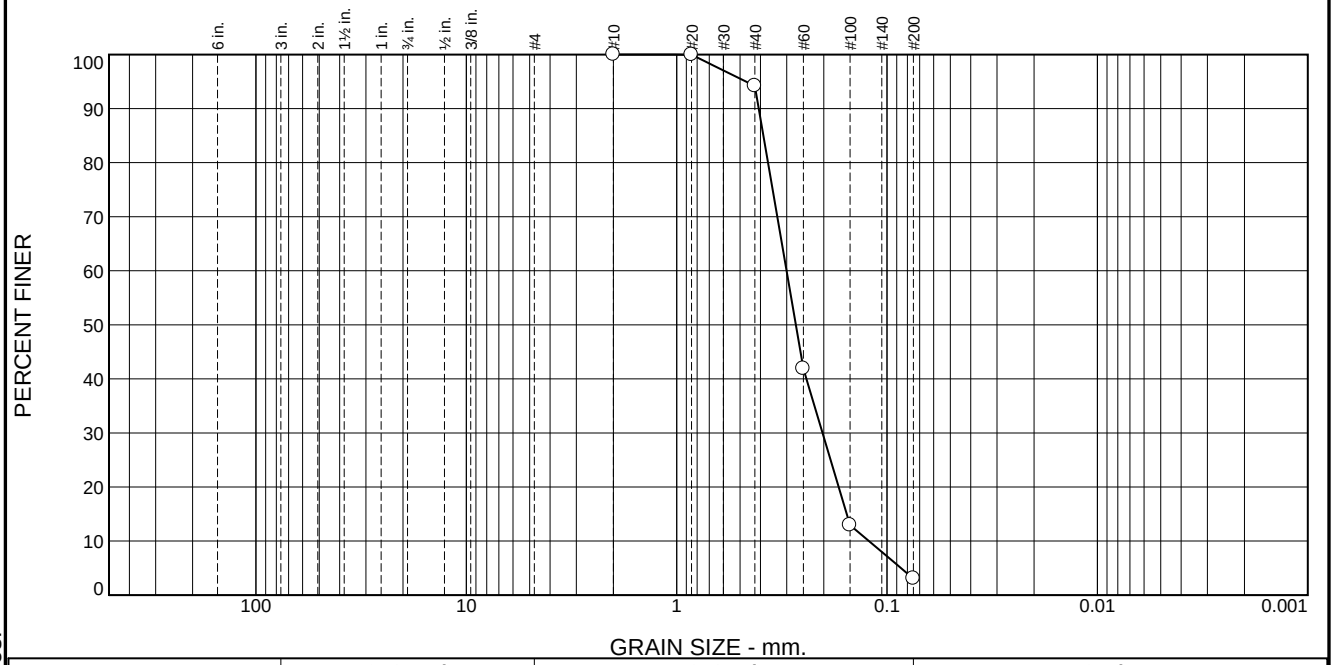
Client: Garrette Customs Homes
Project: Proposed Residential Plat

Project No: GarretteCustomHomes.SpringwoodAveNE **Figure** B-1

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

Tested By: _____ **Checked By:** _____

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	5.8	91.1	3.1	

Test Results (ASTM D 6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#20	100.0		
#40	94.2		
#60	41.9		
#100	12.9		
#200	3.1		

* (no specification provided)

Material Description

Poorly graded SAND (SP)

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SP **AASHTO (M 145)=** A-3

Coefficients

D_{90}= 0.4073 D_{85}= 0.3872 D_{60}= 0.3004
D_{50}= 0.2714 D_{30}= 0.2027 D_{15}= 0.1555
D_{10}= 0.1220 C_u= 2.46 C_c= 1.12

Remarks

Natural Moisture: 4.6%

Date Received: 9/17/24 **Date Tested:** 9/17/24

Tested By: MAW

Checked By: KEB

Title: PM

Location: TP-2, S-2 **Date Sampled:** 9/17/24
Sample Number: 105469 **Depth:** 3'

GeoResources, LLC

Fife, WA

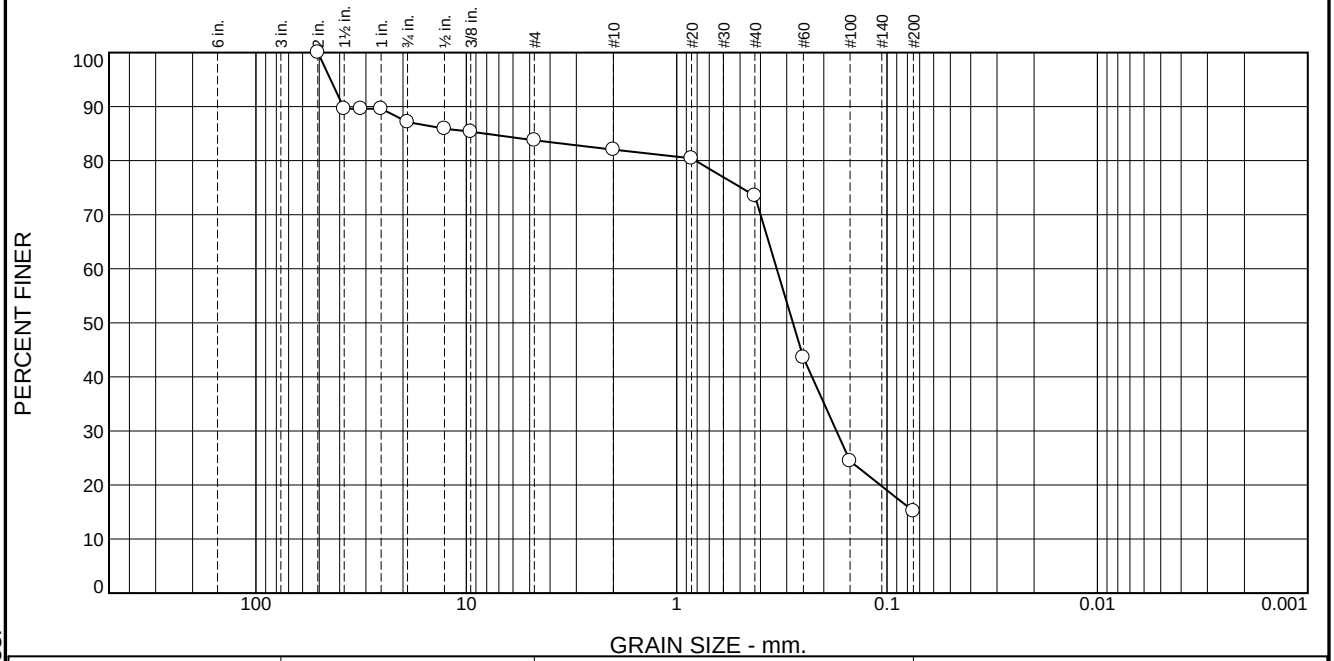
Client: Garrette Customs Homes
Project: Proposed Residential Plat

Project No: GarretteCustomHomes.SpringwoodAveNE **Figure** B-2

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

Tested By: _____ **Checked By:** _____

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	12.9	3.3	1.8	8.5	58.3	15.2	

Test Results (ASTM D 6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
2.0	100.0		
1.5	89.6		
1.25	89.6		
1	89.6		
.75	87.1		
.5	85.9		
0.375	85.4		
#4	83.8		
#10	82.0		
#20	80.4		
#40	73.5		
#60	43.6		
#100	24.4		
#200	15.2		

* (no specification provided)

Material Description

Silty SAND with gravel (SM)

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-2-4(0)

Coefficients

D_{90}= 38.5140 D_{85}= 8.1654 D_{60}= 0.3346
D_{50}= 0.2802 D_{30}= 0.1741 D_{15}=
D_{10}= C_u= C_c=

Remarks

Natural Moisture: 7.7%

Date Received: 9/17/24 **Date Tested:** 9/18/24

Tested By: MAW

Checked By: KEB

Title: PM

Location: TP-3, S-1
Sample Number: 105470 **Depth:** 2'

Date Sampled: 9/17/24

GeoResources, LLC

Fife, WA

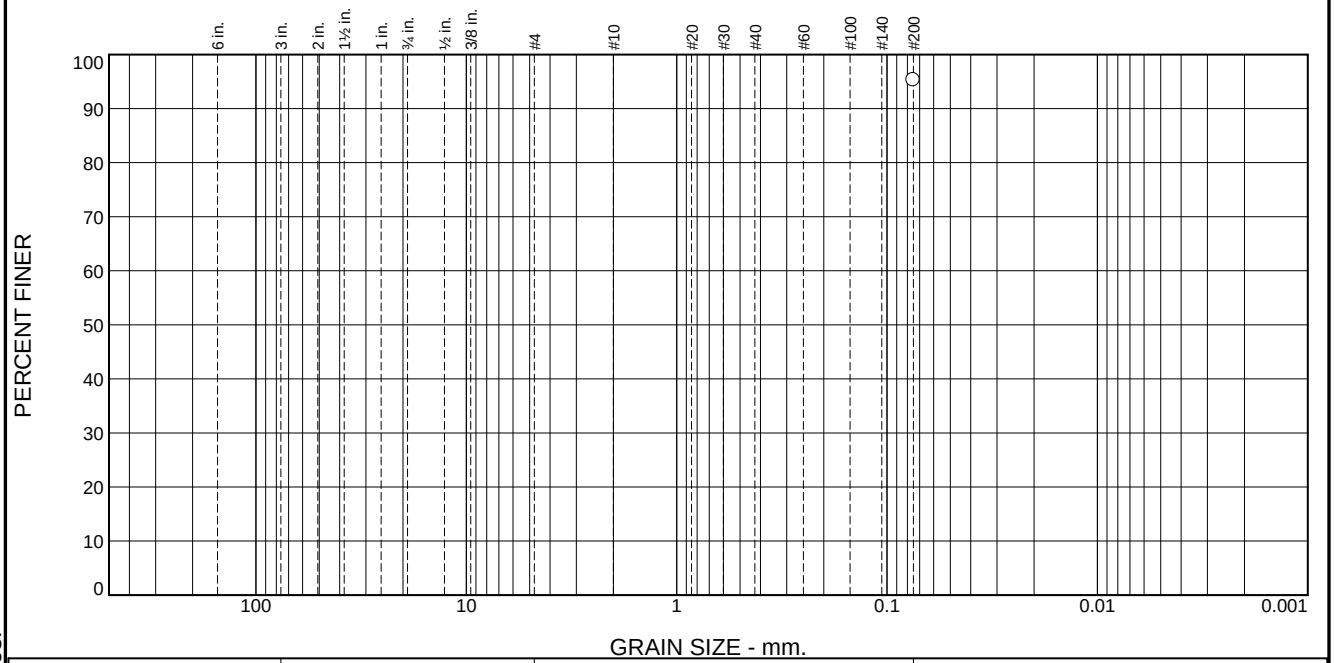
Client: Garrette Customs Homes
Project: Proposed Residential Plat

Project No: GarretteCustomHomes.SpringwoodAveNE **Figure** B-3

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

Tested By: _____ **Checked By:** _____

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						95.3	

Test Results (ASTM D 6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#200	95.3		

* (no specification provided)

Material Description

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= **AASHTO (M 145)=**

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Natural Moisture: 33.3%

Date Received: 9/17/24 **Date Tested:** 9/18/24

Tested By: MAW

Checked By: KEB

Title: PM

Location: TP-6, S-2 **Date Sampled:** 9/17/24
Sample Number: 105471 **Depth:** 3'

GeoResources, LLC

Fife, WA

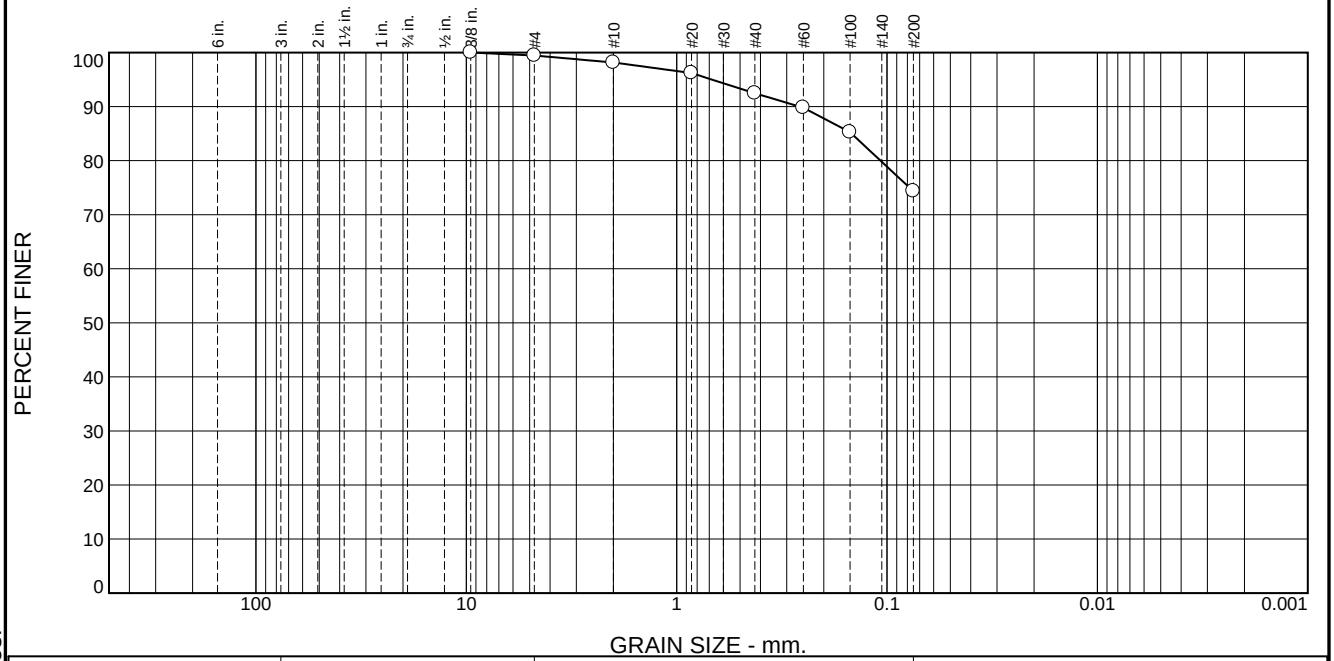
Client: Garrette Customs Homes
Project: Proposed Residential Plat

Project No: GarretteCustomHomes.SpringwoodAveNE **Figure** B-4

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

Tested By: _____ **Checked By:** _____

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.6	1.2	5.7	18.2	74.3	

Test Results (ASTM D 6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
0.375	100.0		
#4	99.4		
#10	98.2		
#20	96.2		
#40	92.5		
#60	89.8		
#100	85.3		
#200	74.3		

* (no specification provided)

Material Description

SILT with sand (ML)

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= ML **AASHTO (M 145)=** A-4(0)

Coefficients

D_{90}= 0.2606 D_{85}= 0.1476 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Natural Moisture: 21.5%

Date Received: 9/17/24 **Date Tested:** 9/18/24

Tested By: MAW

Checked By: KEB

Title: PM

Location: TP-7, S-1 **Date Sampled:** 9/17/24
Sample Number: 105472 **Depth:** 1.5'

GeoResources, LLC

Fife, WA

Client: Garrette Customs Homes
Project: Proposed Residential Plat

Project No: GarretteCustomHomes.SpringwoodAveNE **Figure** B-5

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

Tested By: _____ **Checked By:** _____

Appendix D

Wetland Report

D-1.....Environmentally Critical Areas Assessment by Habitat Technologies, dated October 23, 2024, Revised June 26, 2025.

HABITAT TECHNOLOGIES

ENVIRONMENTALLY CRITICAL AREAS ASSESSMENT

(wetlands, streams, critical habitats)

Parcel 09680073000
1609 Springwood Avenue NE
City of Olympia, Washington

This document incorporates modifications to address review comments provided by City of Olympia Environmental Review Staff

prepared for

Garrette Custom Homes/Pacific Lifestyle Homes
@ Ms. Jessica Estrada, Land Development Manager
e-mail JessicaE@buildgch.com

prepared by

HABITAT TECHNOLOGIES
P.O. Box 1088
Puyallup, Washington 98371-1088
253-845-5119

October 23, 2024
REVISED
JUNE 26, 2025

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INTRODUCTION

This document details the culmination of activities and onsite evaluations undertaken to complete an onsite assessment and characterization of environmentally critical areas (wetlands, surface water drainage corridors/streams, and critical fish and wildlife habitats) as a part of future planning for potential site development actions within **Parcel 09680073000 (project site)** located at 1609 Springwood Avenue NE within the City of Olympia (Figure 1). The evaluation and delineation of onsite and adjacent environmentally critical areas is a vital element in the planning and selection or a site development action. The goal of this approach is to ensure that planned site development does not result in adverse environmental impacts to these identified critical areas or their associated protective buffers. **Please Note** that this assessment did not include an evaluation of potential seismic hazard areas, potential landslide hazard areas, potential septic suitability, potential geological hazard areas, or potential wellhead protection areas.

The onsite assessment and evaluation of critical areas within and immediately adjacent to the project site was completed following the methods and procedures defined in the *Corps of Engineers Wetland Delineation Manual* (United States Army Corps of Engineers, 1987) with the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual:* Western Mountains, Valleys, and Coast Region (United States Army Corps of Engineers, 2010); the 2014 Washington State Department of Ecology *Wetland Rating Form for Western Washington* (Hruby, T. & Yahnke, A. 2023); the State of Washington Department of Natural Resources (WDNR) Forest Practice Rules (WAC 222-16-030); and the City of Olympia Chapter 18.32 – Critical Areas.

PROJECT SITE DESCRIPTION

The project site was somewhat rectangular in shape, approximately 7.06-acres in size, and had undergone prior and ongoing land use manipulations and management. These prior and ongoing land use actions have included clearing and grading, pasture creation and management, single-family homesite and associated outbuilding development, fencing, creation of managed lawn and landscaped areas, the development of adjacent properties, and the development of adjacent public roadways. The project site was within an area of existing single-family homes on similarly sized parcels that were quickly converting into higher density residential communities. The project site was bound to the south, east, and west by existing single-family homesites and to the north by Springwood Avenue NE.

Directions to Project Site: From 4th Avenue East turn north onto Tullis Street NE. Continue northerly on Tullis Street NE to San Francisco Avenue NE. Turn east onto San Francisco Avenue NE and turn almost immediately north onto Bethel Street NE. Continue northerly on Bethel Street NE to Springwood Avenue NE. Turn east onto Springwood Avenue NE and continue to the project site located at 1609 Springwood Avenue NE.

BACKGROUND INFORMATION

NATIONAL WETLAND INVENTORY

The *National Wetland Inventory (NWI) Mapping* completed by the U.S. Fish and Wildlife Service was reviewed as a part of this assessment (Figure 2). This mapping resource did not identify any wetlands or drainage corridors within or immediately adjacent to the project site. This mapping resource identified offsite wetlands well offsite to the east of the project site associated with Setchfield Lake and surface water drainages offsite to the north and south of the project site.

STATE OF WASHINGTON PRIORITY HABITATS AND SPECIES

The State of Washington *Priority Habitats and Species (PHS) Mapping* was reviewed as a part of this assessment (Figure 3). This mapping resource did not identify any priority habitats within or immediately adjacent to the project site. This mapping resource identified Setchfield Lake well offsite to the east and Mission Creek well offsite to the south of the project site. This mapping resource identified the potential presence of Yuma myotis (*Myotis yumanensis*), little brown bat (*Myotis lucifugus*), and big brown bat (*Eptesicus fuscus*) within the same township as the project site.

STATE OF WASHINGTON DEPARTMENT OF FISH AND WILDLIFE

The State of Washington Department of Fish and Wildlife (WDFW) *SalmonScape Mapping* was reviewed as a part of this assessment (Figure 4). This mapping resource did not identify any wetlands or stream corridors within or immediately adjacent to the project site. This mapping resource identified wetland areas offsite to the east of the project site and Mission Creek offsite to the south.

STATE OF WASHINGTON DEPARTMENT OF NATURAL RESOURCES

The State of Washington Department of Natural Resources (WDNR) *Water Type Mapping* was reviewed as a part of this assessment (Figure 5). This mapping resource did not identify any stream corridors or wetlands within or immediately adjacent to the project site. This mapping resource identified wetland areas offsite to the east of the project site associated with Setchfield Lake and Mission Creek offsite to the south of the project site. Mission Creek is defined as a WDNR Type F Water (fish bearing).

THURSTON COUNTY MAPPING

The Thurston County *Inventory Mapping* resource was reviewed as a part of this assessment (Figure 6). This mapping resource did not identify any drainage corridors or wetlands within the project site. This mapping resource identified a few offsite wetlands and surface water drainage corridors.

SOILS MAPPING

The *Soil Mapping Inventory* completed by the Natural Resources Conservation Service was reviewed as a part of this assessment (Figure 6). This mapping resource identified the soil throughout the project site as Yelm fine sandy loam (126). The Yelm soil series is defined as moderately well drained, as formed in glacial outwash within relict glacial lacustrine lakes, and as not meeting the criteria for designation as a “hydric” soil.

ONSITE ANALYSIS

CRITERIA FOR CRITICAL AREAS IDENTIFICATION

The City of Olympia defines “critical areas” within Chapter 18.32 to include seismic hazard areas, landslide hazard areas, geological hazard areas, wetlands, streams and priority riparian areas, important habitats and species, and wellhead protection areas. The *Environmentally Critical Areas Assessment* presented within this document has focused solely on potential wetlands, potential streams and priority riparian areas, and potential important habitats and species within or immediately adjacent to the project site.

WETLANDS

The City of Olympia defines "wetlands" as those areas that are inundated or saturated by surface water or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. Wetlands do not include those artificial wetlands intentionally created from nonwetland sites, including, but not limited to, irrigation and drainage ditches, grass-lined swales, canals, detention facilities, wastewater treatment facilities, farm ponds, and landscape amenities, or those wetlands created after July 1, 1990, that were unintentionally created as a result of the construction of a road, street, or highway. Wetlands may include those artificial wetlands intentionally created from nonwetland areas to mitigate the conversion of wetlands (18.32.505).

Wetlands are transitional areas between aquatic and upland habitats. In general terms, wetlands are lands where the extent and duration of saturation with water is the primary factor determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface (Cowardin, et al., 1979). Wetlands are generally defined within land use regulations as "areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (United States Army Corps of Engineers, 1987).

Wetlands exhibit three essential characteristics, all of which must be present for an area to meet the established criteria (United States Army Corps of Engineers, 1987 and United States Army Corps of Engineers, 2010). These essential characteristics are:

1. **Hydrophytic Vegetation:** The assemblage of macrophytes that occurs in areas where inundation or soil saturation is either permanent or of sufficient frequency and duration to influence plant occurrence. Hydrophytic vegetation is present when the plant community is dominated by species that require or can tolerate prolonged inundation or soil saturation during the growing season.

2. **Hydric Soil:** A soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper parts. Most hydric soils exhibit characteristic morphologies that result from recent periods of saturation or inundation. These processes result in distinctive characteristics that persist in the soil during both wet and dry periods.

3. **Wetland Hydrology:** Permanent or periodic inundation, or surface soil saturation, at least seasonally. Wetland hydrology indicators are used in combination with indicators of hydric soil and hydrophytic vegetation to define the area. Wetland hydrology indications provide evidence that the site has a continuing wetland hydrology regime. Where hydrology has not been altered vegetation and soils provide strong evidence that wetland hydrology is present.

STREAMS AND PRIORITY RIPARIAN AREAS

The City of Olympia defines "streams" as an area where surface waters flow sufficiently to produce a defined channel or bed, an area which demonstrates clear evidence of the passage of water including but not limited to bedrock channels, gravel beds, sand and silt beds and defined-channel swales. The channel or bed need not contain water year-round. This definition is not meant to include irrigation ditches, canals, storm or surface water runoff devices or other entirely artificial watercourses unless they are used to convey streams naturally occurring prior to construction (18.32.405).

The City of Olympia defines “priority riparian areas” as those marine and lake shorelines, as measured from the ordinary high water mark, in the following locations:

1. The eastern shore of Budd Inlet from the southern property line of Priest Point Park northward to the city limits;
2. The western shore of Budd Inlet (in the Port Lagoon) from 4th Avenue NW northward to the extension of Jackson Avenue NW, but not including the BNSF railroad causeway and trestle or their western or eastern shores; West Bay Drive NW; Olympic Way NW; and parcels west of the rights-of-ways of West Bay Drive NW and Olympic Way NW;
3. The western shore of Budd Inlet (north of West Bay Drive) from the extension of 24th Avenue NW northward to the city limits, being approximately six hundred and fifty (650) feet from the end of the fill to the city limits;
4. The eastern shore of Capitol Lake (in the Middle Basin) from the extension of 13th Avenue SE (Olmsted Brothers Axis) southward to the right of way of Interstate 5;
5. The eastern shore of Capitol Lake (in the South Basin) from the right of way of Interstate 5 southward to the city limits; and
6. The western shore of Capitol Lake (in Percival Cove) from the intersection of Lakeridge Drive SW and Deschutes Parkway SW westward to the mouth of Percival Creek (a point due north of the terminus of Evergreen Park Court SW).

IMPORTANT HABITATS AND SPECIES

The City of Olympia defines "important habitats and species" as those habitats or species known to occur within Thurston County and which may be found within the City of Olympia, and which are not receiving habitat protection by another critical area category (streams, wetlands, or landslide hazard areas) in this Chapter and (18.32.305):

A. Are designated as endangered or threatened species identified under the Endangered Species Act; or
B. Are state priority species identified on the Washington Department of Fish and Wildlife (WDFW) Priority Habitats and Species (PHS) List and their habitats of primary association. (Consult the state WDFW for the current PHS list); or
C. Are designated as "locally important habitat or species" pursuant to OMC 18.32.327; or
D. Are areas in Olympia that serve a critical role in sustaining needed habitats and species for the functional integrity of the ecosystem, and which, if altered, may reduce the likelihood that the species will persist over the long term. These areas may include, but are not limited to, rare or vulnerable ecological systems, communities, and habitat or habitat elements including seasonal ranges, breeding habitat, winter range, and movement corridors; and areas with high relative population density or species richness.
E. Small lakes, defined as naturally existing bodies of standing water less than twenty acres in size that exist on a year-round basis in a depression of land or expanded part of a stream and not defined as "Shorelines of the State" by RCW 90.58 (Shoreline Management Act), are considered an "important habitat." This term does not apply to constructed ponds.

STUDY METHODS

Habitat Technologies completed a specific onsite assessment of **Parcel 09680073000** on October 16, 2024 - during a period of seasonal temperate weather. To address City of Olympia comments provided by City of Olympia Environmental Review Staff, additional onsite assessments were completed during the end of May through the middle of June 2025. The onsite assessment was completed consistent with the *Corps of Engineers Wetland Delineation Manual* (United States Army Corps of Engineers, 1987) with the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region* (United States Army Corps of Engineers, 2010); the 2014 Washington State Department of Ecology *Wetland Rating Form for Western Washington* (Hruby, T. & Yahnke, A. 2023); the State of Washington Department of Natural Resources (WDNR) Forest Practice Rules (WAC 222-16-030); and the City of Olympia Chapter 18.32 – Critical Areas. Field data sheets are provided in Appendix A and the location of each sample plot is provided on an attached sample plot graphic.

FIELD OBSERVATION

The project site appeared to have been historically managed as a single-family homesite and included a number of outbuildings, landscape areas, produce gardens, lawn, and livestock pasture areas. The existing single-family homesite and associated buildings were generally within central portion of the project site. The western portion of the project site was dominated by managed lawn and produce garden areas, and remnant retained areas of native vegetation. The eastern portion of the project site exhibited a forest overstory with shrubs and herbs that appeared to have historically been dedicated to livestock pasture. The project site was bound by a residential community to the south, single-family homesites to the west and east, and Springwood Avenue NE to the north.

Soils

As documented at representative sample plots throughout the project site the onsite soils typical exhibited characteristics typical of the Yelm soil series. Soil texture was generally fine sandy loam to loam that appeared to drain moderately well to well. Surface soil coloration to a depth of four (4) to ten (10) inches ranged from very dark grayish brown (10YR 3/2) to dark grayish brown (10YR 4/3). The subsoil to a depth of approximately 24 inches exhibited a generally dark brown (10YR 3/3) to dark yellowish brown (10YR 4/4) coloration. The onsite soils did not exhibit prominent redoximorphic features.

No portion of the project site was identified to exhibit field characteristics typically associated with “hydric” soils.

A single small depression (approximately 400 square feet in size) was present within an internal roadway through the northeastern portion of the project site. This small depression was identified as an intentionally created feature through an upland forested area in a location where the internal roadway makes a 90 degree turn allowing vehicles and equipment to create a pothole. The soil within this created depression exhibited field indicators of hydric soils (see Sample Plot SPT2).

Hydrology

Onsite hydrology appeared to be the result of seasonal stormwater runoff from onsite and from adjacent homesites and public roadways. The entire project site appeared to drain moderately well to well. No portion of the project site was identified to exhibit field characteristics typically associated with wetland hydrology patterns or the concentrated channelization of surface water movement.

No portion of the project site was identified to exhibit field characteristics typically associated with wetland hydrology patterns or the concentrated movement of surface water.

As single small depression (approximately 400 square feet in size) was present within an internal roadway through the northeastern portion of the project site. This small depression was identified as an intentionally created feature through an upland forested area in a location where the internal roadway makes a 90 degree turn allowing vehicles and equipment to create a pothole. The small depression was isolated and identified to pond surface water for a short period of time during the late winter and early growing season. Field indicators of short-term seasonal hydrology included algae matting and water stained leaves (see Sample Plot SPT2).

A very shallow field ditch was also identified in the northwestern portion of the project site. This shallow field ditch appeared to have at one time attached to a culvert associated with the roadway along the northern project site boundary and to extent to the southern boundary of the project site. However, as noted by the property owner land modifications undertaken a few decades ago by adjacent neighbors had filled the offsite portion of this ditch to the south of the project site. Onsite this ditch appeared to intermittently pond surface water for very short periods of time following seasonal storm events. However, this field ditch did not exhibit prominent field indicators of hydric soils and appeared to drain moderately well (see Sample Plot SPT12).

Vegetation

The project site exhibited a mixed plant community that had undergone prior land use manipulations and modifications. The western and central portions of the project site exhibited managed lawn, produce gardens, and retained remnant native vegetation areas. Observed species included Douglas fir (*Pseudotsuga menziesii*), Western red

cedar (*Thuja plicata*), red alder (*Alnus rubra*), big leaf maple (*Acer macrophyllum*), Cottonwood (*Populus trichocarpa)*, cherry (*Prunus* spp.), paper birch (*Betula papyrifera),* hawthorne (*Crataegus monogyna*), Pacific red elderberry (*Sambucus racemosa*), evergreen blackberry (*Rubus laciniatus*), Himalayan blackberry (*Rubus armeniacus*), Scots broom (*Cytisus scoparius*), Indian plum (*Oemleria cerasiformis),* holly (*Ilex* spp.), hazelnut (*Corylus cornuta*), ivy (*Hedera* spp.), nettle (*Urtica dioica*), bluegrass (*Poa* spp.), dandelion (*Taraxacum officinale*), cats ear (*Hypochaeris radicata*), clover (*Trifolium repens*), and buttercup (*Ranunculus* spp.). This plant community was identified as non-hydrophytic in character (typical of uplands).

The eastern portion of the project site appeared to have historically been utilized as livestock pastured woodlot. This area exhibited a forested overstory that included dense areas of blackberry thickets. Observed species included red alder, big leaf maple, cottonwood, cherry, Indian plum, Pacific red elderberry, hazelnut, Oregon grape, salal, Himalayan blackberry, evergreen blackberry, trailing blackberry (*Rubus ursinus*), rose (*Rosa* spp.), Indian plum (*Oemleria cerasiformis*), Oregon grape (*Berberis nervosa*), hazelnut (*Corylus cornuta*), salal (*Gaultheria shallon*), elderberry, salmonberry (*Rubus spectabilis*), sword fern (*Polystichum munitum*), bracken fern (*Pteridium aquilium*), nettle, ivy, and yellow archangle (*Lamiastrum galeobdolom*)**.** This plant community was identified as non-hydrophytic in character (typical of uplands).

No portion of the project site was identified to exhibit a predominant wetland plant community.

As single small depression (approximately 400 square feet in size) was present within an internal roadway through the northeastern portion of the project site. This small depression was identified as an intentionally created feature through an upland forested area in a location where the internal roadway makes a 90 degree turn allowing vehicles and equipment to create a pothole. The plant community within this created depression was dominated by bluegrass, reed canarygrass, tall buttercup, and bare ground (see Sample Plot SPT2).

Wildlife Observations

The majority of observed wildlife species are commonly present within urban areas. Species observed onsite, species that would be expected to utilize the habitats provided by the project site, and species that may potentially utilize the habitats provided by the project site included include red tailed hawk (*Buteo jamaicensis*), merlin (*Falco columbarius*), mourning dove (*Zenaida macroura*), American crow (*Corvus brachynchos*), Northern flicker (*Colaptes auratus*), violet green swallow (*Tachycineta thallassina*), tree swallow (*Tachycineta bicolor*), American robin (*Turdus migratorius*), song sparrow (*Melospiza melodia*), black capped chickadee (*Parus atricapillus*), dark-eyed junco (*Junco hyemalis*), bats (*Myotis* spp.), purple finch (*Carpodacus purpureus*), house finch (*Carpodacus mexicanus*), white crowned sparrow (*Zonotrichia leucophrys*), brown creeper (*Certhia americana*), bushtit (*Psaltriparus minimus*), evening grosbeak

(*Coccothraustes vispertina*), rufous sided towhee (*Pipilo erythrophthalmus*), starling (*Sturnus vulgaris*), rock dove (*Columbia livia*), Steller jay (*Cyanocitta stelleri*), Anna's hummingbird (*Calypte anna*), rufous hummingbird (*Selasphorus rufus*), black tailed deer (*Odocoileus hemionus*), coyote (*Canis latrans*), raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), opossum (*Didelphis virginianus*), Western screech owl (*Otus kennicotti*), deer mouse (*Peromyscus maniculatus*), shrew (*Sorex* spp.), mole (*Scapanus* spp.), bats (*Myotis* spp.), eastern gray squirrel (*Sciurus carolinensis*), Douglas squirrel (*Tamiasciurus douglasi*), eastern cottontail *(Sylvilagus floridanus),* Norway rat (*Rattus norvegicus*), black rat (*Rattus rattus*), and vole (*Microtus* spp.).

The project site was not identified to provide spawning or juvenile rearing habitats for amphibians and was not observed, and has not been documented, to provide direct habitats for fish species.

MOVEMENT CORRIDORS: The project site was generally located within a well urbanized residential area. The project site appeared well used by the daily movements of small to medium sized wildlife species and was within the seasonal migratory pathways for a variety of passerine birds. The project site was also identified to be well used by domestic pets. In addition, the entire project site has been modified and managed for residential uses for several decades. As a result of this manipulation, no portion of the project site exhibited characteristics typically associated with a "prairie ecosystem."

State Priority Species

Several species identified by the State of Washington as "Priority Species" were observed onsite or potentially may utilize the project site. Priority species require protective measures for their survival due to their population status, sensitivity to habitat alteration, and/or recreational, commercial, or tribal importance.

Game Species: "Game species" are regulated by the State of Washington through recreational hunting bag limits, harvest seasons, and harvest area restrictions. Observed or documented "game species" within and adjacent to the project site included black-tailed deer and mourning dove.

State Candidate: State Candidate species are presently under review by the State of Washington Department of Fish and Wildlife (WDFW) for possible listing as endangered, threatened, or sensitive. No State Candidate species were observed or have been documented to utilize the habitats provided within the project site.

State Sensitive: State Sensitive species are native to Washington and are vulnerable to declining and are likely to become endangered or threatened throughout a significant portion of its range without cooperative management or removal of threats. No State Sensitive species were observed or have been documented to utilize the habitats provided within the project site.

State Threatened: State Threatened species means any wildlife species native to the state of Washington that is likely to become an endangered species within the foreseeable future throughout a significant portion of its range within the state without cooperative management or removal of threats. The project site did not appear to provide, and has not been documented to provide, direct critical habitats for State Threatened species.

State Endangered: State endangered species means any species native to the state of Washington that is seriously threatened with extinction throughout all or a significant portion of its range within the state. The project site did not appear to provide, and has not been documented to provide, direct critical habitats for State Endangered species.

Federally Listed Species

The project site was not identified and has not been documented to provide critical habitats for federally listed endangered, threatened, or sensitive species. A single, federally listed "species of concern" – bald eagle – has been observed and documented to utilize the habitats provided along the shoreline of Puget Sound, larger surface water drainages, area lakes, and ponds within the general area of the project site.

ENVIRONMENTALLY CRITICAL AREAS FINDINGS

Environmentally critical areas determination was based on the methods and criteria outlined in following the methods and procedures defined in the *Corps of Engineers Wetland Delineation Manual* (United States Army Corps of Engineers, 1987) with the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region* (United States Army Corps of Engineers, 2010); the 2014 Washington State Department of Ecology *Wetland Rating Form for Western Washington* (Hruby, T. & Yahnke, A. 2023); the State of Washington Department of Natural Resources (WDNR) Forest Practice Rules (WAC 222-16-030); and City of Olympia Chapter 18.32 – Critical Areas.

WETLAND AND STREAMS/PRIORITY RIPARIAN AREAS FINDINGS

ONSITE: This assessment identified that **no** portion of the project site exhibited field characteristics meeting all three of the established criteria for designation as "wetland" and that **no** portion of the project site exhibited field characteristics associated with a "stream" or a "priority riparian area."

As noted above, a single small depression (approximately 400 square feet in size) was present within an internal roadway through the northeastern portion of the project site. This small depression was identified as an intentionally created feature through an upland forested area in a location where the internal roadway makes a 90 degree turn allowing vehicles and equipment to create a pothole. As such, this created and managed feature was not identified as a "wetland" because it was created within a nonwetland area.

In addition, the City of Olympia has identified within **OMC18.32.515 Wetlands – Small Wetlands** that wetlands less than one thousand (1,000) square feet shall be exempt from the requirements of OMC 18.32.135; wetland buffers in OMC18.32.535; compensation projects in OMC18.32.545; and replacement ratios in OMC 18.32.550 provided that the wetland or pond:

1. Is an isolated Category III or IV wetland;
2. Is not associated with a riparian corridor;
3. Is not part of a wetland mosaic; and
4. Does not contain habitat identified as essential for local populations of priority species identified by the Washington State Department of Fish and Wildlife; and
5. No part of the wetland is within shorelines of the State of Washington, except as authorized by OMC 18.20.420.C.3.

Should this small internal roadway depression be considered to meet the criteria for identification as a regulated wetland by the City of Olympia this small depression would meet all five of the established criteria.

OFFSITE: An offsite wetland (noted as Wetland A) was documented in a prior report completed by EnviroVector dated April 21, 2023 (Appendix C). This report identified a City of Olympia Category III emergent wetland (Wetland A) within a depression to the south of the southwestern portion of the project site that eventually outlet via an excavated ditch to Mission Creek and associated Wetland B further to the south (Figure 8).

OFFSITE WETLAND	CLASSIFICATION (USFWS)	OLYMPIA CATEGORY	WDOE RATING SCORE	WDOE HABITAT SCORE	BUFFER WIDTH (standard)
A	PEMC	III	20	6	180

Offsite Wetland A: Offsite Wetland A was identified on an adjacent property to the south of the southwestern portion of the project site. This offsite area had been greatly impacted through vegetation removal, shallow pond excavation, the placement of internal and perimeter modifications (logs, downed trees, vegetation, asphalt, concrete, excavated and imported soils). The southern outlet for this wetland was identified as an excavated deep channel and armoring the cut with logs cut from the trees in the buffer. Offsite Wetland A was dominated by an emergent plant community along with limited areas of shrubs, trees, and aquatic communities. Wetland hydrology was provided by seasonal stormwater runoff from onsite, seasonal stormwater runoff from the adjacent

parcels, roadside runoff, prior ditching, and seasonal surface water flow within the wetland. Wetland A was identified as a slope/depressional wetland and connected via a previously modified and recently restored ditch southward into Wetland B and the Mission Creek Corridor.

As defined within the EnviroVector assessment (Appendix C) as verified by the City of Olympia, Offsite Wetland A met the U.S. Fish and Wildlife Service (USFWS) criteria for classification of palustrine, emergent, seasonally flooded, excavated (PEMCx).

> **SPECIAL NOTE:** As requested by the City of Olympia, Habitat Technologies has re-categorized Offsite Wetland A using the recently adopted Washington State Department of Ecology (WDOE) *Wetland Rating Form for Western Washington* (Hruby and Yahnke, 2023). However, since Habitat Technologies could not obtain permission to enter onto the property containing Offsite Wetland A, this re-categorization utilized the information provided within the EnviroVector assessment (Appendix C) to address many of the rating issues. In particular, Offsite Wetland A was identified as independent from Offsite Wetland B and the associated Mission Creek Corridor because of a previously established excavated outlet drainage ditch approximately 60 linear feet in length, Offsite Wetland A was identified as a headwater wetland, Offsite Wetland A exhibited both an emergent and scrub/shrubs plant community, and that there were three priority habitats with 100 meter of Offsite Wetland A.
>
> Offsite Wetland A was identified as a part of the assessment documented above as meeting the present criteria for identification of a City of Olympia Category II Wetland and achieved a total functions score of 20 points (6 habitat points) utilizing the Washington State Department of Ecology (WDOE) *Wetland Rating Form for Western Washington* (Hruby and Yahnke, 2023) (Appendix B).

Offsite Wetland Buffer Modification: As defined by the professional surface associated with Offsite Wetland A as defined within the EnviroVector assessment the presently defined standard buffer for Offsite Wetland A of 180 feet in width would encroach onto the southwestern corner of the project site. As provided within **18.32.535 - Wetland Buffers** the City of Olympia may allow a modification of the required wetland buffer width by either allowing a **reduction** pursuant to OMC 18.32.535(G) or by allowing **averaging** of buffer widths OMC 18.32.535(F):

Wetland buffer width averaging may be allowed when all of the following are met (OMC 18.32.535(F):

1. The wetland has significant differences in characteristics that affect its habitat functions, such as a wetland with a forested component adjacent to a degraded emergent component or a "dual-rated" wetland with a Category I area adjacent to a lower rated area,

2. The buffer is increased adjacent to the higher-functioning area of habitat or more sensitive portion of the wetland and decreased adjacent to the lower functioning or less sensitive portion,
3. The total area of the buffer after averaging is equal to the area required without averaging, and
4. The buffer at its narrowest point is never less than seventy five percent (75%) of the required width.

Where wetland buffer width averaging has not been used the City of Olympia may allow a reduction of the required wetland buffer width by no more than twenty five percent (25%) provided the following are met (OMC 18.32.535(G):

1. For wetlands that score six (6) points or more for the habitat functions, if both of the following criteria are met:
    a. A relatively undisturbed, vegetated corridor at least one hundred (100) feet wide is protected between the wetland and any other priority habitats as defined by the Washington State Department of Fish and Wildlife. The corridor must be protected for the entire distance between the wetland and the priority habitat by legal protection such as a conservation easement.
    b. Measures to minimize the impacts of different land uses on wetlands, such as those described in *Wetland Guidance for CAO Updates, Western Washington (2016) Ecology publication #16-06-001*, as amended or revised, are applied. Examples of these measures include directing lighting away from wetland, locating noise generating activities away from the wetland, and densely planting the buffer to act as barrier to pets and human disturbance.
2. For wetlands that score five (5) points or less for habitat function, apply the provisions of OMC 18.32.535(G)(1)(b).

As defined within the *Wetland Guidance for CAO Updates, Western Washington (2016) Ecology publication #16-06-001* the following are examples of the measures that may be implemented to minimize the impacts of different land uses on wetlands.

Examples of Disturbance	Examples of Measures to Minimize Impacts	Activities that Cause the Disturbance
Lights	• Direct lights away from wetland	• Parking Lots, Warehouses, Manufacturing, High Density Residential
Noise	• Place activity that generates noise away from the wetland.	• Manufacturing, High Density Residential
Toxic runoff	• Route all new untreated runoff away from wetland, • Covenants limiting use of pesticides within 150 feet of wetland	• Parking Lots, Roads, Manufacturing, Residential Areas, Application of Agricultural Pesticides, Landscaping

	• Integrated pest management programs	
Change in water regime	• Infiltrate or treat, detain and disperse into buffer new runoff from surfaces	• Any impermeable surface, Lawns, Tilling
Pets and Human disturbance	• Fence around buffer • Plant buffer with "impenetrable" natural vegetation appropriate for region	• Residential areas
Dust	• BMPs for dust	• Tilled fields

FISH AND WILDLIFE HABITAT CONSERVATION AREA FINDINGS

This assessment identified that **no** portion of the project site exhibited field characteristics typically associated with City of Olympia defined "*important habitat and species areas*" (18.32.305). The project site has not identified and has not been documented to provide habitats for federal endangered, threatened, or sensitive species; has not been identified and has not been documented to provide habitats for state listed endangered, threatened, sensitive, or candidate species; has not been identified and has not been documented to provide documented "locally important habitat or species;" has not been identified to serve a critical role in sustaining needed habitats and species for the functional integrity of the ecosystem; and has not been identified to exhibit naturally existing bodies of standing water less than twenty acres in size.

SELECTED DEVELOPMENT ACTION

The *Selected Development Action* has not yet been fully defined. However, present planning focuses on the development of the new **Residential Community** consistent with the City of Olympia Comprehensive Plan, local zoning, and the character of the local neighborhood. As presented above, the development of this residential community could be accomplished without adversely impacting environmentally critical areas (wetlands, surface water drainage corridors/streams, or critical fish and wildlife habitats).

Offsite Wetland A Buffer Establishment: As noted above, a City of Olympia Category II Wetland has been identified offsite to the south of the southwestern corner of the project site. The standard buffer for this offsite wetland is defined as 180 feet in width as measured perpendicular to the wetland boundary. The majority of the standard buffer associated with this offsite wetland is located offsite and has been restored as outlined in the *Critical Areas Report and Wetland Restoration Plan* prepared by EnviroVector (Appendix C). To allow for the reduction of this standard buffer of 180 feet to not less than 135 feet in width the proposed development of the onsite residential community would implement a variety of measures to minimize the potential adverse impacts that the

proposed site development action would have on this offsite wetland or on local water quality. Such measures to be implemented would include the best management practices to manage and minimize dust during and following construction; the utilization of directional lighting within the residential community to minimize encroachment into the established buffer and associated wetland; the placement of those residential activities that generate noise away from the established buffer and associated wetland; the treatment, detention, and dispersal of seasonal stormwater runoff from the residential community into the buffer to allow appropriate biofiltration; the routing of new untreated runoff away from the established buffer and associated wetland for appropriate treatment prior to release; the implementation of controls to address appropriate pesticides and pest management programs to ensure protection of the established buffer and associated wetland; the establishment of a protective fence to limit adverse pet and human intrusions into the established buffer; the placement of signage along the onsite protective fence to further protect the established buffer; and following the removal of existing invasive species the establishes buffer would be planted with a variety of desirable native trees and shrubs to restore and enhance the physical and biological functions of the established buffer. The establishment and restoration of the onsite wetland buffer would also provide a corridor to other aquatic habitats located to the south of the project site and along Mission Creek.

STANDARD OF CARE

This document has been completed by Habitat Technologies for use by **Garrette Custom Homes/Pacific Lifestyle Homes.** Prior to extensive site planning the findings documented in this document should be reviewed and verified by the City of Olympia and potentially other resource agency personnel. Habitat Technologies has provided professional services that are in accordance with the degree of care and skill generally accepted in the nature of the work accomplished. No other warranties are expressed or implied. Habitat Technologies is not responsible for design costs incurred before this document is approved by the appropriate resource and permitting agencies.

Bryan W. Peck

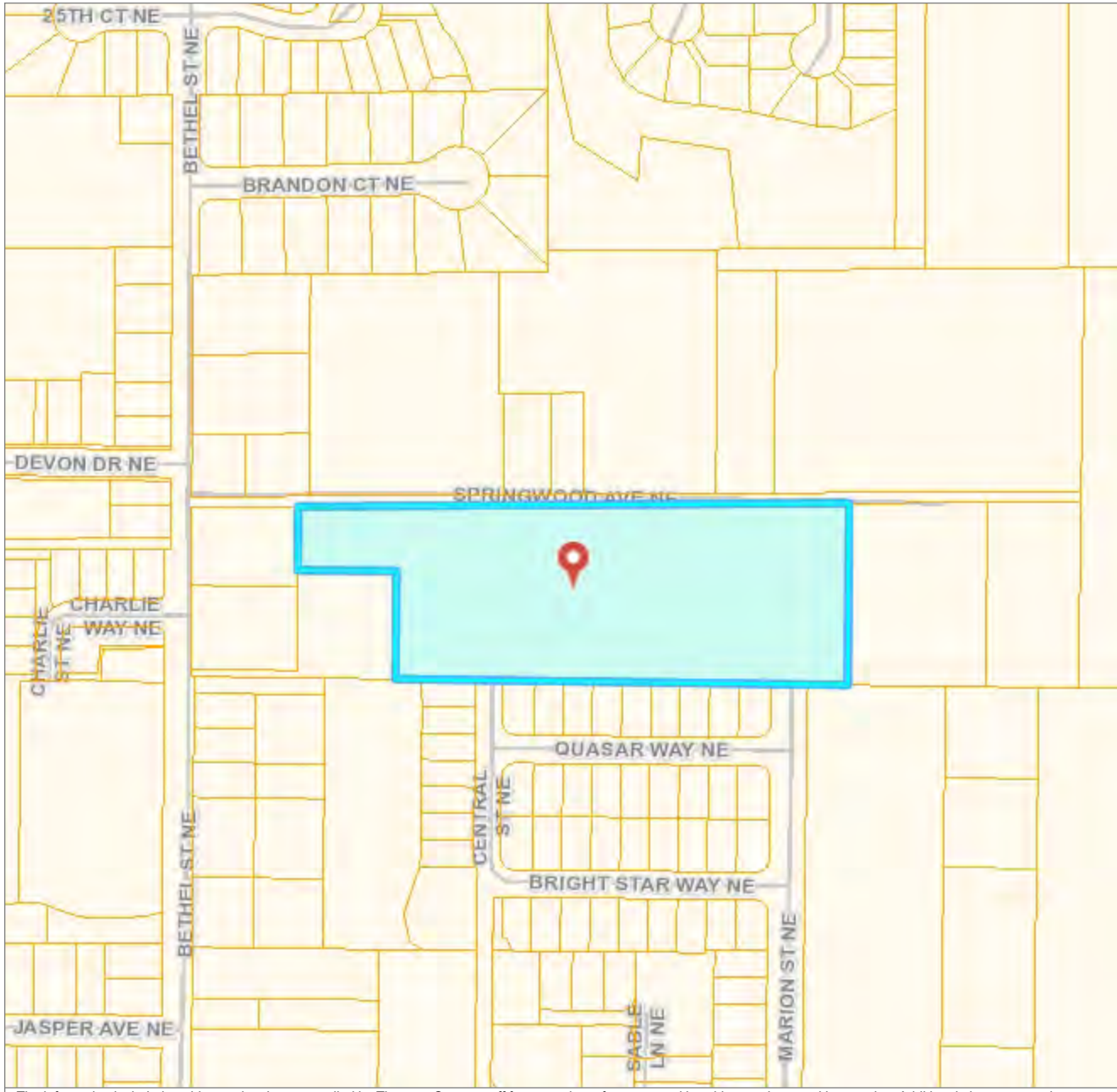
Bryan W. Peck
Senior Wetland Biologist

Thomas D. Deming

Thomas D. Deming, SPWS
Habitat Technologies

FIGURES

Figure 1 - Site Vicinity



Legend

- Parcel Boundaries
- Roads - Major (Large Scale)
  - <all other values>
  - I 5 ACCESS; US 101 ACCESS; US 101 SB OFF RAMP
  - I 5; US 101
- Roads (Large Scale)
- Railroads
- County Border
- Olympia Municipal Airport
- Water Bodies (River - Small Scale)
- Water Bodies (Other)
- Parks
- Cities
- Capital Forest
- County Background

Scale 1: 5,369

0 250 500

Feet

Map Created Using GeoData Public Website

Published: 10/22/2024

Note:

THURSTON COUNTY
WASHINGTON
SINCE 1852

Thurston County GeoData Center

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U.S. Fish and Wildlife Service
National Wetlands Inventory

Figure 2 - NWI Mapping

Attachment 5



October 22, 2024

Wetlands

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

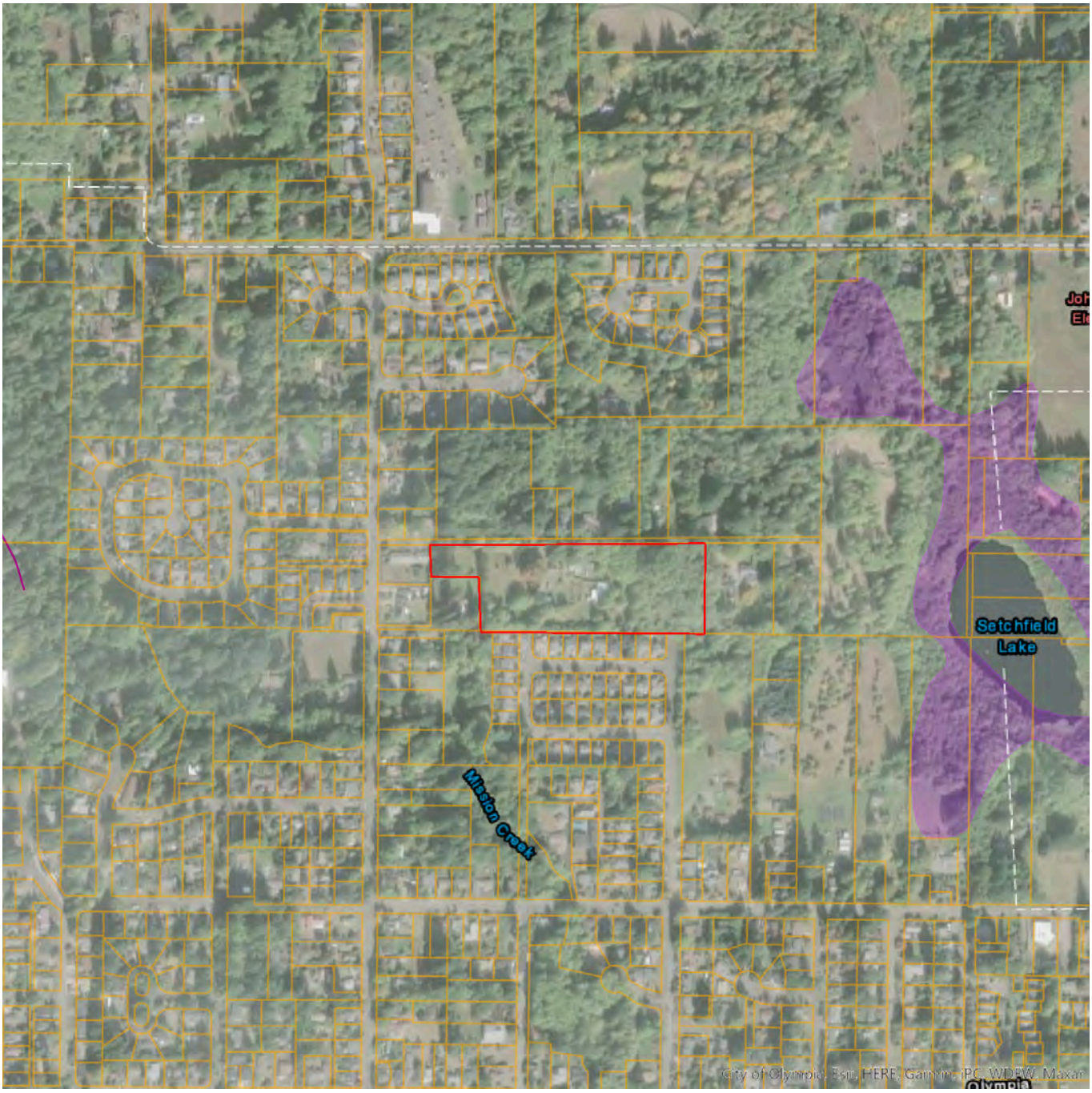
This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

National Wetlands Inventory (NWI)
This page was produced by the NWI mapper

Attachment 5

Figure 3

Priority Habitats and Species on the Web



Report Date: 10/22/2024

PHS Species/Habitats Overview:

Occurence Name	Federal Status	State Status	Sensitive Location
Big brown bat			Yes
Little Brown Bat			Yes
myotis spp			Yes
Yuma myotis			Yes

Attachment 5

PHS Species/Habitats Details:

Big brown bat	
Scientific Name	*Eptesicus fuscus*
Notes	This polygon mask represents one or more records of the above species or habitat occurrence. Contact PHS Data Release at phsproducts@dfw.wa.gov for obtaining information about masked sensitive species and habitats.
PHS Listing Status	PHS Listed Occurrence
Sensitive	Y
Display Resolution	TOWNSHIP
ManagementRecommendations	http://wdfw.wa.gov/publications/pub.php?id=00605

Little Brown Bat	
Scientific Name	*Myotis lucifugus*
Notes	This polygon mask represents one or more records of the above species or habitat occurrence. Contact PHS Data Release at phsproducts@dfw.wa.gov for obtaining information about masked sensitive species and habitats.
PHS Listing Status	PHS Listed Occurrence
Sensitive	Y
Display Resolution	TOWNSHIP
ManagementRecommendations	http://wdfw.wa.gov/publications/pub.php?id=00605

myotis spp	
Scientific Name	*Myotis yumanensis/lucifigus*
Notes	This polygon mask represents one or more records of the above species or habitat occurrence. Contact PHS Data Release at phsproducts@dfw.wa.gov for obtaining information about masked sensitive species and habitats.
PHS Listing Status	PHS Listed Occurrence
Sensitive	Y
Display Resolution	TOWNSHIP

Yuma myotis	
Scientific Name	*Myotis yumanensis*
Notes	This polygon mask represents one or more records of the above species or habitat occurrence. Contact PHS Data Release at phsproducts@dfw.wa.gov for obtaining information about masked sensitive species and habitats.
PHS Listing Status	PHS Listed Occurrence
Sensitive	Y
Display Resolution	TOWNSHIP
ManagementRecommendations	http://wdfw.wa.gov/publications/pub.php?id=00605

DISCLAIMER. This report includes information that the Washington Department of Fish and Wildlife (WDFW) maintains in a central computer database. It is not an attempt to provide you with an official agency response as to the impacts of your project on fish and wildlife. This information only documents the location of fish and wildlife resources to the best of our knowledge. It is not a complete inventory and it is important to note that fish and wildlife resources may occur in areas not currently known to WDFW biologists, or in areas for which comprehensive surveys have not been conducted. Site specific surveys are frequently necesssary 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.

Figure 4 WDFW Salmonscape Mapping

Attachment 5



October 22, 2024

All SalmonScape Species

1:9,028

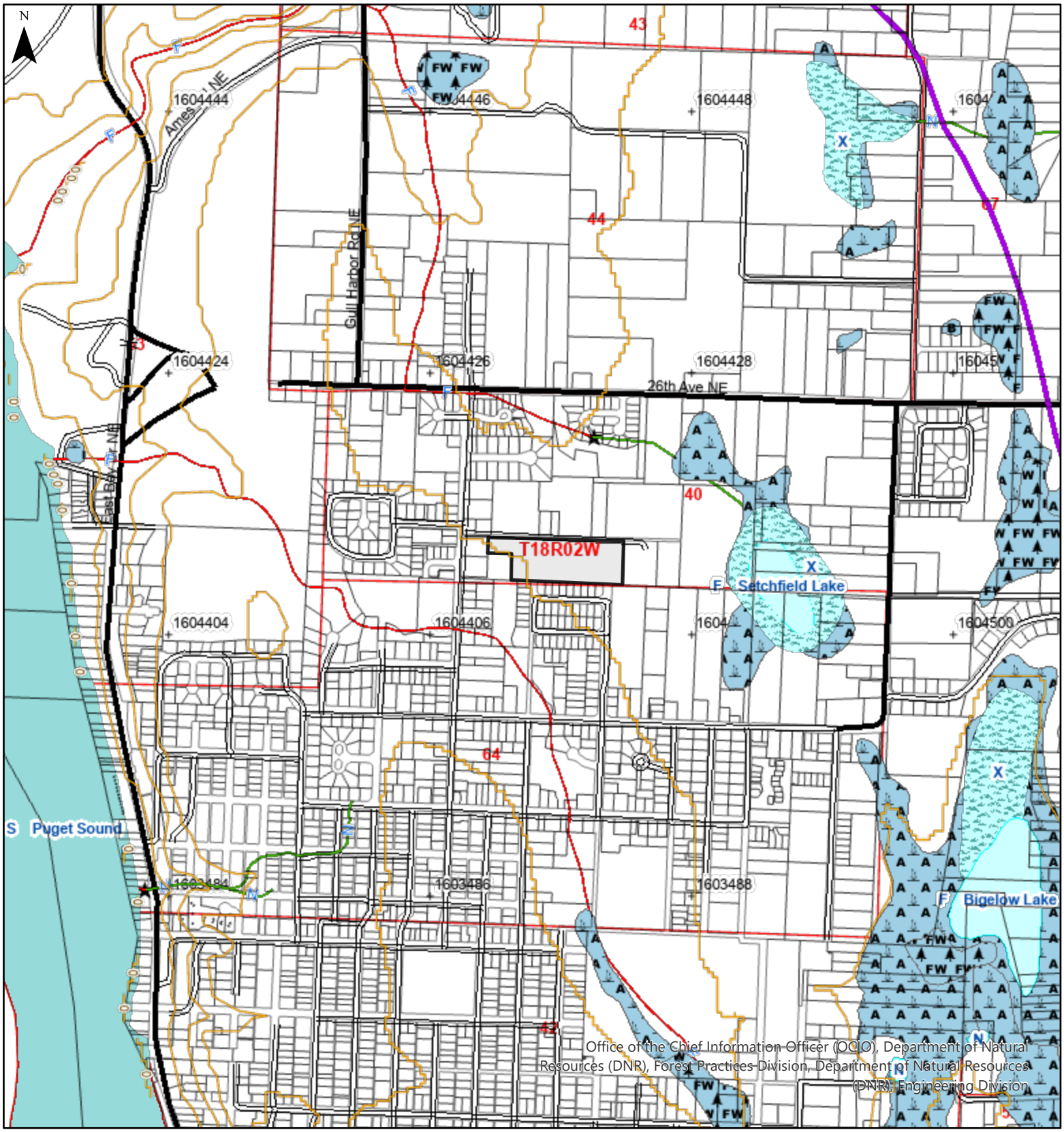
0 0.05 0.1 0.2 mi

0 0.07 0.15 0.3 km

City of Olympia, Esri, HERE, Garmin, iPC, USGS/NHD, Dale Gombert (WDFW), WDFW, Maxar

Figure 5 Forest Practices Water Type Map

Attachment 5



Map Symbols

- New Stream
- Proposed Water Type
- Stream Removal
- Break between water types
- Start and End Point of Surveyed Reach
- Natural Fish Barrier
- Manmade Barrier
- End of Fish or Last Fish

Additional Information

Legal Description

S40 T18.0N R02.0W, S64 T18.0N R02.0W, S52 T18.0N R02.0W, S67 T18.0N R02.0W, S53 T18.0N R02.0W, S43 T18.0N R02.0W, S44 T18.0N R02.0W, S42 T18.0N R02.0W

WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES

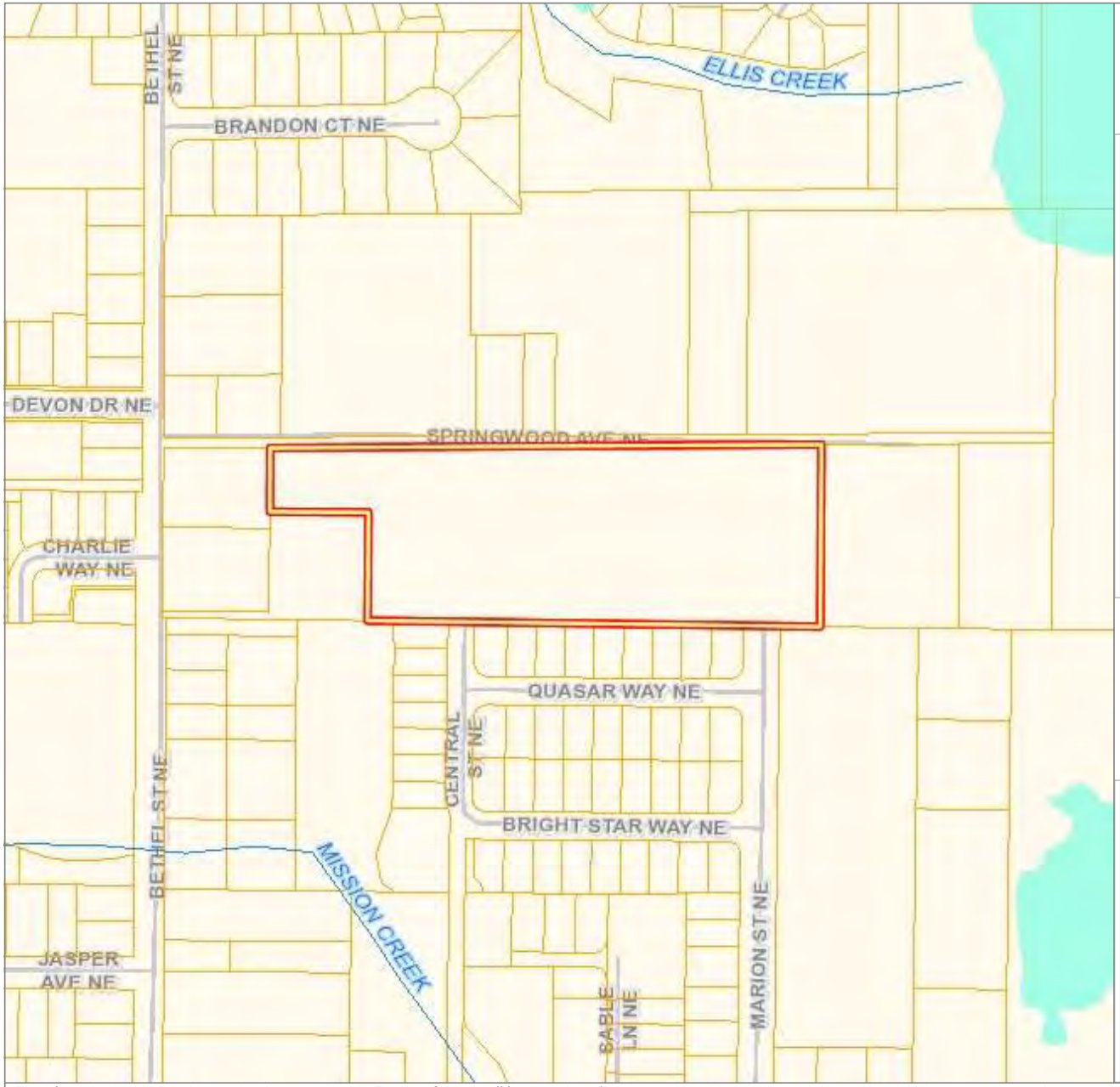
Extreme care was used during the compilation of this map to ensure its accuracy. However, due to changes in data and the need to rely on outside information, the Department of Natural Resources cannot accept responsibility for errors or omissions, and therefore, there are no warranties that accompany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

Approximate Scale : 1:12,000

0 500 1,000 2,000 Feet

Date: 10/22/2024 Time: 10:32 AM

Figure 6 Thurton County Mapping



Legend

- Streams
- Wetlands
- Parcel Boundaries
- Roads - Major (Large Scale)
  - <all other values>
  - I 5 ACCESS; US 101 ACCESS; US 101 SB OFF RAMP
  - I 5; US 101
- Roads (Large Scale)
- Railroads
- County Border
- Olympia Municipal Airport
- Water Bodies (River - Small Scale)
- Water Bodies (Other)
- Parks
- Cities
- Capital Forest
- County Background
- Roads - Major (Large Scale)
  - <all other values>
  - I 5 ACCESS; US 101 ACCESS; US 101 SB OFF RAMP
  - I 5; US 101
- Roads (Large Scale)
- Railroads
- County Border

Scale 1: 5,342

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Feet

Map Created Using GeoData Public Website

Published: 10/23/2024

Note:

THURSTON COUNTY
WASHINGTON
SINCE 1852

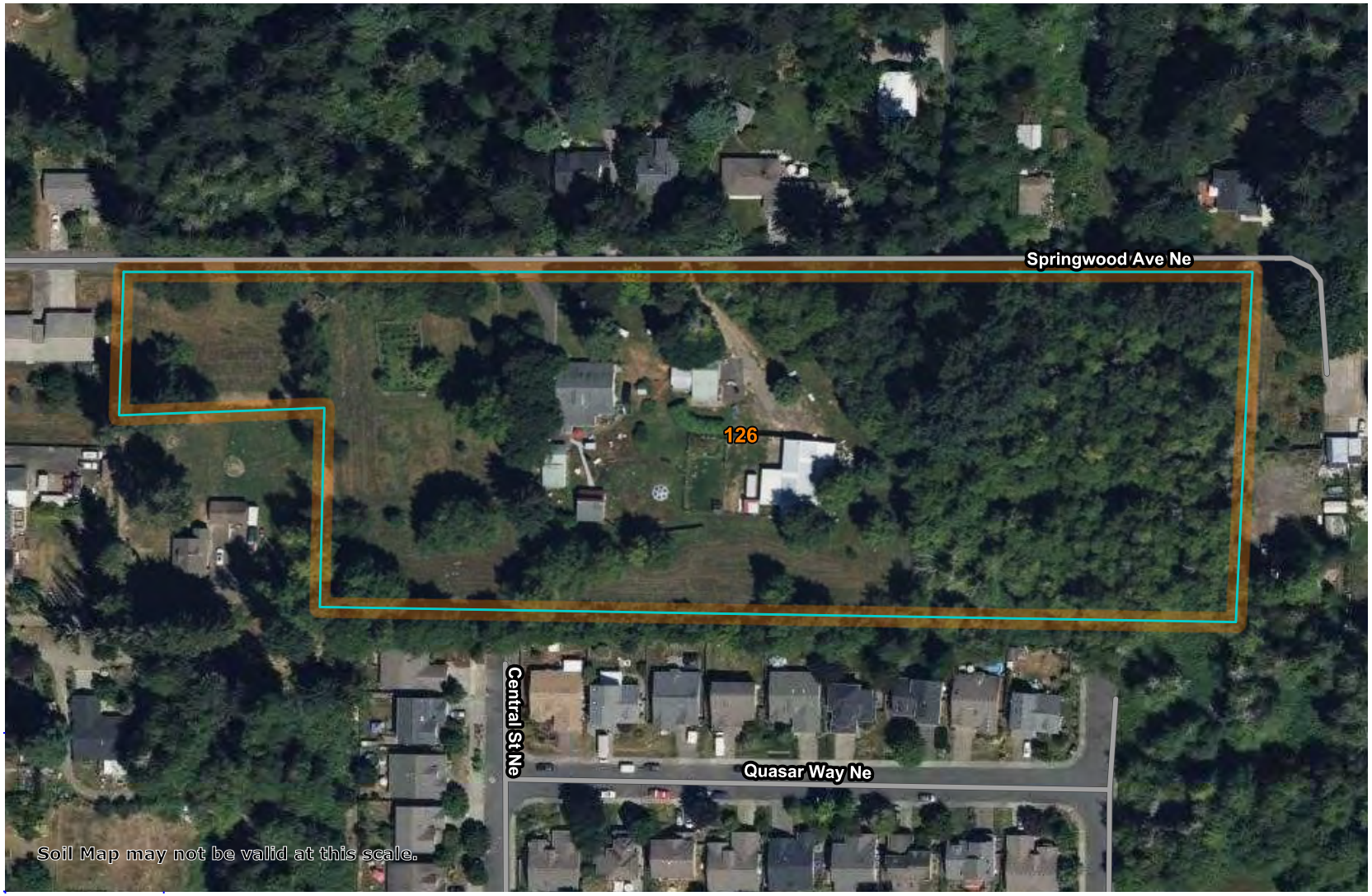
Thurston County GeoData Center

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Soil Map—Thurston County Area, Washington
(Figure 7 Soils Mapping)

122° 53' 3" W
122° 52' 44" W
47° 3' 59" N
47° 3' 51" N



Map Scale: 1:1,760 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 25 50 100 150

Feet
0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84

Soil Map—Thurston County Area, Washington
(Figure 7 Soils Mapping)

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 1:24,000.

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: Thurston County Area, Washington
Survey Area Data: Version 18, Aug 27, 2024

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
126	Yelm fine sandy loam, 0 to 3 percent slopes	6.8	100.0%
Totals for Area of Interest		**6.8**	**100.0%**

Attachment 5

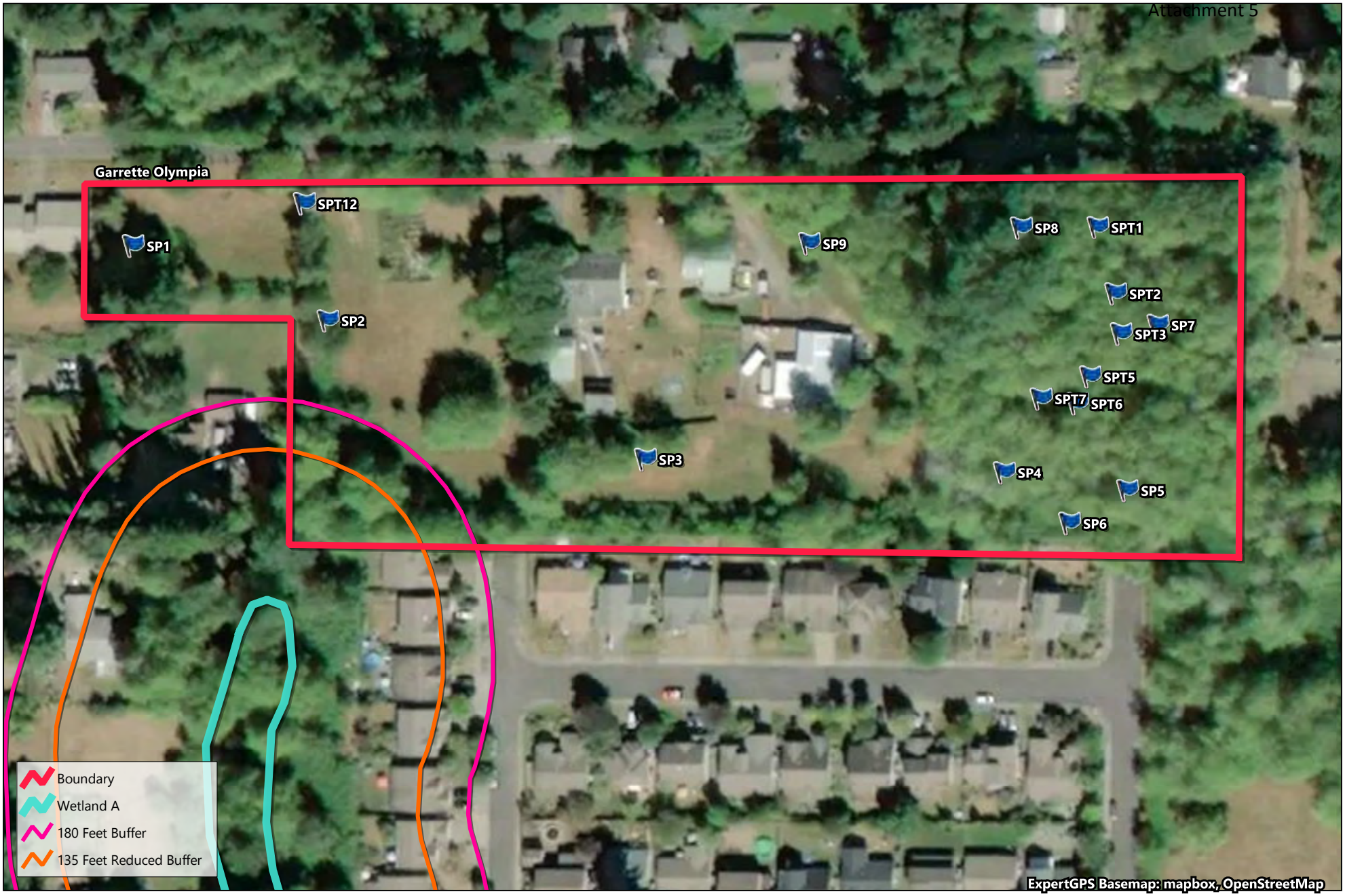


Figure 8 Site Graphic

ExpertGPS

50 ft

MN
15°00'

LITERATURE AND REFERENCE LIST

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Washington State Department of Natural Resources FPARS Mapping System, 2016 (for stream typing): http://fortess.wa.gov/dnr/app1/fpars/viewer.htm

APPENDIX A – Field Data Sheets

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

Project/Site: PARCEL 09680073000 City/County: Olympia / Thurston County Sampling Date: 16 OCT 2024

Applicant/Owner: _____ State: WA. Sampling Point: SP1

Investigator(s): Habitat Technologies Section, Township, Range: Section 12 Township 18 Range 02W

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Rolling Slope (%): 1-2%

Subregion (LRR): A Lat: N47.06543 Long: W122.88296 Datum: _____

Soil Map Unit Name: Yelm fine sandy loam NWI classification: Moderately well drained

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 ☒ Hydric Soil Present? Yes ☐ No ☒ Wetland Hydrology Present? Yes ☐ No ☒	**Is the Sampled Area within a Wetland?** Yes ☐ No ☒

Remarks: Managed pasturet

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer macrophyllum	25	YES	FACU
2. Prunus emarginata	12	YES	FACU
3.			
4.			
	37	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15ft radius)			
1. Corylus cornuta	25	YES	FACU
2. Ilex aquifolium	20	YES	UPL
3.			
4.			
5.			
	45	= Total Cover	
Herb Stratum (Plot size: 15ft radius)			
1. Poa spp.	60	YES	FAC
2. Taraxacum officinale	5	NO	FACU
3. Hedera helix	30	YES	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	95	= Total Cover	
Woody Vine Stratum (Plot size: 15ft radius)			
1. Rubus procera	12	YES	FAC
2.			
	12	= Total Cover	

% Bare Ground in Herb Stratum _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 29 (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:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☐ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 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: Managed pasture

SOIL

Sampling Point: SP1

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 3/2	100					SL	

[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: No prominent Field indicators of hydric soils.

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 prominent field indicators of wetland hydrology.

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

Project/Site: PARCEL 09680073000 City/County: Olympia / Thurston County Sampling Date: 16 OCT 2024

Applicant/Owner: _____ State: WA. Sampling Point: SP2

Investigator(s): Habitat Technologies Section, Township, Range: Section 12 Township 18 Range 02W

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Rolling Slope (%): 1-2%

Subregion (LRR): A Lat: N47.06562 Long: W122.88366 Datum: _____

Soil Map Unit Name: Yelm fine sandy loam NWI classification: Moderately well drained

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 ☐ Hydric Soil Present? Yes ☐ No ☒ Wetland Hydrology Present? Yes ☐ No ☒	**Is the Sampled Area within a Wetland?** Yes ☐ No ☒

Remarks: Managed Lawn section of the property

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Betula papyrifera	80	YES	FAC
2.			
3.			
4.			
	80 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15ft radius)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 15ft radius)			
1. Ranunculus acris	5	NO	FAC
2. Hedera helix	20	YES	FACU
3. Geum macrophyllum	5	NO	FAC
4. Poa spp.	70	YES	FAC
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: 15ft radius)			
1. Rubus procera	30	YES	FAC
2.			
	30 = 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:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☒ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 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: Upland managed lawn section of the property.

SOIL

Sampling Point: SP2

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-24	10YR 3/2	100					SL	

[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: No prominent Field indicators of hydric soils.

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 prominent field indicators of wetland hydrology.

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

Project/Site: PARCEL 09680073000 City/County: Olympia / Thurston County Sampling Date: 16 OCT 2024

Applicant/Owner: _____ State: WA. Sampling Point: SP3

Investigator(s): Habitat Technologies Section, Township, Range: Section 12 Township 18 Range 02W

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Rolling Slope (%): 1-2%

Subregion (LRR): A Lat: N47.06509 Long: W122.88182 Datum: _____

Soil Map Unit Name: Yelm fine sandy loam NWI classification: Moderately well drained

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 ☐ Hydric Soil Present? Yes ☐ No ☒ Wetland Hydrology Present? Yes ☐ No ☒	**Is the Sampled Area within a Wetland?** Yes ☐ No ☒

Remarks: Managed yard

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Alnus rubra	50	YES	FAC
2.			
3.			
4.			
	50 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15ft radius)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 15ft radius)			
1. Poa spp.	100	YES	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: 15ft radius)			
1.			
2.			
	0 = Total Cover		

% Bare Ground in Herb Stratum _____

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:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☒ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 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: managed yard

SOIL

Sampling Point: SP3

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-20	10YR 4/3	100					SL	

[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: No prominent Field indicators of hydric soils.

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 prominent field indicators of wetland hydrology.

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

Project/Site: PARCEL 09680073000 City/County: Olympia / Thurston County Sampling Date: 16 OCT 2024

Applicant/Owner: _____ State: WA. Sampling Point: SP4

Investigator(s): Habitat Technologies Section, Township, Range: Section 12 Township 18 Range 02W

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Rolling Slope (%): 1-2%

Subregion (LRR): A Lat: N47.06506 Long: W122.88053 Datum: _____

Soil Map Unit Name: Yelm fine sandy loam NWI classification: Moderately well drained

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 ☒ Hydric Soil Present? Yes ☐ No ☒ Wetland Hydrology Present? Yes ☐ No ☒	**Is the Sampled Area within a Wetland?** Yes ☐ No ☒

Remarks: Forested section of property

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Alnus rubra	20	YES	FAC
2.			
3.			
4.			
	20 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15ft radius)			
1. Oemleria cerasiformis	20	YES	FACU
2.			
3.			
4.			
5.			
	20 = Total Cover		
Herb Stratum (Plot size: 15ft radius)			
1. Polystichum munitum	20	YES	FACU
2. Pteridium aquilium	20	YES	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	40 = Total Cover		
Woody Vine Stratum (Plot size: 15ft radius)			
1. Rubus procera	80	YES	FAC
2.			
	80 = Total Cover		

% Bare Ground in Herb Stratum _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

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

Percent of Dominant Species That Are OBL, FACW, or FAC: 40 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	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:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☐ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 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: Forested area of property

SOIL

Sampling Point: SP4

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 3/2	100					SL	
3-18	10YR 4/3	100					SL	

[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: No prominent Field indicators of hydric soils.

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 prominent field indicators of wetland hydrology.

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

Project/Site: PARCEL 09680073000 City/County: Olympia / Thurston County Sampling Date: 16 OCT 2024

Applicant/Owner: _____ State: WA. Sampling Point: SP5

Investigator(s): Habitat Technologies Section, Township, Range: Section 12 Township 18 Range 02W

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Rolling Slope (%): 1-2%

Subregion (LRR): A Lat: N47.06502 Long: W122.88008 Datum: _____

Soil Map Unit Name: Yelm fine sandy loam NWI classification: Moderately well drained

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 ☒ Hydric Soil Present? Yes ☐ No ☒ Wetland Hydrology Present? Yes ☐ No ☒	**Is the Sampled Area within a Wetland?** Yes ☐ No ☒

Remarks: Forested area of property

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Prunus emarginata	35	YES	FACU
2. Alnus rubra	30	YES	FAC
3.			
4.			
	65	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15ft radius)			
1. Ilex aquifolium	10	YES	UPL
2.			
3.			
4.			
5.			
	10	= Total Cover	
Herb Stratum (Plot size: 15ft radius)			
1. Polystichum munitum	50	YES	FACU
2. Pteridium aquilium	40	YES	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	90	= Total Cover	
Woody Vine Stratum (Plot size: 15ft radius)			
1. Rubus procera	20	YES	FAC
2. Rubus ursinus	35	YES	FACU
	55	= Total Cover	

% Bare Ground in Herb Stratum _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 29 (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:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☐ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 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: Forested area of property

SOIL

Sampling Point: SP5

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 4/3	100					SL	

[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: No prominent Field indicators of hydric soils.

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 prominent field indicators of wetland hydrology.

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

Project/Site: PARCEL 09680073000 City/County: Olympia / Thurston County Sampling Date: 16 OCT 2024

Applicant/Owner: _____ State: WA. Sampling Point: SP6

Investigator(s): Habitat Technologies Section, Township, Range: Section 12 Township 18 Range 02W

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Rolling Slope (%): 1-2%

Subregion (LRR): A Lat: N47.065493 Long: W122.88029 Datum: _____

Soil Map Unit Name: Yelm fine sandy loam NWI classification: Moderately well drained

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 ☒ Hydric Soil Present? Yes ☐ No ☒ Wetland Hydrology Present? Yes ☐ No ☒	**Is the Sampled Area within a Wetland?** Yes ☐ No ☒

Remarks: Forested area of property

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Crataegus douglasii	100	YES	FAC
2.			
3.			
4.			
	100 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15ft radius)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 15ft radius)			
1. Hedera helix	70	YES	FACU
2. Polystichum munitum	20	YES	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	90 = Total Cover		
Woody Vine Stratum (Plot size: 15ft radius)			
1. Rubus procera	10	NO	FAC
2. Rubus ursinus	5	NO	FACU
	15 = Total Cover		

% Bare Ground in Herb Stratum _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33 (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:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☐ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 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: Forested area of property

SOIL

Sampling Point: SP6

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 4/3	100					SL	

[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: No prominent Field indicators of hydric soils.

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 prominent field indicators of wetland hydrology.

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

Project/Site: PARCEL 09680073000 City/County: Olympia / Thurston County Sampling Date: 16 OCT 2024

Applicant/Owner: _____ State: WA. Sampling Point: SP7

Investigator(s): Habitat Technologies Section, Township, Range: Section 12 Township 18 Range 02W

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Rolling Slope (%): 1-2%

Subregion (LRR): A Lat: N47.06542 Long: W122.87998 Datum: _____

Soil Map Unit Name: Yelm fine sandy loam NWI classification: Moderately well drained

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 ☒ Hydric Soil Present? Yes ☐ No ☒ Wetland Hydrology Present? Yes ☐ No ☒	**Is the Sampled Area within a Wetland?** Yes ☐ No ☒

Remarks: Forested area of property

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Alnus rubra	50	YES	FAC
2.			
3.			
4.			
	50 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15ft radius)			
1. Rubus spectabilis	10	YES	FAC+
2.			
3.			
4.			
5.			
	10 = Total Cover		
Herb Stratum (Plot size: 15ft radius)			
1. Polystichum munitum	50	YES	FACU
2. Pteridium aquilium	40	YES	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	90 = Total Cover		
Woody Vine Stratum (Plot size: 15ft radius)			
1. Rubus ursinus	70	YES	FACU
2.			
	70 = Total Cover		

% Bare Ground in Herb Stratum _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

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

Percent of Dominant Species That Are OBL, FACW, or FAC: 40 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	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:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☐ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 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: Forested area of property

SOIL

Sampling Point: SP7

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 4/4	100					LS	

[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: No prominent Field indicators of hydric soils.

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 prominent field indicators of wetland hydrology.

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

Project/Site: PARCEL 09680073000 City/County: Olympia / Thurston County Sampling Date: 16 OCT 2024

Applicant/Owner: _____ State: WA. Sampling Point: SP8

Investigator(s): Habitat Technologies Section, Township, Range: Section 12 Township 18 Range 02W

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Rolling Slope (%): 1-2%

Subregion (LRR): A Lat: N47.06566 Long: W122.88047 Datum: _____

Soil Map Unit Name: Yelm fine sandy loam NWI classification: Moderately well drained

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 ☐ Hydric Soil Present? Yes ☒ No ☐ Wetland Hydrology Present? Yes ☐ No ☒	**Is the Sampled Area within a Wetland?** Yes ☐ No ☒

Remarks: Forested area of property

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Populus trichocarpa	50	YES	FAC
2. Crataegus douglasii	15	YES	FAC
3.			
4.			
	65	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15ft radius)			
1. Oemleria cerasiformis	25	YES	FACU
2. Corylus cornuta	20	YES	FACU
3.			
4.			
5.			
	45	= Total Cover	
Herb Stratum (Plot size: 15ft radius)			
1. Polystichum munitum	40	YES	FACU
2. Phalaris arundinacea	10	YES	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	50	= Total Cover	
Woody Vine Stratum (Plot size: 15ft radius)			
1. Rubus procera	10	YES	FAC
2. Rubus ursinus	20	YES	FACU
	30	= Total Cover	

% Bare Ground in Herb Stratum _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 8 (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:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☒ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 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: Forested area of property

SOIL

Sampling Point: SP8

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-10	10YR 3/3	100					LS	
11-18	10YR 4/2	90	10YR 4/6	10	C	M	SL	

[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: Prominent Field indicators of hydric soils.

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 prominent field indicators of wetland hydrology.

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

Project/Site: PARCEL 09680073000 City/County: Olympia / Thurston County Sampling Date: 16 OCT 2024

Applicant/Owner: _____ State: WA. Sampling Point: SP9

Investigator(s): Habitat Technologies Section, Township, Range: Section 12 Township 18 Range 02W

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Rolling Slope (%): 1-2%

Subregion (LRR): A Lat: N47.06562 Long: W122.88123 Datum: _____

Soil Map Unit Name: Yelm fine sandy loam NWI classification: Moderately well drained

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 ☐ Hydric Soil Present? Yes ☐ No ☒ Wetland Hydrology Present? Yes ☐ No ☒	**Is the Sampled Area within a Wetland?** Yes ☐ No ☒

Remarks: Edge of the forested area of property

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Alnus rubra	50	YES	FAC
2.			
3.			
4.			
	50 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15ft radius)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 15ft radius)			
1. Poa spp.	50	YES	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	50 = Total Cover		
Woody Vine Stratum (Plot size: 15ft radius)			
1. Rubus procera	50	YES	FAC
2.			
	50 = 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: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	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:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☒ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 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: Edge of forested area of property

SOIL

Sampling Point: SP9

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 3/3	100					LS	

[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: No prominent Field indicators of hydric soils.

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 prominent field indicators of wetland hydrology.

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

Project/Site: PARCEL 09680073000 City/County: Olympia / Thurston County Sampling Date: 4 JUNE 2025

Applicant/Owner: _____ State: WA. Sampling Point: SPT1

Investigator(s): Habitat Technologies Section, Township, Range: Section 12 Township 18 Range 02W

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Rolling Slope (%): 1-2%

Subregion (LRR): A Lat: N47.06509 Long: W122.88182 Datum: _____

Soil Map Unit Name: Yelm fine sandy loam NWI classification: Moderately well drained

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 ☒ Hydric Soil Present? Yes ☐ No ☒ Wetland Hydrology Present? Yes ☐ No ☒	**Is the Sampled Area within a Wetland?** Yes ☐ No ☒

Remarks: mixed upland forest

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Alnus rubra	20	yes	FAC
2. Acer macrophyllum	70	yes	FACU
3. Pseudotsuga menzieii	<10	no	FACU
4.			
	100	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15ft radius)			
1. Oemleria cerasiformis	25	yes	FACU
2. Rubus ursinus	10	no	FACU
3. Rubus armeniacus	<10	no	FAC
4. Rubus spectabilis	<5	no	FAC
5.			
	<50	= Total Cover	
Herb Stratum (Plot size: 15ft radius)			
1. Polystichum munitum	50	yes	FACU
2. Pteridium aquilium	<10	no	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	<60	= Total Cover	
Woody Vine Stratum (Plot size: 15ft radius)			
1.			
2.			
	0	= Total Cover	

% Bare Ground in Herb Stratum _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 25% (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:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☐ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 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: mixed upland forest

SOIL

Sampling Point: SPT1

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/2	100					SL	
4-24	10YR 3/4	100					L	Loose 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: No prominent Field indicators of hydric soils.

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 prominent field indicators of wetland hydrology.

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

Project/Site: PARCEL 09680073000 City/County: Olympia / Thurston County Sampling Date: 4 JUNE 2025

Applicant/Owner: State: WA. Sampling Point: SPT2

Investigator(s): Habitat Technologies Section, Township, Range: Section 12 Township 18 Range 02W

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Rolling Slope (%): 1-2%

Subregion (LRR): A Lat: N47.06509 Long: W122.88182 Datum:

Soil Map Unit Name: Yelm fine sandy loam NWI classification: Moderately well drained

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 ☐ Hydric Soil Present? Yes ☒ No ☐ Wetland Hydrology Present? Yes ☒ No ☐	**Is the Sampled Area within a Wetland?** Yes ☒ No ☐

Remarks: small depression formed within turn of internal roadway. depression approxiamtely 400 square feet in total size within early growing season shallow ponding.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15ft radius)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 15ft radius)			
1. Poa spp.	20	yes	FAC
2. Phalaris arundinace	10	no	FACW
3. Ranunculus acris	5	no	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	35 = Total Cover		
Woody Vine Stratum (Plot size: 15ft radius)			
1.			
2.			
	0 = Total Cover		

% Bare Ground in Herb Stratum 65%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (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:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☒ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 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: small depression in internal road with grasses, herbs, and bare ground

SOIL

Sampling Point: SPT2

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/3	100					L	loose loam
4-18	10YR 5/1	50					L	mixed with 50% 10YR/2 loam
18-24	10YR 5/1	90	10YR 4/6	10	D	M	L	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: prominent field indicators of hydric soils. soils mixed as a part of internal roadway utilization and management .

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: prominent field indicators of wetland hydrology. small depression formed within internal roadway. early growing season shallow ponding

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

Project/Site: PARCEL 09680073000 City/County: Olympia / Thurston County Sampling Date: 4 JUNE 2025

Applicant/Owner: _____ State: WA. Sampling Point: SPT3

Investigator(s): Habitat Technologies Section, Township, Range: Section 12 Township 18 Range 02W

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Rolling Slope (%): 1-2%

Subregion (LRR): A Lat: N47.06509 Long: W122.88182 Datum: _____

Soil Map Unit Name: Yelm fine sandy loam NWI classification: Moderately well drained

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 ☐ Hydric Soil Present? Yes ☐ No ☒ Wetland Hydrology Present? Yes ☐ No ☒	**Is the Sampled Area within a Wetland?** Yes ☐ No ☒

Remarks: center of internal road through mixed upland forest. just to the south of SPT2

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: 15ft radius)			
1. Oemleria cerasiformis	<5	no	FACU
2. Rubus ursinus	<5	no	FACU
3. Rubus armeniacus	trace	no	FAC
4. Rubus spectabilis	<5	no	FAC
5.			
	<20 = Total Cover		
Herb Stratum (Plot size: 15ft radius)			
1. Polystichum munitum	10	no	FACU
2. Pteridium aquilium	<10	no	FACU
3. Ranunculus acris	25	yes	FAC
4. Poa spp.	20	yes	FAC
5. Agrostis tenuis	<10	no	FAC
6. Plantago major	<5	no	FACU
7. Hypochaeris lanatum	<5	no	FACU
8.			
9.			
10.			
11.			
	80 = Total Cover		
Woody Vine Stratum (Plot size: 15ft radius)			
1.			
2.			
	0 = Total Cover		
% Bare Ground in Herb Stratum _____			

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:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☒ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 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: mixed grasses, herbs, and ferns along internal roadway

SOIL

Sampling Point: SPT3

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-15	10YR 3/3	100					L	compacted loam
15-24	10YR 4/4	100					L	somewhat compacted 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: No prominent Field indicators of hydric soils.

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 prominent field indicators of wetland hydrology. area appears to drain moderately well

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

Project/Site: PARCEL 09680073000 City/County: Olympia / Thurston County Sampling Date: 4 JUNE 2025

Applicant/Owner: _____ State: WA. Sampling Point: SPT5

Investigator(s): Habitat Technologies Section, Township, Range: Section 12 Township 18 Range 02W

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Rolling Slope (%): 1-2%

Subregion (LRR): A Lat: N47.06509 Long: W122.88182 Datum: _____

Soil Map Unit Name: Yelm fine sandy loam NWI classification: Moderately well drained

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 ☒ Hydric Soil Present? Yes ☐ No ☒ Wetland Hydrology Present? Yes ☐ No ☒	**Is the Sampled Area within a Wetland?** Yes ☐ No ☒

Remarks: mixed upland forest

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Alnus rubra	70	yes	FAC
2. Acer macrophyllum	trace	no	FACU
3. Prunus emarginata	20	yes	FACU
4.			
	90	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15ft radius)			
1. Oemleria cerasiformis	20	yes	FACU
2. Crataegus monogyna	<10	no	FACU
3. Rubus armeniacus	35	yes	FAC
4. Rubus spectabilis	<5	no	FAC
5. Rubus laciniatus	30	yes	FACU
	100	= Total Cover	
Herb Stratum (Plot size: 15ft radius)			
1. Polystichum munitum	25	yes	FACU
2. Pteridium aquilium	<10	no	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	<35	= Total Cover	
Woody Vine Stratum (Plot size: 15ft radius)			
1.			
2.			
	0	= Total Cover	

% Bare Ground in Herb Stratum _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33% (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:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☐ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 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: mixed upland forest

SOIL

Sampling Point: SPT5

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-11	10YR 3/3	100					SL	
11-24	10YR 3/4	100					L	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: No prominent Field indicators of hydric soils.

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 prominent field indicators of wetland hydrology.

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

Project/Site: PARCEL 09680073000 City/County: Olympia / Thurston County Sampling Date: 4 JUNE 2025

Applicant/Owner: _____ State: WA. Sampling Point: SPT6

Investigator(s): Habitat Technologies Section, Township, Range: Section 12 Township 18 Range 02W

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Rolling Slope (%): 1-2%

Subregion (LRR): A Lat: N47.06509 Long: W122.88182 Datum: _____

Soil Map Unit Name: Yelm fine sandy loam NWI classification: Moderately well drained

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 ☐ Hydric Soil Present? Yes ☐ No ☒ Wetland Hydrology Present? Yes ☐ No ☒	**Is the Sampled Area within a Wetland?** Yes ☐ No ☒

Remarks: center of internal road through mixed upland forest.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: 15ft radius)			
1. Oemleria cerasiformis	<5	no	FACU
2. Rubus ursinus	<5	no	FACU
3. Rubus armeniacus	<5	no	FAC
4. Rubus spectabilis	<5	no	FAC
5. Rubus laciniatus	<5	no	FACU
	<25 = Total Cover		
Herb Stratum (Plot size: 15ft radius)			
1. Polystichum munitum	<10	no	FACU
2. Pteridium aquilium	<5	no	FACU
3. Ranunculus acris	20	yes	FAC
4. Poa spp.	20	yes	FAC
5. Agrostis tenuis	20	yes	FAC
6. Plantago major	<5	no	FACU
7. Hypochaeris lanatum	<5	no	FACU
8. Anthoxanthum odoratum	<10	no	FAC
9. Athyrium filix-femina	<5	no	FAC
10. Festuca spp.	<5	no	FAC
11.			
	80 = Total Cover		
Woody Vine Stratum (Plot size: 15ft radius)			
1.			
2.			
	0 = 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: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	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:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☒ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 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: mixed grasses, herbs, and ferns along internal roadway

SOIL

Sampling Point: SPT6

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 3/3	100					L	compacted loam
8-24	10YR 3/4	100					L	somewhat compacted 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: No prominent Field indicators of hydric soils.

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 prominent field indicators of wetland hydrology. area appears to drain moderately well

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

Project/Site: PARCEL 09680073000 City/County: Olympia / Thurston County Sampling Date: 4 JUNE 2025

Applicant/Owner: _____ State: WA. Sampling Point: SPT7

Investigator(s): Habitat Technologies Section, Township, Range: Section 12 Township 18 Range 02W

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Rolling Slope (%): 1-2%

Subregion (LRR): A Lat: N47.06509 Long: W122.88182 Datum: _____

Soil Map Unit Name: Yelm fine sandy loam NWI classification: Moderately well drained

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 ☐ Hydric Soil Present? Yes ☐ No ☒ Wetland Hydrology Present? Yes ☐ No ☒	**Is the Sampled Area within a Wetland?** Yes ☐ No ☒

Remarks: center of internal road through mixed upland forest.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: 15ft radius)			
1.			
2. Rubus ursinus	10	no	FACU
3. Rubus armeniacus	<5	no	FAC
4. Rubus spectabilis	<5	no	FAC
5. Rubus laciniatus	<5	no	FACU
	<25 = Total Cover		
Herb Stratum (Plot size: 15ft radius)			
1. Polystichum munitum	trace	no	FACU
2. Pteridium aquilium	trace	no	FACU
3. Ranunculus acris	40	yes	FAC
4. Poa spp.	10	yes	FAC
5. Agrostis tenuis	40	yes	FAC
6. Plantago major	trace	no	FACU
7. Hypochaeris lanatum	trace	no	FACU
8. Anthoxanthum odoratum	trace	no	FAC
9. Athyrium filix-femina	trace	no	FAC
10. Festuca spp.	<5	no	FAC
11.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: 15ft radius)			
1.			
2.			
	0 = 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: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	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:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☒ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 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: mixed grasses, herbs, and ferns along internal roadway

SOIL

Sampling Point: SPT7

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-9	10YR 3/2	100					L	compacted loam
9-24	10YR 3/4	100					L	somewhat compacted 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: No prominent Field indicators of hydric soils.

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 prominent field indicators of wetland hydrology. area appears to drain moderately well

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

Project/Site: PARCEL 09680073000 City/County: Olympia / Thurston County Sampling Date: 4 JUNE 2025

Applicant/Owner: _____ State: WA. Sampling Point: SPT12

Investigator(s): Habitat Technologies Section, Township, Range: Section 12 Township 18 Range 02W

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Rolling Slope (%): 1-2%

Subregion (LRR): A Lat: N47.06509 Long: W122.88182 Datum: _____

Soil Map Unit Name: Yelm fine sandy loam NWI classification: Moderately well drained

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 ☐ Hydric Soil Present? Yes ☐ No ☒ Wetland Hydrology Present? Yes ☐ No ☒	**Is the Sampled Area within a Wetland?** Yes ☐ No ☒

Remarks: small patch of red alder along old, shallow field drain within managed lawn area

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Alnus rubra	60	yes	FAC
2. Acer macrophyllum	trace	no	FACU
3.			
4.			
	60 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15ft radius)			
1. Oemleria cerasiformis	trace	no	FACU
2. Rubus ursinus	<10	no	FACU
3. Rubus armeniacus	30	yes	FAC
4. Rubus spectabilis	<5	no	FAC
5. Rubus laciniatus	25	yes	FACU
	<75 = Total Cover		
Herb Stratum (Plot size: 15ft radius)			
1. Polystichum munitum	<5	no	FACU
2. Pteridium aquilium	<10	no	FACU
3. Ranunculus acris	40	yes	FAC
4. Poa spp.	<15	no	FAC
5. Phalaris arundinace	<10	no	FACW
6.			
7.			
8.			
9.			
10.			
11.			
	<60 = Total Cover		
Woody Vine Stratum (Plot size: 15ft radius)			
1.			
2.			
	0 = 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:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☐ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 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: small patch of red alder

SOIL

Sampling Point: SPT12

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 2/2	100					SL	
4-14	10YR 3/3	100					L	Loose loam
14-24	10YR 3/4	100					L	loose 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: No prominent Field indicators of hydric soils.

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 prominent field indicators of wetland hydrology. area along old, shallow field ditch that may pond seasonal surface water for a short period of time following seasonal storm events. no direct connection downslope to the south.

APPENDIX B – Wetland Rating Worksheet



EnviroVector
OPTIMIZE USABLE LAND
curtis@envirovector.com
www.envirovector.com
360-790-1559

Scrub-shrub Seasonally-flooded

Emergent Seasonally-flooded

Figure 11

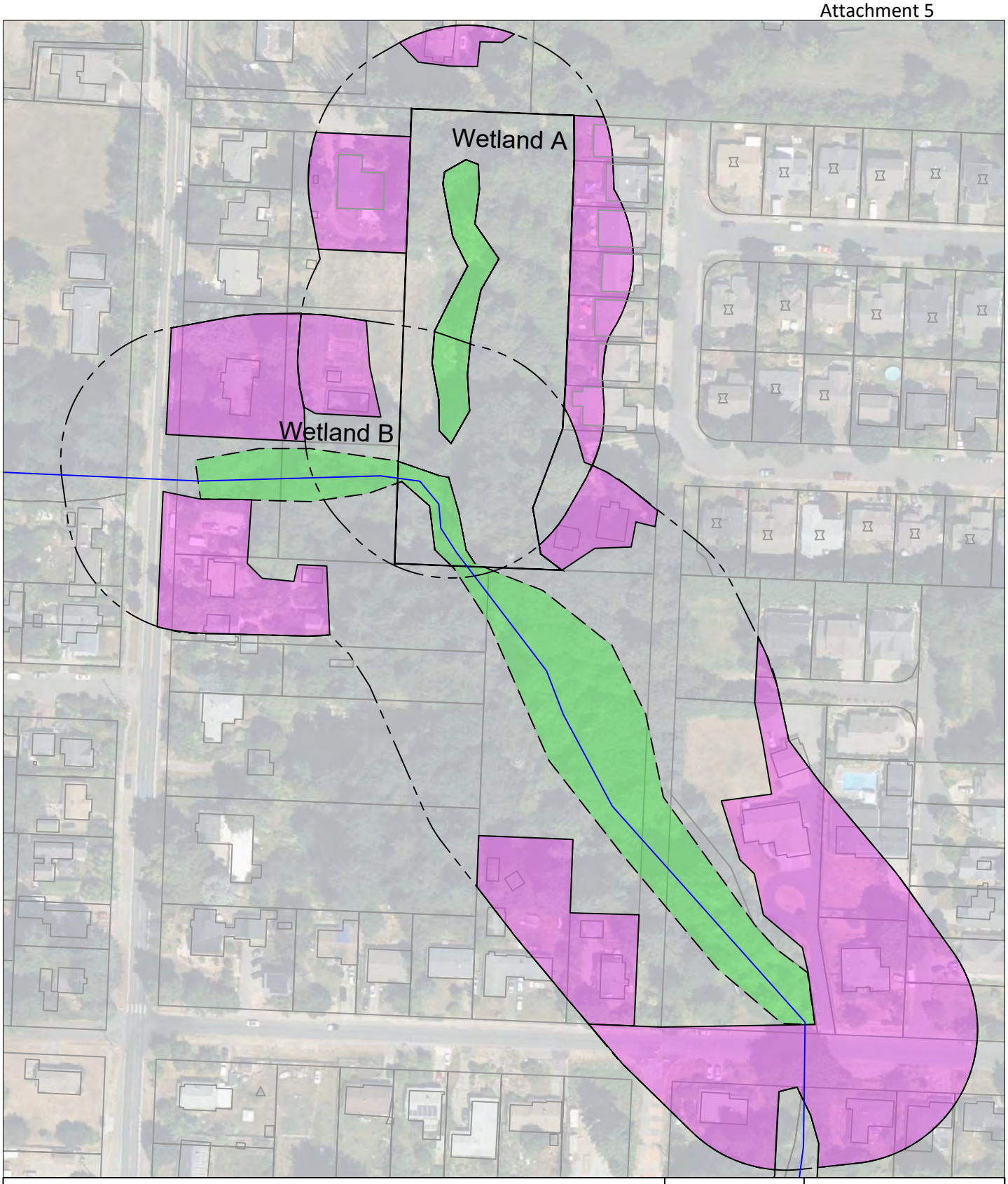
Gemini Corp

Veg Class & Hydroperiod

Scale: 1" = 125'

0 125'

8 April 2023



EnviroVector
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360-790-1559

Wetland (Delineated)
Wetland (Not Delineated)
Potential Pollutants
Wetland A (>10%)
Wetland B (>10%)

Figure 12

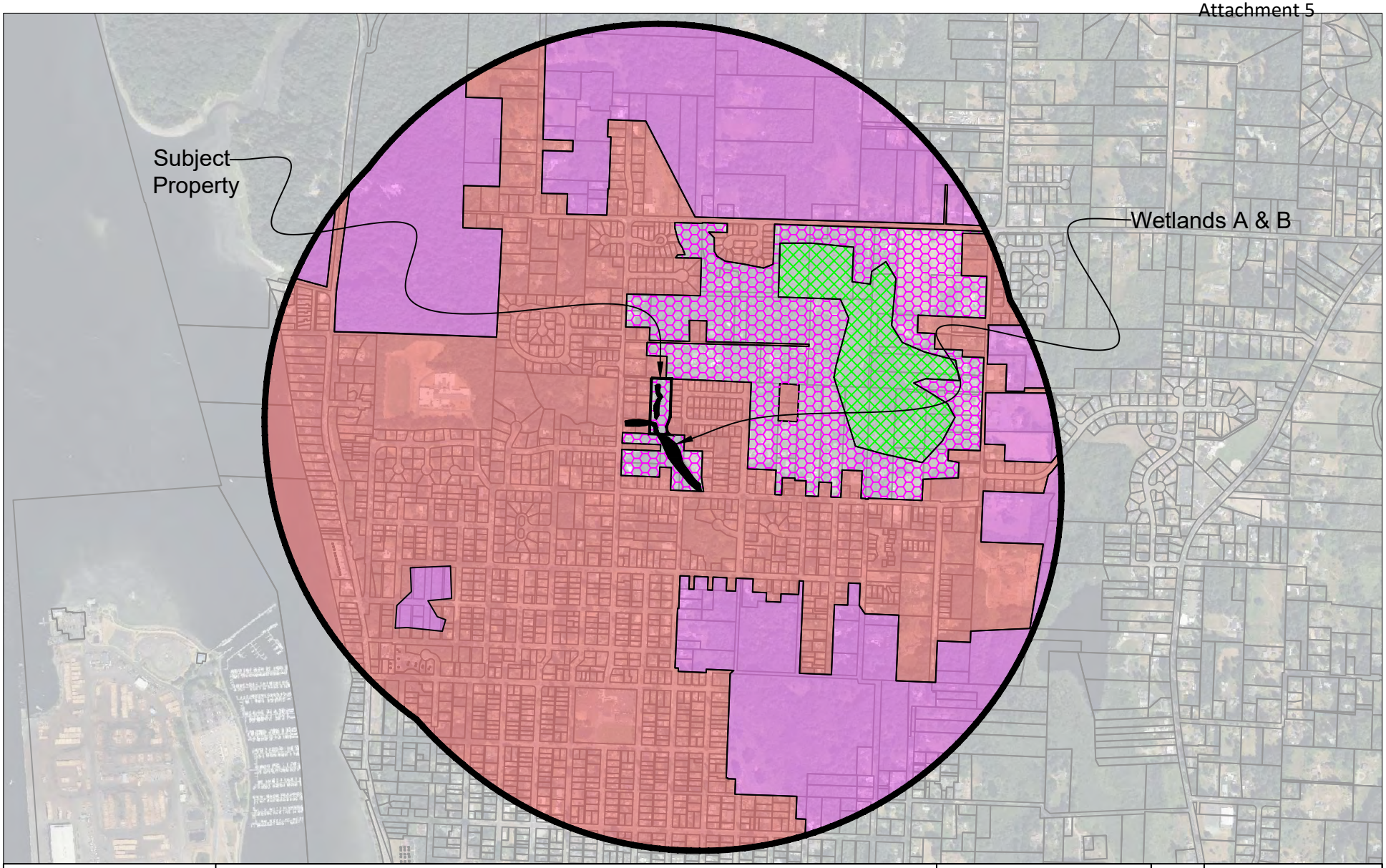
Gemini Corp.

Pollutants within 150'

Scale: 1" = 150'

0 150'

8 April 2023



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360-790-1559

Accessible Habitat (1,505,152 sf, 35 acres, 3.6%)

Accessible Moderate to Low Intensity Land Use (4,243,310 sf, 97 acres, 10%)

Total Undisturbed Habitat + Accessible Habitat (1,505,152 sf, 35 acres, 3.6%)

Low to Moderate Intensity Land Use (17,203,899 sf, 395 acres, 40.9%)

High Intensity Land Use (23,277,984 sf, 534 acres, 55%)

1km Polygon 42,074,606 sf, 965 acres

H2.1: 3.6% + 10.1%/2 = 8.65% (0 points) H2.2: 3.6% + 40.9%/2 = 24.05% (2 point) H2.3: High Intensity = 55.3% (-2 points)

Figure 13

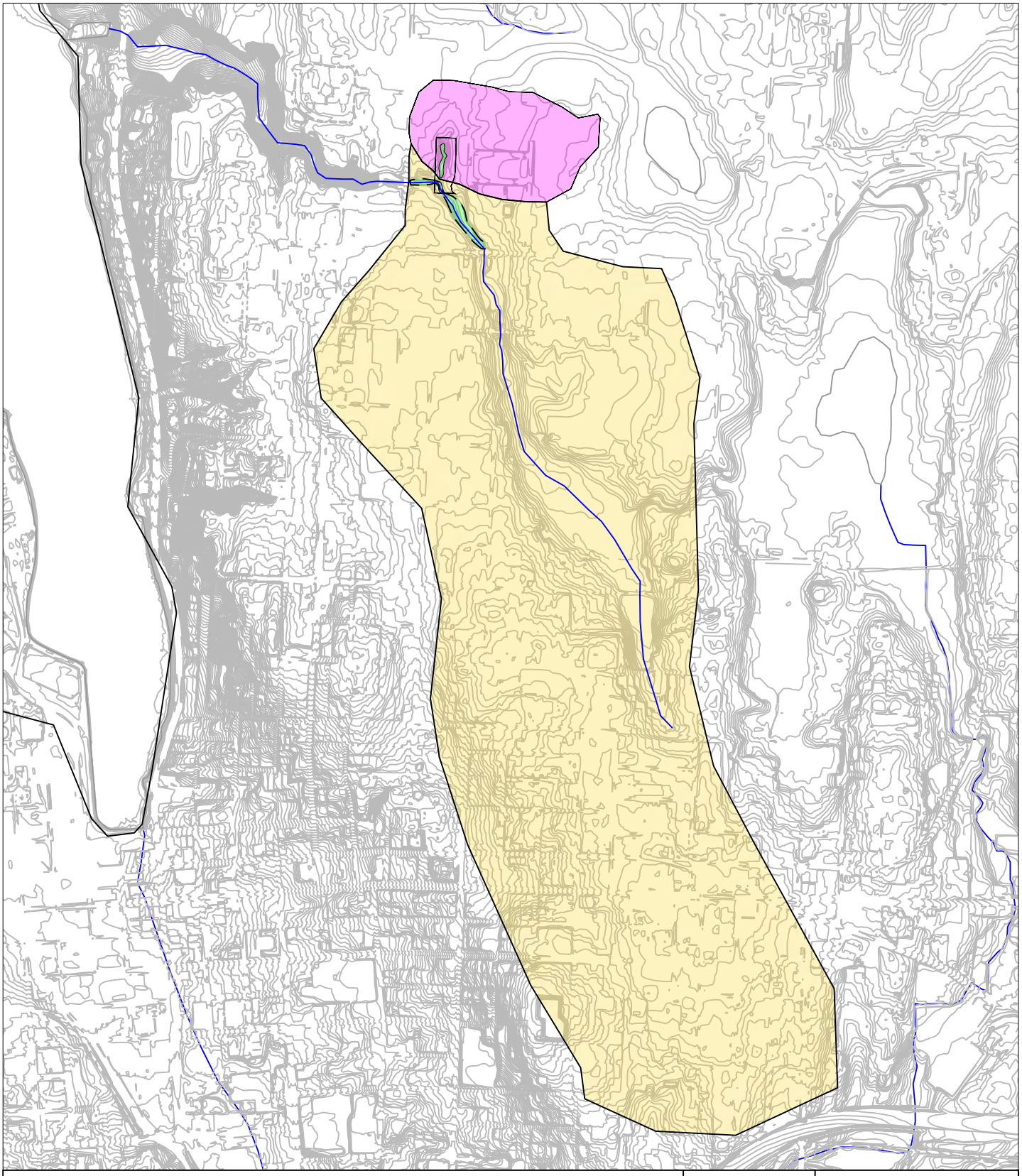
Gemini Corp.

1 KM Polygon

Scale: 1" = 1250'

0 1250'

8 April 2023



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Wetland

Wetland A: Contributing Basin (>100x)

Wetland B: Contributing Basin (>100x)

Figure 14

Gemini Corp.

Contributing Basin

Scale: 1" = 1250'

0 1250'

8 April 2023

June 27, 2025
Attachment 5

Figure W1



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

WQ Improvement Projects
- TMDL - Approved
- 4B - Approved
- STI - Approved
- ARP - Approved
- TMDL - In Development
- STI - In Development
- ARP - In Development

Subbasins (12 digit HUCs)
- HUC boundary

Miles
0 0.05 0.1 0.2

Esri, NASA, NGA, USGS, FEMA
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri

Subject Property


Photo 1. Neighbors appear to encroach onto subject property


Photo 2. North facing south on subject property


Photo 3. Reed canarygrass in Wetland A


Photo 4. Northern portion of subject property facing north


Photo 5. Neighbors appear to encroach onto subject property


Photo 6. Upland portion of property, trees cut


Photo 7. Cut material from slopes pushed into wetland


Photo 8. Central portion of property

Wetland A


Photo 9. Skunk cabbage (OBL) in Wetland A


Photo 10. Northern portion of Wetland A and buffer


Photo 11. Excavated area in southern portion of Wetland A


Photo 12. Skunk cabbage (OBL) in Wetland A



Photo 13. Flag A-7 on boundary of Wetland A



Photo 14. Flag A-8 on boundary of Wetland A



Photo 15. Flag A-14 on boundary of Wetland A

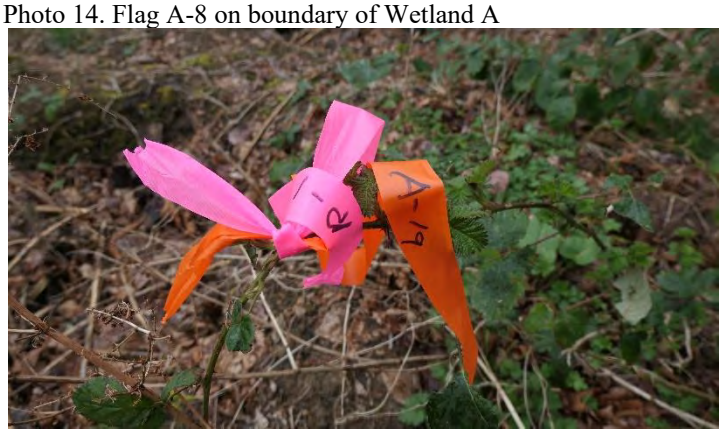


Photo 16. Flag A-19 on boundary of Wetland A


Photo 17. Record flag locations with Trimble at sub-foot accuracy


Photo 18. Excavated southern portion of Wetland A


Photo 19. Excavated southern portion of Wetland A

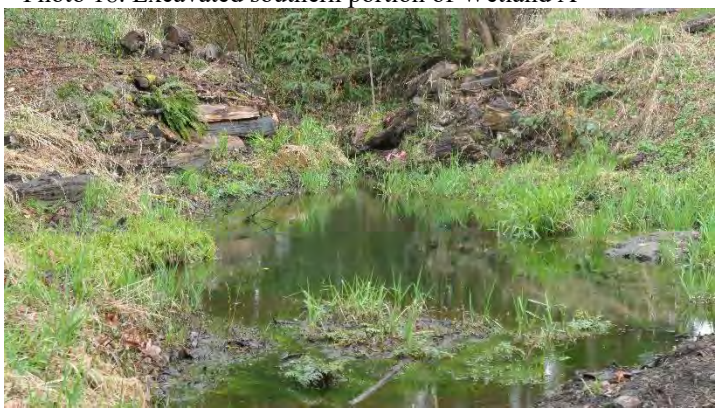

Photo 20. Excavated southern portion of Wetland A



Photo 21. Test Plot TP-A1, soils & reed canarygrass



Photo 22. Test Plot TP-A1, water parsley (OBL)


Photo 23. Test Plot TP-A1, upland soils and plants, no hydro


Photo 24. Test Plot TP-A1, upland soils and plants, no hydro

Wetland name or number __Offsite Wetland A

RATING SUMMARY – Western Washington

Name of wetland (or ID #): Offsite Wetland A Date of site visit: 4 JUN 2025

Rated by Habitat Technologies Trained by Ecology? X Yes ___No Date of training 2014

HGM Class used for rating Depressional Wetland has multiple HGM classes? X Y ____N

Offsite wetland information primarily from prior rating and aerial photos

NOTE: **Form is not complete without the required figures** (figures can be combined).

Source of base aerial photo/map _____

Depressional Slope Wetland

OVERALL WETLAND CATEGORY II (based on functions X or special characteristics__)

1. Category of wetland based on FUNCTIONS

_____**Category I** – Total score = 23 - 27

X **Category II** – Total score = 20 - 22

_____**Category III** – Total score = 16 - 19

_____**Category IV** – Total score = 9 - 15

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
	Circle the appropriate ratings			
Site Potential	H [M] L	H [M] L	H [M] L	
Landscape Potential	H [M] L	H [M] L	H M [L]	
Value	[H] M L	[H] M L	[H] M L	**TOTAL**
Score Based on Ratings	7	7	6	20

Score for each function based on three ratings (order of ratings is not important)

9 = H, H, H
8 = H, H, M
7 = H, H, L
7 = H, M, M
6 = H, M, L
6 = M, M, M
5 = H, L, L
5 = M, M, L
4 = M, L, L
3 = L, L, L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	CATEGORY
Estuarine	**I II**
Wetland of High Conservation Value	**I**
Bog	**I**
Mature Forest	**I**
Old Growth Forest	**I**
Coastal Lagoon	**I II**
Interdunal	**I II III IV**
None of the above	

Wetland name or number Offsite 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	Fig 11
Hydroperiods	D 1.4, H 1.2	Fig 12
Location of outlet (*can be added to map of hydroperiods)*	D 1.1, D 4.1	Fig 12
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	Fig 12
Map of the contributing basin	D 4.3, D 5.3	Fig 14
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and total habitat	H 2.1, H 2.2, H 2.3	Fig 13
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	W1
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	D 3.3	W1

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Ponded depressions	R 1.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	R 2.4	
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	
Width of unit vs. width of stream *(can be added to another figure)*	R 4.1	
Map of the contributing basin	R 2.2, R 2.3, R 5.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and total habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	R 3.2, R 3.3	

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	L 1.1, L 4.1, H 1.1, H 1.4	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and total habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants (*can be added to figure above)*	S 4.1	
Boundary of 150 ft buffer (can be added to another figure)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and total habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	S 3.3	

Wetland name or number Offsite A

HGM Classification of Wetlands in Western Washington

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

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-7 apply, and go to Question 8.

1. Are the water levels in the entire unit usually controlled by tides except during floods?

   NO – go to 2 **YES** – the wetland class is **Tidal Fringe** – go to 1.1

   1.1 Is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)?

   NO – Saltwater Tidal Fringe (Estuarine) **YES – Freshwater Tidal Fringe**
   If your wetland can be classified as a Freshwater Tidal Fringe use the forms for **Riverine** wetlands. If it is Saltwater Tidal Fringe, it is an **Estuarine** wetland and is not scored. This method **cannot** be used to score functions for estuarine wetlands.

2. The entire wetland unit is flat, and precipitation is the only source (>90%) of water to it. Groundwater and surface water runoff are NOT sources of water to the unit.

   NO – go to 3 **YES** – The wetland class is **Flats**
   If your wetland can be classified as a Flats wetland, use the form for **Depressional** wetlands.

3. Does the entire wetland unit **meet all** of the following criteria?
   ___The vegetated part of the wetland is on the shores of a body of permanent open water (without any plants on the surface at any time of the year) at least 20 ac (8 ha) in size,
   ___At least 30% of the open water area is deeper than 6.6 ft (2 m).

   NO – go to 4 **YES –** The wetland class is **Lake Fringe** (Lacustrine Fringe)

4. Does the entire wetland unit **meet all** of the following criteria?
   ____The wetland is on a slope (slope can be very gradual),
   ____The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheet flow, or in a swale without distinct banks,
   ____The water leaves the wetland **without being impounded**.

   NO – go to 5 **YES –** The wetland class is **Slope**

   NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 ft deep).

Wetland name or number ___Offsite A

5. Does the entire wetland unit **meet all** of the following criteria?
   ____The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river,
   ____The overbank flooding occurs at least once every 2 years.

NO – go to 6 **YES** – The wetland class is **Riverine**

NOTE: The Riverine unit can contain depressions that are filled with water when the river is not flooding

6. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year? This means that any outlet, if present, is higher than the interior of the wetland.

NO – go to 7 **YES** – The wetland class is **Depressional**

7. Is the entire wetland unit located in a very flat area with no obvious depression and no overbank flooding? The unit does not pond surface water more than a few inches. The unit seems to be maintained by high groundwater in the area. The wetland may be ditched but has no obvious natural outlet.

NO – go to 8 **YES** – The wetland class is **Depressional**

8. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-7 APPLY TO DIFFERENT AREAS IN THE UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

   NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine along stream within boundary of depression	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine
Salt Water Tidal Fringe and any other class of freshwater wetland	Treat as ESTUARINE

If you are ~~still unable to determine which of the above criteria apply to your wetland, or if you have~~ **more than 2 HGM classes** within a wetland boundary, classify the wetland as Depressional for the rating.

Wetland name or number Offsite A

DEPRESSIONAL AND FLATS WETLANDS

Water Quality Functions - Indicators that the site functions to improve water quality

D 1.0. Does the site have the potential to improve water quality?	
D 1.1. Characteristics of surface water outflows from the wetland: Wetland is a depression or flat depression (QUESTION 7 on key) with no surface water leaving it (no outlet). points = 3 Wetland has an intermittently flowing stream or ditch, OR highly constricted permanently flowing outlet. points = 2 Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing points = 1 Wetland is a flat depression (QUESTION 7 on key), whose outlet is a permanently flowing ditch. points = 1	2
D 1.2. The soil 2 in. below the surface (or duff layer) is true clay or true organic *(use NRCS definitions).* Yes = 4 No = 0	0
D 1.3. Characteristics and distribution of persistent plants (Emergent, Scrub-shrub, and/or Forested Cowardin classes): Wetland has persistent, ungrazed plants > 95% of area points = 5 Wetland has persistent, ungrazed plants > ½ of area points = 3 Wetland has persistent, ungrazed plants ≥ 1/10 of area points = 1 Wetland has persistent, ungrazed plants < 1/10 of area points = 0	5
D 1.4. Characteristics of seasonal ponding or inundation: *This is the area that is ponded for at least 2 months. See description in manual.* Area seasonally ponded is > ½ total area of wetland points = 4 Area seasonally ponded is ≥ ¼ total area of wetland points = 2 Area seasonally ponded is < ¼ total area of wetland points = 0	2
Total for D 1 Add the points in the boxes above	9

Rating of Site Potential If score is: __**12-16 = H** X **6-11 = M** ___**0-5 = L** *Record the rating on the first page*

D 2.0. Does the landscape have the potential to support the water quality function of the site?	
D 2.1. Does the wetland unit receive stormwater discharges? Yes = 1 No = 0	0
D 2.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate pollutants? Yes = 1 No = 0	1
D 2.3. Are there septic systems within 250 ft of the wetland? Yes = 1 No = 0	1
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1-D 2.3? Source_____ Yes = 1 No = 0	0
Total for D 2 Add the points in the boxes above	2

Rating of Landscape Potential If score is: __**3 or 4 = H** X **1 or 2 = M** ___**0 = L** *Record the rating on the first page*

D 3.0. Is the water quality improvement provided by the site valuable to society?	
D 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, lake, or marine water that is on the 303(d) list? Yes = 1 No = 0	1
D 3.2. Is the wetland in a basin or sub-basin where an aquatic resource is on the 303(d) list? Yes = 1 No = 0	1
D 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality? (Answer YES if there is a TMDL in development or in effect for the basin in which the unit is found.) Yes = 2 No = 0	2
Total for D 3 Add the points in the boxes above	4

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

Wetland name or number Offsite A

DEPRESSIONAL AND FLATS WETLANDS

Hydrologic Functions - Indicators that the site functions to reduce flooding and stream degradation

D 4.0. Does the site have the potential to reduce flooding and erosion?	
D 4.1. Characteristics of surface water outflows from the wetland: Wetland is a depression or flat depression with no surface water leaving it (no outlet) points = 4 Wetland has an intermittently flowing stream/ditch, OR highly constricted permanently flowing outlet points = 2 Wetland is a flat depression (question 7 on key), whose outlet is a permanently flowing ditch points = 1 Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing points = 0	2
D 4.2. Depth of storage during wet periods: Estimate the height of ponding above the bottom of the outlet. For wetlands with no outlet, measure from the surface of permanent water or if dry, the deepest part. Marks of ponding are 3 ft or more above the surface or bottom of outlet points = 7 Marks of ponding between 2 ft to < 3 ft from surface or bottom of outlet points = 5 Marks are at least 0.5 ft to < 2 ft from surface or bottom of outlet points = 3 The wetland is a "headwater" wetland X 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	3
D 4.3. Contribution of the wetland to storage in the watershed: Estimate the ratio of the area of upstream basin contributing surface water to the area of the wetland unit itself. The area of the basin is less than 10 times the area of the unit points = 5 The area of the basin is 10 to 100 times the area of the unit points = 3 The area of the basin is more than 100 times the area of the unit points = 0 Entire wetland is in the Flats class points = 5	3
Total for D 4 Add the points in the boxes above	8

Rating of Site Potential If score is: __**12-16 = H** X **6-11 = M** ___**0-5 = L** *Record the rating on the first page*

D 5.0. Does the landscape have the potential to support hydrologic functions of the site?	
D 5.1. Does the wetland receive stormwater discharges? Yes = 1 No = 0	0
D 5.2. Is >10% of the area within 150 ft of the wetland in land uses that generate excess runoff? Yes = 1 No = 0	1
D 5.3. Is more than 25% of the contributing basin of the wetland covered with intensive human land uses (residential at >1 residence/ac, urban, commercial, agriculture, etc.)? Yes = 1 No = 0	1
Total for D 5 Add the points in the boxes above	2

Rating of Landscape Potential If score is: __**3 = H** X **1 or 2 = M** ___**0 = L** *Record the rating on the first page*

D 6.0. Are the hydrologic functions provided by the site valuable to society?	
D 6.1. Is the unit in a landscape that has flooding problems? Choose the description that best matches conditions around the wetland unit being rated. Do not add points. Choose the highest score if more than one condition is met. The wetland captures surface water that would otherwise flow downgradient into areas where flooding has damaged human or natural resources (e.g., houses or salmon redds): • Flooding occurs in a sub-basin that is immediately downgradient of unit. points = 2 • Surface flooding problems are in a sub-basin farther downgradient. points = 1 • Flooding from groundwater is an issue in the sub-basin. points = 1 • The existing or potential outflow from the wetland is so constrained by human or natural conditions that the water stored by the wetland cannot reach areas that flood. *Explain why* _____ points = 0 • There are no problems with flooding downstream of the wetland. points = 0	2
D 6.2. Has the site been identified as important for flood storage or flood conveyance in a regional flood control plan? Yes = 2 No = 0	0
Total for D 6 Add the points in the boxes above	2

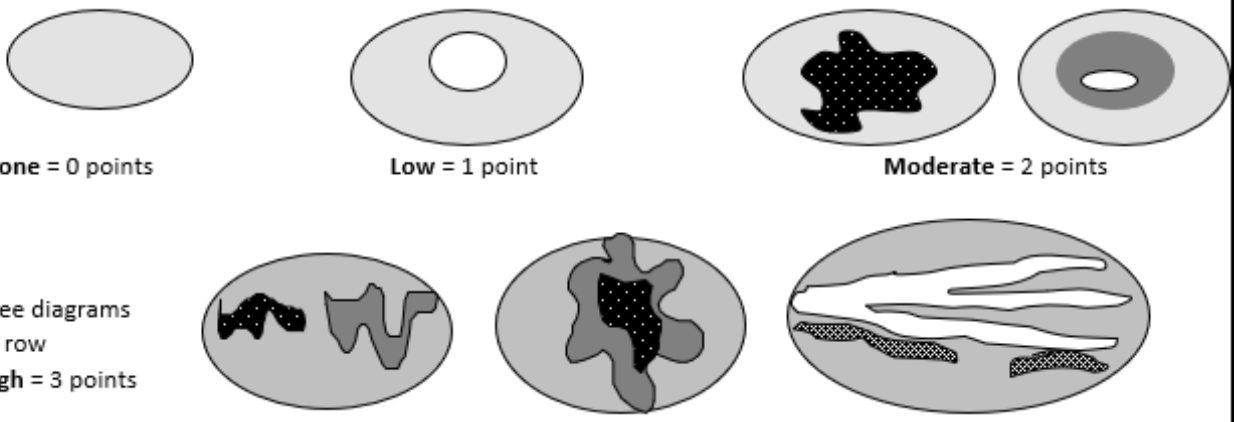
Rating of Value If score is: X **2-4 = H** ___**1 = M** ___**0 = L** *Record the rating on the first page*

Wetland name or number __Offsite 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 if the unit is at least 2.5 ac, or more than 10% of the unit if it is smaller than 2.5 ac. ____Aquatic bed — 4 structures or more: points = 4 _X_Emergent — 3 structures: points = 2 _X_Scrub-shrub (areas where shrubs have > 30% cover) — 2 structures: points = 1 ____Forested (areas where trees have > 30% cover) — 1 structure: points = 0 *If the unit has a Forested class, check if:* ____The Forested class has 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/groundcover) that each cover 20% within the Forested polygon	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 if the unit is < 2.5 ac, or ¼ ac if the unit is at least 2.5 ac to count (see text for descriptions of hydroperiods). ____Permanently flooded or inundated — 4 or more types present: points = 3 _X_Seasonally flooded or inundated — 3 types present: points = 2 ____Occasionally flooded or inundated — 2 types present: points = 1 _X_Saturated only — 1 type present: points = 0 ____Permanently flowing stream or river in, or adjacent to, the wetland _X_Intermittently or seasonally flowing stream in, or adjacent to, the wetland ____**Lake Fringe wetland** — **2 points** ____**Freshwater tidal wetland** — **2 points**	2
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, Canada 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 Offsite 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. _X_ Large, downed, woody debris within the wetland (> 4 in. diameter and 6 ft long). ____ Standing snags (dbh > 4 in.) within the wetland _X_ Undercut banks are present for at least 6.6 ft (2 m) **and/or** overhanging plants extend at least 3.3 ft (1 m) over open water or a stream (or ditch) in, or contiguous with the wetland, for at least 33 ft (10 m) ____ Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 30 degree slope) OR signs of recent beaver activity are present (cut shrubs or trees that have not yet weathered where wood is exposed) _X_ At least ¼ ac of thin-stemmed persistent plants or woody branches are present in areas that are permanently or seasonally inundated (structures for egg-laying by amphibians) ____ Invasive plants cover less than 25% of the wetland area in every stratum of plants (see H 1.1 above for the list of strata and H 1.5 in the manual for the list of aggressive plant species)	3
Total for H 1 — Add the points in the boxes above	8

Rating of Site Potential If score is: __**15-18 = H** _X_ **7-14 = M** ___**0-6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support the habitat functions of the site?	
H 2.1. Accessible habitat (include only habitat polygons accessible from the wetland. *Calculate:* % relatively undisturbed habitat 3.6 + [(% moderate and low intensity land uses)/2] 10.2 = 8.65 % Total accessible habitat is: > 1/3 (33.3%) of 1 km Polygon — points = 3 20-33% of 1 km Polygon — points = 2 10-19% of 1 km Polygon — points = 1 < 10% of 1 km Polygon — points = 0	0
H 2.2. Total habitat in 1 km Polygon around the wetland. *Calculate:* % relatively undisturbed habitat 3.6 + [(% moderate and low intensity land uses)/2] 40.9 = 24.05 % Total habitat > 50% of Polygon — points = 3 Total habitat 10-50% and in 1-3 patches — points = 2 Total habitat 10-50% and > 3 patches — points = 1 Total habitat < 10% of 1 km Polygon — points = 0	2
H 2.3. Land use intensity in 1 km Polygon: > 50% of 1 km Polygon is high intensity land use — points = (- 2) ≤ 50% of 1 km Polygon is high intensity — points = 0	-2
Total for H 2 — Add the points in the boxes above	0

Rating of Landscape Potential If score is: __**4-6 = H** ___**1-3 = M** _X_ **< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose only the highest score that applies to the wetland being rated.* Site meets ANY of the following criteria: — points = 2 — It has 3 or more Priority Habitats within 100 m (see next page) — It provides habitat for Threatened or Endangered species (any plant or animal on the state or federal lists) — It is mapped as a location for an individual WDFW Priority Species — It is a Wetland of High Conservation Value as determined by the Department of Natural Resources data — It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan Site has 1 or 2 Priority Habitats (listed on next page) within 100 m — points = 1 Site does not meet any of the criteria above — points = 0	2

Rating of Value If score is: _X_ **2 = H** ___**1 = M** ___**0 = L** *Record the rating on the first page*

Wetland name or number Offsite A

WDFW Priority Habitats

See complete descriptions of Priority Habitats listed by WDFW, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008 (current year, as revised). Priority Habitat and Species List.[133] This list was updated for consistency with guidance from WDFW.

This question is independent of the land use between the wetland unit and the Priority Habitat. All vegetated wetlands are by definition a Priority Habitat but are not included in this list because they are addressed by this rating system.

Count how many of the following Priority Habitats are within 330 ft (100 m) of the wetland unit:

— **Aspen Stands:** Pure or mixed stands of aspen greater than 1 ac (0.4 ha).

— **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife. This habitat automatically counts if mapped on the PHS online map within 100m of the wetland. If not mapped, a determination can be made in the field.

— **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

— **Cliffs:** Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.

— **Fresh Deepwater:** Lands permanently flooded with freshwater, including environments where surface water is permanent and often deep, so that water, rather than air, is the principal medium within which the dominant organisms live. Substrate does not support emergent vegetation. Do not select if Instream habitat is also present, or if the entire Deepwater feature is included in the wetland unit being rated (such as a pond with a vegetated fringe).

— **Herbaceous Balds:** Variable size patches of grass and forbs on shallow soils over bedrock.

X **Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources. Do not select if Fresh Deepwater habitat is also present.

— **Nearshore:** Relatively undisturbed nearshore habitats. These include Coastal Nearshore, Open Coast Nearshore, and Puget Sound Nearshore.

— **Old-growth/Mature forests:** Old-growth west of Cascade crest – Stands of at least 2 tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) > 32 in. (81 cm) diameter at breast height (dbh) or > 200 years of age. Mature forests – Stands with average diameters exceeding 21 in. (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west of the Cascade crest.

[133] http://wdfw.wa.gov/publications/00165/wdfw00165.pdf

Wetland name or number Offsite A

— **Oregon White Oak:** Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important. For single oaks or oak stands <0.4 ha in urban areas, WDFW's Management Recommendations for Oregon White Oak[134] provides more detail for determining if they are Priority Habitats

X **Riparian:** The area adjacent to freshwater aquatic systems with flowing or standing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

X **Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 20 in. (51 cm) in western Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in. (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

— **Talus:** Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

— **Westside Prairies:** Herbaceous, non-forested plant communities that can either take the form of a dry prairie or a wet prairie.

[134] https://wdfw.wa.gov/publications/00030/wdfw00030.pdf

APPENDIX C – EnviroVector Report

GEMINI CORP

CITY OF OLYMPIA, WASHINGTON

CRITICAL AREAS REPORT & WETLAND RESTORATION PLAN

Prepared By:



Curtis Wambach, M.S.
Senior Biologist and Principal

EnviroVector
OPTIMIZE USABLE LAND

21 April 2023

360-790-1559

www.envirovector.com

GEMINI CORP

CRITICAL AREAS REPORT

&

WETLAND RESTORATION PLAN

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21 April 2023

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1.0 INTRODUCTION

1.1 Purpose

The purpose of this Critical Areas Report is to identify and map Critical Areas on the subject property, satisfying City of Olympia regulatory requirements under Critical Areas. Potential wetlands, streams, steep slopes, and their buffers were evaluated on the subject property and within three hundred (≤300) feet of the subject property.

EnviroVector has been asked to analyze potential wetland and buffer impacts and to prepare a Restoration plan to off-set those potential impacts. This report analyses potential impacts to an on-site wetland to determine the extent of those impacts for the purpose of restoring wetland and buffer functions.

1.2 Property Location

The subject property is located in the City of Olympia, Thurston County WA (**Figure 1; Table 1**).

Table 1. Parcels Comprising Subject Property

No#	Property Address	Parcel Number	Map Coordinates	Property Size (Acres)
1	---	49602901000	Section 12 Township 18N Range 02W	2.04
1 Parcels	Total Size			2.04 acres

The permitting jurisdiction is the City of Olympia.

1.3 Site Evaluation

A wetland and stream evaluation were performed on the subject property on 23 March 2023.

2.0 METHODOLOGY

This report is based on a review of existing information and field investigations. The goal of these efforts is to collect and document existing information that reflects current site conditions for assessing potential impacts.

2.1 Review of Existing Literature

Prior to conducting fieldwork, biologists reviewed existing information to identify wetlands, streams, vegetation patterns, topography, soils, wildlife habitats, and other natural resources on the subject property. Existing data sources that were reviewed for this report included but were not limited to the following:

- Washington. U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) Soil Survey
- U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI), online wetlands mapper
- Washington Department of Fish and Wildlife (WDFW) Salmonscape Database

- Washington Department of Fish and Wildlife (WDFW) Priority and Habitat Species Database
- Washington State Department of Natural Resources (DNR) Natural Heritage Database
- Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM) and Flood Insurance Studies

2.2 Field Investigation

A wetland evaluation was performed onsite as well as offsite of the subject property to determine if wetlands, streams, or their buffers extend onto the subject property. The routine on-site determination method was used to identify potential wetlands using the procedures outlined in the *Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory, 1987) and the 2010 USACE Regional Wetland Supplement.

2.3 Wetland Identification

Prior to 2010, biologists delineated wetlands according to the methods specified in the U.S. Army Corps of Engineers (USACE) Wetlands Delineation Manual (Environmental Laboratory 1987). At that time, these methods complied with those in the Washington State Wetland Identification and Delineation Manual (Washington State Department of Ecology [Ecology] 1997).

Following 2010, biologists evaluate wetlands according to the methods specified in the USACE's Wetlands Delineation Manual (Environmental Laboratory 1987) and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0) (USACE 2010). These methods comply with those adopted by Washington State pursuant to Washington Administrative Code (WAC) 173-22-035, Revised Code of Washington (RCW) 90.58.380.

2.3.1 Vegetation

The dominant plants and their wetland indicator status were evaluated to determine whether the vegetation is hydrophytic. Hydrophytic vegetation is generally defined as vegetation adapted to prolonged saturated soil conditions. To meet the hydrophytic vegetation criterion, more than 50 percent of the dominant plants must be facultative, facultative wetland, or obligate, according to the plant indicator status category assigned to each plant species by the USACE National Wetland Plant List. **Table 2** provides the definitions of the indicator status categories. The scientific and common names for plants follow the currently accepted nomenclature. Dominant plant species were observed and recorded on wetland determination data forms for each data plot (**Appendix M**).

Table 2. Key to Plant Indicator Status Categories

Plant Indicator Status Category	Symbol	Description
Obligate Wetland Plants	OBL	Plants that almost always (>99% of the time) occur in wetlands but may rarely (<1% of the time) occur in non-wetlands
Facultative Wetland Plants	FACW	Plants that often (67% to 99% of the time) occur in wetlands but sometimes (1% to 33% of the time) occur in non-wetlands
Facultative Plants	FAC	Plants with a similar likelihood (33% to 66% of the time) of occurring in both wetlands and non-wetlands
Facultative Upland Plants	FACU	Plants that sometimes (1% to 33% of the time) occur in wetlands but occur more often (67% to 99% of the time) in non-wetlands
Upland Plants	UPL	Plants that rarely (<1% of the time) occur in wetlands and almost always (> 99% of the time) occur in non-wetlands

2.3.2 Soils

Soils were excavated to 18 inches or more below the surface within test pits to evaluate soil characteristics and hydrological conditions throughout the property. Soil chroma (color) is evaluated using the *Munsell Color Chart* (Munsell Color, 1988). Generally, an area must have hydric soils to be considered a wetland. Hydric soil forms when soils are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper portion. Biological activities in saturated soil result in reduced concentrations of oxygen that in turn result in a preponderance of organisms that use anaerobic processes for metabolism. Over time, anaerobic biological processes result in certain soil color patterns, which are used as indicators of hydric soil. Typically, low-chroma colors are formed in the matrix of hydric soil. Bright-colored redoximorphic features form within the matrix under a fluctuating water table. Other important hydric soil indicators include organic matter accumulations in the surface layer, reduced sulfur odors, and organic matter staining in the subsurface.

2.3.3 Hydrology

The subject property was examined for evidence of hydrology. The U.S. Army Corps of Engineers (2005) provides a technical standard for monitoring hydrology on such sites. This standard requires 14 or more consecutive days of flooding or ponding, or a water table twelve (12) inches (30 cm) or less below the soil surface, during the growing season at a minimum frequency of five (5) years in ten (10) (fifty percent [50%] or higher probability). The USACE (2010) Regional Supplement provides a list of hydrology indicators to evaluate whether the hydrology standard is satisfied. If wetland hydrology, including pooling, ponding, and soil saturation, is not clearly evident, hydrological conditions may be observed through surface or soil indicators. Indicators of hydrological conditions include oxidized root channels, drainage patterns, drift lines, sediment deposition, watermarks, historic records, visual observation of saturated soils, and visual observation of inundation.

2.4 Wetland Classification and Rating

Delineated wetlands, if identified, would be classified according to the USFWS Classification of Wetlands and Deepwater Habitats of the United States. Hydrogeomorphic classifications were assigned to wetlands using USACE methods established in 'A Hydrogeomorphic Classification for Wetlands.' Wetlands were rated using the revised Washington State Wetland Rating System for Western Washington.

3.0 STUDY RESULTS

3.1 Background Information

3.1.1 NRCS Soil Survey for Thurston County

Two (2) non-hydric soils mapped on the subject property by the NRCS Soil Survey (**Table 3; Appendix B**).

Table 3. NRCS Soils Survey

Soil Unit	Hydric	Comments
Yelm fine sandy loam, 0-3% slopes	No	Primarily on eastern edge of subject property
Dystic xerochrepts	No	Located on central and western portions of the subject property

3.1.2 National Wetlands Inventory (NWI)

One (1) riparian wetland has been mapped on the southwestern corner of the subject property by the US Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) (**Appendix C**).

3.1.3 Thurston County Geodata Center Wetlands

No wetlands have been mapped on the subject property or within three hundred (≤300) feet of the subject property by the Thurston County Geodata Center database (**Appendix E**).

3.1.4 Thurston County Geodata Center Contours

Contours show a concave depression on the central portion of the subject property and a ravine that extends diagonally across the southwestern corner of the subject property (**Appendix F**).

3.1.5 Department of Natural Resources (DNR) Water Typing Database

A Type F water is mapped on the southwestern corner of the subject property by the State Department of Natural Resources (DNR) Water Typing Database (**Appendix G**). However, a "total fish passage barrier" and a "partial fish passage barrier" are both mapped downstream of the subject property.

3.1.6 The WDFW PHS Database

No priority species have been mapped on the subject property or within one thousand (≤1,000) feet of the subject property by the Washington Department of Fish and Wildlife (WDFW) Priority Habitats and Species (PHS) database (**Appendix H**). Fall chum (*Oncorhynchus keta*), State Priority Species, is mapped approximately seventeen hundred (1,700) feet west of the subject property. Wetlands are mapped sixteen hundred (1,600) feet east of the subject property.

3.1.7 303(d) Water

One (1) 303(d) listed water has been mapped less than one (<1) mile downgradient of the subject property in Puget Sound by the Department of Ecology Water Quality Atlas database (**Appendix I**).

3.1.8 TMDL

An approved water improvement project has been mapped on the subject property and vicinity by the Department of Ecology Water Quality Atlas Database (**Appendix J**).

3.1.9 Potential Flooding

A FEMA floodplain is mapped on the southern portion of the subject property by the Department of Ecology Water Quality Atlas Database (**Appendix K**).

3.2 Field results

A summary of findings is found in **Table 4**.

Two (2) wetlands, labeled Wetlands A & B, and one (1) stream, Mission Creek, were identified and delineated on the subject property (**Figures 2 & 3; Appendix A, Photos 9-24 & 71-82**). An excavated channel was identified that drains Wetland A to Mission Creek (**Figure 2; Appendix A, Photos 57-70**).

Table 4. Summary of Critical Areas Results

WETLANDS						
Wetlands	Area of Wetland		Veg Class Hydroperiod	Buffer Condition	Habitat Features	Comments
	Onsite	Total				
Wetland A	10,556 sf (0.24 acre)	10,556 sf (0.24 acres)	PEMC[1]	Lawns, residences, invasive weeds	Some amphibian and waterfowl habitat	Severely degraded habitat dominated by non-native invasive weeds
Wetland B	4,088 sf (0.09 acre)	64,992 sf (1.49 acre)	PSSC[2]	Lawns, residences, roads, forests	Stream	Relatively undisturbed wetland, partially disturbed buffer
STREAMS						
Drainages	On-site Reach	Channel Width	Channel Depth	Stream Bottom	DNR Mapped Fish Presence	Comments
Ditch A	100 ft	1 ft	1 ft	Mud	No	Excavated channel
Mission Creek	1,083 ft	4 ft	0.5 ft	Mud & Gravel	Yes, but downstream total fish barrier	Urban stream, total fish barrier downstream

1. PEMC: Palustrine Emergent Seasonally-flooded
2. PSSC: Palustrine Scrub-shrub Seasonally-flooded

3.2.1 Wetland A

The Wetland A boundary has been marked using orange ribbon flagging tied to vegetation and labeled A-1 through A-19 (**Figure 4**). Wetland flags were GNSS located using a Trimble Geo 7x with sub-foot accuracy.

Greater than ten percent (>10%) of the area within one hundred fifty (150) feet of Wetland B contains potential sources of pollutants (**Figure 12**). Habitat within one (1) kilometer is shown in **Figure 13**, and the wetland contributing basin is shown in **Figure 14**.

Conditions

Wetland A is a severely degraded wetland grazed by numerous livestock and dominated by non-native invasive weeds, almost entirely reed canarygrass (*Phalaris arundinacea*; FACW) (**Appendix A, Photos 75 & 76**).

The Cowardin (1979) classification of Wetland A is Palustrine Emergent Seasonally-flooded (PEMC) (**Table 4; Figure 11**).

The wetland boundary on Wetland A is well-defined and consistent throughout (**Appendix A, Photos 13 & 15**).

Hydrology

Hydrology derives from local precipitation and groundwater within this deep depression (**Appendix A, Photo 56**). The wetland outlet is an artificially excavated channel draining the wetland to Mission Creek.

Vegetation

One (1) vegetation class, emergent, occurs in Wetland A (**Figure 11**). The emergent vegetation class is dominated by reed canarygrass (*Phalaris arundinacea*, FACW) (**Appendix A, Photo 3**). Some skunk cabbage (*Lysichiton americanus*; OBL) (**Appendix A, Photos 9 & 12**).

Dominant plant species identified in Wetland A include:

- Reed canarygrass (*Phalaris arundinacea*, FACW)

Dominant plant species outside of the Basin include:

- Red alder (*Alnus rubra*)
- Black cottonwood (*Populus trichocarpa*; FAC)
- Himalayan blackberry (*Rubus armeniacus*; FAC)
- English laurel (*Prunus laurocerasus*; NL)
- English Ivy (*Hedera helix*, FACU)
- Trailing blackberry (*Rubus ursinus*, FACU)
- Scotch broom (*Cytisus scoparius*, FACU)

Soils

Soils in Wetland A consist of a very dark gray (10YR 3/1) sandy silt loam from zero (0) to twenty (20) inches in depth.

Soils adjacent to the wetland consist of a very dark grayish brown (10YR 3/2) sandy silt loam from the surface to six (5) inches below the surface and a dark brown (10YR 3/3) sandy silt loam from zero (0) to twenty (20) inches in depth.

Habitat Features

Habitat features in Wetland A are minimal but include standing water that may be used by amphibians and waterfowl.

3.2.2 Wetland B

The Wetland B boundary has been marked using orange ribbon flagging labeled B-1 to B-2, Ba-1 to Ba-6, and Bb-1 through Bb-4 (**Figure 4**). Wetland boundary markers were GNSS located using a Trimble Geo 7x with sub-foot accuracy.

Conditions

Wetland B is a relatively undisturbed sub-shrub wetland within a depression within the Mission Creek ravine. The Cowardin (1979) Wetland classification is Palustrine Scrub-shrub Seasonally-flooded (PSSC) (**Table 4; Figure 11**). The wetland boundary on Wetland B is well-defined and consistent throughout (**Appendix A, Photos 19-24**).

Greater than ten percent (>10%) of the area within one hundred fifty (150) feet of Wetland B contains potential sources of pollutants (**Figure 12**). Habitat within one (1) kilometer is shown in **Figure 13**, and the wetland contributing basin is shown in **Figure 14**.

Hydrology

Hydrology derives from Mission Creek, which also acts as an unrestricted outlet.

Vegetation

Dominant vegetation consists of (**Appendix A, Photos 73-76**):

- Salmonberry (*Rubus spectabilis*, FAC)
- Himalayan blackberry (*Rubus armeniacus*, FAC
- Pacific crabapple (*Malus fusca*, FACW)
- Vine maple (*Acer circinatum*, FAC)
- Pacific ninebark (*Physocarpus capitatus*, FACU)
- Reed canarygrass (*Phalaris arundinacea*, FACW)
- Slough sedge (*Carex obnupta*, OBL)

Dominant plant species outside of the Basin include:

- Red alder (*Alnus rubra*)
- Black cottonwood (*Populus trichocarpa*; FAC)
- Big-leaf maple (*Acer macrophyllum*, FACU)
- Douglas fir (*Pseudotsuga menzeisii*, FACU)
- Himalayan blackberry (*Rubus armeniacus*; FAC)
- English laurel (*Prunus laurocerasus*; NL)
- Beaked hazelnut (*Corylus cornuta*, FACU)
- English Ivy (*Hedera helix*, FACU)
- Trailing blackberry (*Rubus ursinus*, FACU)
- Scotch broom (*Cytisus scoparius*, FACU)

Soils

Soils in Wetland A consist of a very dark gray (10YR 3/1) sandy silt loam from zero (0) to twenty (20) inches in depth.

Soils adjacent to the wetland consist of a very dark grayish brown (10YR 3/2) sandy silt loam from the surface to six (5) inches below the surface and a dark brown (10YR 3/3) sandy silt loam from zero (0) to twenty (20) inches in depth.

Habitat Features

Mission Creek and some standing water provides habitat.

3.2.3 Ditch A

Ditch A is an excavated ditch draining Wetland A to Mission Creek (**Appendix A, Photos 57-70**). Ditch A has been delineated using pink ribbon flagging labeled D-1 through D-3. The ditch was flowing during the site evaluation. The sides of the ditch cut were armored with lots from trees cut in the wetland buffer.

3.2.4 Mission Creek

Mission Creek extends across the southeastern corner of the subject property (**Figures 2 & 3; Appendix A, Photos 7 & 8**). The State DNR Stream Typing database maps Mission Creek as a Type F stream, indicating fish presence (**Appendix G**). However, a "partial fish barrier" and a "total fish barrier" are mapped downstream of the subject property. These fish barriers are listed as culverts.

Mission Creek extends through Wetland B and drains directly to Puget Sound more than four thousand (>4,000) feet downstream of the subject property. The Creek is situated within a ravine to Puget Sound.

4.0 REGULATORY CONSIDERATIONS

Wetland regulatory considerations have been summarized in **Table 5**.

Table 5. Summary of Regulatory Considerations

Wetlands							
Wetland	**Area of Wetland**		**Category**	**Habitat Score**	**Standard Buffer**	**Reduced Buffer**	**Comments**
	Onsite	**Total**					
Wetland A	10,556 sf (0.24 acre)	10,556 sf (0.24 acres)	III	5	140 ft	105 ft	Wetland buffers extends over the entire subject property
Wetland B	4,088 sf (0.09 acre)	64,992 sf (1.49 acre)	III	5	140 ft	105 ft	

Watercourse							
Watercourse	Reach Offsite	Channel Width	DNR Mapped Stream Type	Fish Presence	Stream Type	Stream Buffer	Comments
Ditch A	100 ft	1 ft	N/A	No	N/A	None	Untyped under WAC 222-16-030/031
Mission Creek	1,083 ft	4 ft	F	No	F	200 ft	Fish may occur onsite if culvert barriers downstream replaced

4.1 Wetland A

Wetland A has been classified as a Category III wetland using the Department of Ecology (2014) Wetland Rating Form for Western Washington as required under Olympia Municipal Code (OMC) Chapter 18.32.510 ---*Wetland – Rating Systems*. Wetland A is a depressional wetland under the Department of Ecology (2014) Wetland Rating System (**Appendix L**).

Under Olympia Municipal Code (OMC) Chapter 18.32.535, Table 32-1---*Wetland Buffer Widths*, wetland buffers are calculated based on the habitat score determined by the Washington State Department of Ecology (2014) Wetland Rating System. Wetland A scored a "Low (L)" potential to provide habitat, a "Low (L)" landscape potential to support habitat, and a "High (H)" potential value to society (**Appendix L**). Wetlands that rate as an L, L, H (order of ratings are not important) receive a score of five (5) points for total habitat functions and require a one hundred forty (140)-foot standard buffer (**Insert 1; Figure 5**).

Insert 1. OMC Chapter 18.32.535 Table 32-1: *Wetland Buffer Widths*

Wetland Characteristics	Wetland Buffer Width
Wetlands of High Conservation Value and Bogs	Not less than 250 feet
Estuarine - Category I	250 feet
Estuarine - Category II	150 feet
Habitat score: 3 pts	80 feet
Habitat score: 4 pts	100 feet
Habitat score: 5 pts	**140 feet**
Habitat score: 6 pts	180 feet
Habitat score: 7 pts	220 feet
Habitat score: 8 pts	260 feet
Habitat score: 9 pts	300 feet
Water Quality Improvement Score: 8 - 9 pts, and Habitat score: 4 pts or less	100 feet
Category I or II Wetland - Not meeting any of the above criteria	100 feet
Category III Wetland - Not meeting any of the above criteria	80 feet
Category IV Wetland - Score for all three wetland functions is less than 16 pts	50 feet

4.2 Wetland B

Wetland B has been classified as a Category III wetland using the Department of Ecology (2014) Wetland Rating Form for Western Washington as required under Olympia Municipal Code (OMC) Chapter 18.32.510 ---*Wetland – Rating Systems*. Wetland B is a depressional wetland under the Department of Ecology (2014) Wetland Rating System (**Appendix L**).

Under Olympia Municipal Code (OMC) Chapter 18.32.535, Table 32-1---*Wetland Buffer Widths*, wetland buffers are calculated based on the habitat score determined by the Washington State Department of Ecology (2014) Wetland Rating System. Wetland B scored a "Low (L)" potential to provide habitat, a "Low (L)" landscape potential to support habitat, and a "High (H)" potential value to society (**Appendix L**). Wetlands that rate as an L, L, H (order of ratings are not important) receive a score of five (5) points for total habitat functions and require a one hundred forty (140)-foot standard buffer (**Insert 1; Figure 5**).

4.3 Mission Creek

Under OMC 18.32.410---*Streams and Priority Riparian Areas – Typing System*, streams are grouped into categories according to the Washington Department of Natural Resources (DNR) Water Typing System under Washington Administrative Code (WAC) 222-16-031. Mission Creek is mapped as a Type F stream by the State DNR Stream Typing database (**Appendix G**). However, a "partial fish barrier" and "total fish barrier" are mapped downstream of the subject property as a result of culverts. Although no fish may occur on the subject property, fish may occur in the future if the culverts are replaced to current fish passage standards. Thereby, the reach of Mission Creek that extends onto the subject property is rated as a Type F stream. Because the reach of Mission Creek extending through the subject property has been measured at four (4) feet wide, under OMC 18.32.435(C), Mission Creek requires a two hundred (200) foot stream buffer (**Insert 2, Figure 5**).

Insert 2. Stream Buffers under OMC 18.32.435(C).

Stream Type and Description	Buffer
Type S waters – Shorelines of the State	Refer to OMC 18.20.620, Table 6-3 for the Shoreline Setback and Vegetation Conservation Areas
Priority Riparian Areas	250 feet
Type F streams greater than 5 feet wide (bankfull width) that provide habitat for fish	250 feet
Type F streams less than 5 feet wide (bankfull width) that provide habitat for fish	200 feet
Type Np and Ns streams (no fish habitat) with high mass wasting potential	225 feet
Type Np and Ns streams (no fish habitat) without high mass wasting potential	150 feet

4.4 Ditch A

Under OMC 18.32.410---*Streams and Priority Riparian Areas – Typing System*, streams are grouped into categories according to the Washington Department of Natural Resources (DNR) Water Typing System under Washington Administrative Code (WAC) 222-16-031. Ditch A is not recognized by the DNR Stream Typing database, other than a gray line on the background image (**Appendix G**). Ditch A is rated as "un-typed" under the WAC 222-16-031/030.

Under OMC 18.32.435(C), stream buffers are based on the DNR Water Type Classification (WAC 222-16-031) required under OMC 18.32.410. Ditch A is rated as "un-typed" under the WAC 222-16-031/030. No buffer requirements are required for un-typed watercourses under 18.32.435(C). Thereby, no buffers will be applied to this un-typed watercourse labeled as Ditch A.

5.0 WETLAND IMPACTS

5.1 General Discussion of Impacts

Impacts in Wetland A and its buffer were identified during the site evaluation (**Figure 6**). Wetland impacts appear to be the result of activities not associated with land use. These activities appear to be the result of one individual's artistic expression or hobby. These activities include wetland fill, tree cutting in the buffer, and grading in the wetland and buffer. Indirect impacts include the invasion of non-native, invasive weeds and the degradation of wetland and buffer habitat.

Wetland fill appears to take the form of a flower where flower peddles were formed using logs cut from trees in the buffer area (**Appendix A, Photos 35 & 36**). Soils were placed in the center of the flower-shaped fill surrounded by rings of concrete & asphalt pieces. This structure sits on a pile of branches. An additional pile of branches and soil occurs south of this flower structure (**Appendix A, Photo 37**). Pieces of concrete and asphalt are scattered around the northern portion of Wetland A and its buffer (**Appendix A, Photos 25-30, 38, 41, & 42**). The southern portion of Wetland A has been excavated, moving around soils (**Appendix A, Photos 47-49**). These soils appear to have been moved around to improve the flow of water to an excavated channel that drains Wetland A to Wetland B and Mission Creek. This channel was excavated on the southern end of Wetland A, draining the wetland and lowering the water level in the wetland.

Grading and tree cutting had occurred in the northern portion of the Wetland A buffer. Grading in the wetland buffer consists of vertical cuts into slopes (**Appendix A, Photos 7, 35, and 43-47**). Trees were cut in the wetland buffer (**Appendix A, Photos 31, 39, 46, & 52**). Roots were cut on at least one (1) of the existing vertical, living trees, creating a hazard for houses east of the subject property (**Appendix A, Photos 40, 50, & 51**). Logs for many of these trees were placed in artistic forms within Wetland A (**Appendix A, Photos 33, 35, & 36**).

The Wetland A buffer is severely degraded without significant wetland buffer functions. Indirect impacts include the invasion of non-native invasive weeds, particularly English ivy and Himalayan blackberry. These non-native invasive weeds displace native plant species with minimal benefit for wildlife species. English ivy kills trees, particularly deciduous (non-conifer) trees. English ivy climbs the trees smothering the tree and limiting the tree's capacity for photosynthesis, while creating a heavy weight for the tree to support (**Appendix A, Photos 53**). Eventually the ivy infested trees weaken and fall (**Appendix A, Photos 54**).

A channel was cut on the southern end of Wetland A, partially draining the wetland (**Appendix A, Photos 57-70**). The lowered water level creates an optimal environment for the proliferation of the non-native, invasive weed reed canarygrass in Wetland A. Reed canarygrass has replaced the wetland vegetation and is now the dominant wetland plant, forming a monotypical vegetation community. The undisturbed portions of Wetland B have little to no reed canarygrass. The excavated area on the southern portion of Wetland A is too deep for the growth of reed canarygrass. Seasonal water levels greater than twelve (>12) inches of the surface kills rhizomes and prevents seed germination.

The southern portion of Wetland A was excavated where soils were moved around. The grading in the southern portion of Wetland A appears to have been directed toward conveying water to the excavated channel to maximize the draining of Wetland A. However, the pond located at the excavated channel provides habitat for waterfowl and amphibians.

5.2 Specific Impact Areas

Five (5) distinct impacts areas have been identified during the site evaluation as follows (**Figure 6**):

1. Area A (2,322 sf)

   Wetland fill consisting of logs from trees cut in the buffer, soils excavated from buffers, pile of branches from trees cut in buffer, and asphalt & concrete chunks (**Appendix A, Photos 25-46**). Soils excavated in buffer created steep vertical slope where plants were removed (**Appendix A, Photos 35, 43-47).** Stumps from the cut trees are clearly visible in the buffer (**Appendix A, Photos 31, 32, 39, 52**). Roots have been cut creating a hazard tree in the buffer area (**Figure 6**; **Appendix A, Photos 40, 50, & 51**). Non-native, invasive weeds dominate buffer vegetation.

2. Area B (2,955 sf)

   Wetland fill consisting of a pile of intermixed branches, asphalt, concrete, and soils (**Appendix A, Photos 47-49**). Cut trees and excavation in the buffer of Wetland A in Area B. Soils excavated in buffer created steep vertical slope where plants were removed. Stumps from the cut trees are clearly visible in the buffer. Non-native, invasive weeds dominate buffer vegetation.

3. Area C (2,189 sf)

   Soils were excavated and moved around on the southern portion of Wetland A forming a pond and spoils pile (**Appendix A, Photos 11, 18-20, 55, & 56**). It appears that grading was applied toward maximizing the conveyance of water to an excavated channel affectively draining Wetland A.

4. Area D (660 sf)

   A deep channel was excavated draining Wetland A to Wetland B and Mission Creek (**Appendix A, Photos 57-70**). The walls of the excavated channel were armored with logs from trees cut in the buffer (**Appendix A, Photos 61-66**).

5. Area E (20,261 sf)

   Trees cut and native plants removed from the northern portion of the buffer on Wetland A. The cutting of trees and the disturbance of other native vegetation facilitates the

A small portion of Wetland B south of the cut channel was cleared of shrubs where reed canarygrass (FACW) has become the dominant vegetation. However, shrubs are beginning to recover and are expected to eventually replace the reed canarygrass. Because this area is recovering, it will not be included in the Restoration plan.

Secondary consequences of these impacts include the domination of the non-native, invasive weed reed canarygrass (FACW) in Wetland A and of the non-native replacement of native plants by non-native, invasive weeds. These non-native, invasive weeds, particularly Himalayan blackberry and English ivy have invaded the Wetland A buffer and currently comprise the dominant vegetation.

6.0 RESTORATION PLAN

6.1 General Restoration Summery

The general restoration strategy consists of restoring Wetland A and its buffer to pre-existing conditions prior to recent wetland and buffer impacts. Specifics of the proposed restoration plan includes removing fill material from Wetland A, restoring pre-existing contours in the buffer area, repair the Wetland A outlet, manage non-native invasive weeds, and install native plant species. The goal of the restoration plan is to restore and enhance Wetland A to improve wetland and buffer functions. Wetland structural diversity would be improved through the management of non-native invasive weeds and through the installation of native plant species.

Hydrological functions would be restored to pre-existing conditions through the restoration of the Wetland A outlet. Restoring the contours at the Wetland A outlet would increase water levels in Wetland A managing the current infestation of reed canarygrass.

Native plant species would be installed to replace the existing non-naïve, invasive weeds that have infested the wetland and buffer. The management of non-native invasive weeds would ensure planting success in the re-establishment of the wetland and buffer vegetation communities. The weed-infested wetland buffer would be transformed into a forested buffer vegetation community. Western red cedar would be installed to eventually shade out and discourage the germination of non-native, invasive weeds. Conifer needles acidify soils discouraging the growth and germination of non-native invasive weeds. A complete canopy of conifers would discourage the recolonization of non-native invasive weeds in the wetland buffer.

6.2 Detailed Restoration Strategy

The detailed restoration plan is summarized in **Table 6**, which describes the restoration plan applied to each impact area.

Table 6. Impacts and Proposed Restoration Strategy

Wetland Impacts				Wetland Restoration		
Wetland	Impact Areas	Impact Area	Impacts Described	Wetland Restoration Strategy	Restoration Area	Comments
Wetland A	Area A	2,330 sf (0.5 acre)	Wetland fill, Concrete & asphalt, grading in wetland & buffer	Remove fill and restore original grade in wetland and buffer. Remove concrete, asphalt, & trash. Install native vegetation. Five (5) years monitoring and maintenance.	2,330 sf (0.5 acre)	Remove logs, asphalt, concrete, and fill material from the wetland and restore the original contours of wetland and buffer within Areas A & B.
	Area B	2,955 sf (0.07 acre)	Wetland fill, Concrete & asphalt, grading in wetland & buffer		2,955 sf (0.07 acre)	
	Area C	2,189 sf (0.05 acre)	Grading in wetland	No Action	2,189 sf (0.05 acre)	The excavated pond supports waterfowl and provides some amphibian habitat. The pond would remain.
	Area D	660 sf (0.02 acre)	Cut channel draining Wetland A	Restore original outlet by filling in the excavated ditch to three (3) feet above its existing ground level.	660 sf (0.02 acre)	The restored outlet would allow the wetland to retain larger volumes of water improving hydrological functions and would drown out reed canarygrass.
	Area E	20,261 sf (0.47 acre)	Cutting trees in the buffer	Eliminate and manage non-native invasive weeds. Install seventy-three (73) western red cedar trees. Five (5) years monitoring and maintenance.	20,261 sf (0.47 acre)	Western red cedar trees

6.3 Impact Area A

The general restoration strategy for Area A consists of removing material placed in the wetland and buffer and restoring the wetland and buffer habitat.

The details of restoration within Area A includes (**Figure 7**):

6.3.1 Remove Wetland Fill

Remove wetland fill from an area totaling one thousand four hundred thirty-nine (1,439) sf, which is the wetland portion of Area A, which totals two thousand three hundred thirty (2,330) sf (**Figure 7**). This material includes cut logs, branches, soils, concrete pieces, and asphalt chunks. This material will be removed to the depth of native wetland soils. The soil component of the fill material would be removed from the wetland and placed in eight hundred ninety-one (891) sf of the upland buffer in Area A to restore natural contours in the area of cut slopes. Some of this material may be used to restore the wetland outlet in Area D.

6.3.2 Remove Logs and Branches

Remove logs and branches that are intermixed with soils, asphalt, and concrete materials in the wetland portion of Area A. Logs and branches that are intact and not contaminated by asphalt dust or other potentially toxic materials would be placed in a scattered distribution within the buffer area.

6.3.3 Remove Concrete and Asphalt Chunks

Remove chunks of concrete and asphalt from Area A. Remove asphalt and concrete embedded in fill material. Dispose of the concrete and asphalt offsite.

6.3.4 Enhance Wetland and Buffer

1. Install dense native trees, shrubs, and herbs in the wetland and buffer portions of Area A as detailed in the Planting Plan.
2. Install western red cedar trees in the buffer surrounding Areas A & B to enhance wetland buffer habitat and to discourage the germination and growth of non-native invasive weeds, such as English Ivy and Himalayan blackberry.
3. This restoration plan will provide a visual screen between the wetland and surrounding land use.
4. Raise water level in Wetland A by closing the excavated channel that drains the wetland, which would discourage the growth and germination of the non-native, invasive weed reed canarygrass, which dominates the wetland vegetation community.
5. Remove English Ivy and Himalayan blackberry from the wetland buffer on the subject property. Removal techniques would include manual removal using hand tools, such as hedge clippers, and mechanical removal using a brush hog or string trimmer. Cut English ivy and Himalayan blackberry, including living stems and cut stems, would be spot sprayed with Rodeo herbicide.

6.3.5 Remove Garbage and Trash

Removal of trash and garbage from the wetlands and buffers to improve wetland and buffer habitat.

6.4 Impact Area B

6.4.1 Remove Wetland Fill

Remove wetland fill from an area totaling two thousand one hundred six (2,106) sf of Area B, which totals two thousand nine hundred fifty-five (2,959) sf (**Figure 7**). This material includes cut logs, branches, soils, concrete pieces, and asphalt chunks. This material will be removed to the depth of native wetland soils. The soil component of the fill material would be removed from the wetland and placed in eight hundred fifty-three (853) sf of the upland buffer in Area A to restore natural contours in the area of cut slopes.

6.4.2 Remove Logs and Branches

Remove logs and branches that are intermixed with soils, asphalt, and concrete materials in the wetland portion of Area B. Logs and branches that are intact and not contaminated by asphalt dust or other potentially toxic materials would be placed in a scattered distribution within the buffer area.

6.4.3 Remove Concrete and Asphalt Chunks

Remove chunks of concrete and asphalt from Area B. Remove asphalt and concrete embedded in fill material. Dispose of the concrete and asphalt offsite.

6.4.4 Enhance Wetland and Buffer

1. Install dense native trees, shrubs, and herbs in the wetland and buffer portions of Area B as detailed in the Planting Plan.
2. Install western red cedar trees in the buffer surrounding Areas A & B to enhance wetland buffer habitat and to discourage the germination and growth of non-native invasive weeds, such as English Ivy and Himalayan blackberry.
3. This restoration plan will provide a visual screen between the wetland and surrounding land use.
4. Raise water level in Wetland A by closing the excavated channel that drains the wetland, which would discourage the growth and germination of the non-native, invasive weed reed canarygrass, which dominates the wetland vegetation community.
5. Remove English Ivy and Himalayan blackberry from the wetland buffer on the subject property. Removal techniques would include manual removal using hand tools, such as hedge clippers, and mechanical removal using a brush hog or string trimmer. Cut English ivy and Himalayan blackberry, including living stems and cut stems, would be spot sprayed with Rodeo herbicide.

6.4.5 Remove Garbage and Trash

Removal of trash and garbage from the wetlands and buffers to improve wetland and buffer habitat.

6.5 Impact Area C

No action would be taken to correct the grading in the southern portion of Wetland A in Area C because the pond that was created through grading provides habitat for waterfowl and amphibians. This ponded area would continue to provide habitat for waterfowl and amphibians (**Figure 7, Appendix A, Photos 55 & 56**). The increase in water levels following the correction of the wetland outlet in Area C, the spoils from the pond, which is a mound located in Area C, is expected to continue maintaining wetland conditions.

6.6 Impact Area D

The Wetland A outlet was altered through excavating a deep channel and armoring the cut with logs cut from the trees in the buffer (**Appendix A, Photos 57-70**). The outlet appears to have been cut at least three (≥3) feet in depth, draining Wetland A to Mission Creek. However, the cut may have been as much as five (≤5) feet. The outlet would be raised by three (3) feet. Some of the soil fill removed from the wetland in Areas A & B would be translocated to restore presumed pre-existing contours at the existing outlet. Restoring the presumed pre-existing contours at the outlet would subsequently increase the water level in the wetland, especially in the southern portion, discouraging the growth and germination of reed canarygrass. Because the northern portion of the wetland is higher in elevation, this increased water level should not hinder the planting plan success in Areas A & B. However, adaptive management techniques would be employed during the monitoring period to ensure planting success.

6.7 Wetland Hydrology

Following the implementation of restoration measures, wetland hydrology will be monitored to assure that hydrology performance standards are satisfied. Contingency measures, such as a re-adjustment of the outlet level, would be applied, if necessary, to achieve the desired water regime. The entire wetland area should perform as a seasonally or permanently flooded wetland.

If the wetland creation area does not maintain wetland hydrology as defined by the water level within twelve (12) inches of the surface for a minimum of thirty (30) consecutive days during the wettest portion of the growing season, each monitoring year assuming a period of normal precipitation during the growing season and three (3) months prior to the beginning of the growing season, corrective measures would be implemented through adaptive management to retain wetland hydrology.

6.8 Impact Area E

Buffer enhancement is proposed totaling twenty-three thousand two hundred sixty-one (23,261) sf that will include a planting strategy minimizing mortality and temporal loss and maximizing planting success (**Figure 8**). Part of the buffer enhancement area, consisting of one thousand seven hundred forty (1,740) sf in Areas A & B, would employ measures consisting of reestablishing pre-existing contours and installing a dense vegetation community of native plant species. This strategy includes a planting plan to install a variety of hardy trees, shrubs, and herbaceous plant species at a high density.

Habitat features, such as large woody debris, will be installed to jump start wildlife species diversity and to improve wildlife habitat. Logs cut from trees in the buffer would be removed from the wetland fill areas and placed in the buffer to provide habitat.

Western red cedar will be planted in twenty-one thousand five hundred sixty-one (21,261) sf of the wetland buffer to provide a more structurally diverse forested habitat (**Figure 8**). The advantage of planting conifers, such as the western red cedar (*Thuja plicata*, FAC), is reflected in the quality of habitat that would best benefit the entire ecosystem. The western red cedar would shade out invasive weeds and discourage the germination and growth of non-native invasive weeds that would otherwise invade and dominate valuable habitat. In addition, as the conifers mature, these large, long-lived trees produce large woody debris for wildlife habitat.

Habitat diversity is strongly influenced by large woody debris. Conifers would provide adequate and sustainable supplies of large woody debris. Hardwood-dominated stands are not capable of supplying sufficient long-term large woody debris inputs. The proposal would improve habitat and water quality functions in the Mission Creek watershed.

Additional important considerations to achieve planting goals are invasive weed control, cost of plant stock, and the need to minimize maintenance by increasing plant survival. This can all be achieved through the planting of hardy, long-lived plant species, particularly conifers. Conifers would be installed to provide dense canopy cover, which would aid in shading-out sun-loving invasive weeds. Along with conifers, a variety of shrubs and herbs would be planted in a portion of the buffer to increase the native plant diversity, increase the functional value of the wetland buffers, and to provide a more structurally diverse wildlife habitat.

The installed western red cedar will act as a visual and noise screen to the proposed land use. Western red cedar trees shade out invasive weeds and discourage the germination of non-native plants. Western red cedar needles on the forest floor acidifies the soils discouraging the germination of non-native invasive weeds, while creating a favorable environment for native understory vegetation to flourish. Removal of debris from the buffer will improve the health of the soil, vegetation, wildlife habitat, and water quality into the future.

A planting plan would enhance buffers into a vibrant conifer forest, providing high-quality habitat for wildlife species. Planting along the outer portion of Impact Areas A & B will reduce edge effect and discourage invasive plants from acquiring a foothold in the buffer. A monitoring and maintenance plan would ensure that installed native plant species successfully grow into a forested plant community in the wetland buffers.

6.9 Planting Plan

6.9.1 Planting Areas

Four (4) distinctive planting areas, Areas A, B, D, & E, are proposed to restore Wetland A, its buffer, and the wetland outlet. These planting areas include:

- Area A

  Restore wetland and buffer vegetation by densely planting native vegetation in the wetland and buffer within Area A (**Figure 8**). Invasive species, such as English ivy and Himalayan blackberry, will be removed prior to planting to ensure successful propagation of planted species.

- Area B

  Restore wetland and buffer vegetation by densely planting native vegetation in the wetland and buffer within Area A (**Figure 8**). Invasive species, such as English ivy and Himalayan blackberry, will be removed prior to planting to ensure successful propagation of planted species.

- Area D

  Install seventy-four (74) willow cuttings within an area of six hundred sixty (660) sf to restore vegetation at the repaired wetland outlet, to live armor the outlet preventing erosion, and to install plant species that can compete with and even outcompete reed canarygrass and other non-native invasive weeds (**Figure 9**).

- Area E

  Install two hundred three (203) western red cedar trees at a density of ten (10) feet on center for an area of twenty thousand two hundred sixty-one (20,261) sf adjacent restored Areas A & B (**Figure 8**). Invasive species, such as English ivy and Himalayan blackberry, will be removed prior to planting to ensure successful propagation of planted species. Geofabric will be placed at a three (3)-foot radius around installed cedar trees to discourage the growth of these invasive plant species until the tree is large enough to shade out the invasive species.

6.9.2 Planting Specification

The summary of the planting plan and costs is provided in **Table 7**. The planting plan groups together wetland plantings in Areas A and B and groups together buffer plantings in Areas A and B. The wetland planting specifications for Areas A and B are provided in **Table 8**. The wetland buffer planting specifications for Areas A and B are provided in **Table 9**. Planting specifications for Area D are provided in **Table 10**. Planting specifications for Area E are provided in **Table 11**.

Table 7. Planting Plan Area Calculations

Areas	Planting Plan	Area		Estimated Costs	Planting Specifications	Comments
		SF	Acres			
A & B	Wetland Restoration Planting Plan Areas A & B	3,545	0.08	$1,100.10	Table 8	Grouped together wetland Areas A & B
A & B	Buffer Planting Plan Areas A & B	1,740.00	0.04	$499.53	Table 9	Grouped together wetland Areas A & B
D	Install Willow at Repaired Outlet	660	0.02	$74.22	Table 11	Willow would armor repaired wetland outlet & provide habitat
E	Buffer Enhancement with Western Red Cedar Trees	20,261.00	0.47	$1,266	Table 10	Cedars will transform buffer into vibrant forested habitat
Total		26,206	1.00	$2,940		

6.9.2.1 Wetland Restoration Planting Plan (Areas A & B)

The planting plan calls for the installation of diverse plant species in an area totaling three thousand five hundreds forty-five (3,545) sf to create a multilayered forested wetland vegetation community. Planting details are summarized in **Table 8** and illustrated in **Figure 8**.

The cost for plant stock covering the created wetland will cost an estimated $1,100. The plant species in the wetland will consist of native hydrophytic plant species. In contrast, the planting plan for the buffer area consists of planting upland conifers, shrubs, and herbs.

6.9.2.2 Buffer Restoration Planting Plan (Areas A &B)

The wetland buffer portions of Areas A & B would be enhanced through the installation of a variety of non-wetland trees, shrubs, in an area totaling one thousand seven hundred forty (1,740) sf costing $74.22 in pant stock (**Table 9; Figure 8**).

6.9.2.3 Area D Install Willow at Repaired Outlet

Install seventy-four (74) willow cuttings within an area of six hundred sixty (660) sf costing $74.22 (**Table10; Figure 9**). Restore vegetation at the repaired wetland outlet to live armor the outlet preventing erosion and to displace reed canarygrass and other non-native invasive weeds.

6.9.2.3 Area E Buffer Enhancement with Western Red Cedar Trees

Install western red cedar trees at ten (10) feet on center to enhance wetland buffers onsite in an area totaling twenty thousand two hundred sixty-one (20,261) sf in size costing $1,215.66 in plant stock (**Table 11; Figure 8)**.

Fertilizer and Irrigation.

A small amount of fertilizer will be added to the planting hole prior to installing the plant. An irrigation system will be installed in the planting area, if necessary, until the plants are established.

Table 8. Wetland Restoration Area

Wetland Restoration Planting Plan Areas A & B

Willow	Plant species	Scientific Name	Number	Container	Cost/plant	Cost
FAC	Sitka Willow	*Salix sitchensis*	19	3' cuttings	$0.60	$11.40
FAC	Scouler's Willow	*Salix scouleriana*	18	3' cuttings	$0.60	$10.80
FAC	Hooker's Willow	*Salix hookeriana*	18	3' cuttings	$0.60	$10.80
	Total		55			$83.09

Trees	Plant species	Scientific Name	Number	Container	Cost/plant	Cost
FACW	Oregon Ash	*Fraxinus latafolia*	6	1-gal	$6.00	$36.00
FAC	Western red cedar	*Thuja plicata*	6	1-gal	$6.00	$36.00
FAC	sitka sprice	*Picea sitchensis*	6	1-gal	$6.00	$36.00
	Total		18			$94.53

Shrubs	Plant species	Scientific Name	Number	Container		
FACW	Black twinberry	*Lonicera involucrata*	8	1-gal	$6.00	$48.00
FAC	Salmonberry	*Rubus spectabilis*	8	1-gal	$6.00	$48.00
FACW	Pacific ninebark	*Physocarpus capitatus*	8	1-gal	$6.00	$48.00
FACW	Red-osier dogwood	*Cornus stolonifera*	8	1-gal	$6.00	$48.00
FAC	Clustered rose	*Rosa pisocarpa*	8	1-gal	$6.00	$48.00
FAC	Nootka rose	*Rosa nutkana*	8	1-gal	$6.00	$48.00
FACW	Douglas spirea	*Spiraea douglasii*	7	1-gal	$6.00	$42.00
	Total		55			$332.34

Herbs	Plant species	Scientific Name	Number	Container		
OBL	slough Sedge	*Carex Obnupta*	16	1-gal	$6.00	$96.00
OBL	Small-fruited Bullrush	*Scirpus microcarpus*	16	1-gal	$6.00	$96.00
FACW	Soft Rush	*Juncus effusus*	16	1-gal	$6.00	$96.00
FAC	Lady Fern	*Athyrium filix-femina*	16	1-gal	$6.00	$96.00
FACW	Dagger-leaf Rush	*Juncus ensifolius*	17	1-gal	$6.00	$102.00
OBL	Hard-stem Bullrush	*Scirpus acutus*	17	1-gal	$6.00	$102.00
	Total		98			$590.83

Plant Types	Feet on center	Area (sf)	Plants/Acre	Plants/sf	# Plants
Willow	8	3,545	681	0.0156	55
Trees	15	3,545	194	0.0044	16
Shrubs	8	3,545	681	0.0156	55
Herbs	6	3,545	1210	0.0278	98

	Est. cost per plant	# Plants	Total Cost
Willow	$1.50	55	$83.09
Trees	$6.00	16	$94.53
Shrubs	$6.00	55	$332.34
Herbs	$6.00	98	$590.83
	Total	225	$1,100.80

Total Cost of Plants		$1,100.80

Table 9. Buffer Enhancement within Impact Areas A & B

Buffer Planting Plan Areas A & B

Trees	Plant species	Scientific Name	Number	Container	Cost/plant	Cost
FACU	Western Hemlock	*Tsuga heterophylla*	3	1-gal	$6.00	$18.00
FACU	Douglas fir	*Pseudotsuga menziesii*	3	1-gal	$6.00	$18.00
FAC	Western red cedar	*Thuja plicata*	2	1-gal	$6.00	$12.00
	Total		8			$46.40

Shrubs	Plant species	Scientific Name	Number	Container		
FACU	Thimbleberry	*Rubus parvflorus*	4	1-gal	$6.00	$24.00
FACU	Osoberry	*Oemleria cerasiformis*	4	1-gal	$6.00	$24.00
FACU	Red elderberry	*Sambucus racemosa*	4	1-gal	$6.00	$24.00
FAC-	Vine Maple	*Acer circinatum*	4	1-gal	$6.00	$24.00
FAC	Clustered rose	*Rosa pisocarpa*	4	1-gal	$6.00	$24.00
FAC	Nootka rose	*Rosa nutkana*	4	1-gal	$6.00	$24.00
FACU	Snowberry	*Symphoricarpos albus*	3	1-gal	$6.00	$18.00
	Total		27			$163.13

Herbs	Plant species	Scientific Name	Number	Container		
FACU	Trailing blackberry	*Rubus Ursinus*	8	1-gal	$6.00	$48.33
FACU	Cascade Oregongrape	*Mahonia repens*	8	1-gal	$6.00	$48.33
FACU	salal	*Gaultheria shallon*	8	1-gal	$6.00	$48.33
FACU	Sword Fern	*Polystichum munitum*	8	1-gal	$6.00	$48.33
FAC	False lilly of the valley	*Maianthemum dilatatum*	8	1-gal	$6.00	$48.33
FAC	Deer Fern	*Blechnum spicant*	8	1-gal	$6.00	$48.33
	Total		48			$290.00

Plant Types	Feet on center	Area (sf)	Plants/Acre	Plants/sf	# Plants
Trees	15	1,740	193.6	0.0044	8
Shrubs	8	1,740	680.625	0.0156	27
Herbs	6	1,740	1210	0.0278	48

	Est. cost per plant	# Plants	Total Cost
Trees	$6.00	8	$46.40
Shrubs	$6.00	27	$163.13
Herbs	$6.00	48	$290.00
	Total	83	$499.53

Total Cost of Plants		$499.53

Table 10. Planting Specifications for Repaired Outlet within Area D

Outlet Planting Plan

Willow	Plant species	Scientific Name	Number	Container	Cost/plant	Cost
	Sitka Willow	*Salix sitchensis*	24	3' cuttings	$1.00	$24.00
	Scouler's Willow	*Salix scouleriana*	24	3' cuttings	$1.00	$24.00
FAC	Hooker's Willow	*Salix hookeriana*	25	3' cuttings	$1.00	$25.00
	Total		73			$73.33

Plant Types	Feet on center	Area (sf)	Plants/Acre	Plants/sf	# Plants
Trees	3	660	4840	0.1111	73

	Est. cost per plant	# Plants	Total Cost
Trees	$1.00	73	$73.33
	Total	73	$73.33

Total Cost of Plants		$73.33

Table 11. Planting Specifications for Buffer Enhancement in Area E

Buffer Restoration

Trees	Plant species	Scientific Name	Number	Container	Cost/plant	Cost
FAC	Western red cedar	*Thuja plicata*	203	1-gal	$6.00	$1,215.66
	Total		203			$1,215.66

Plant Types	Feet on center	Area (sf)	Plants/Acre	Plants/sf	# Plants
Trees	10	20,261	435.6	0.0100	203

	Est. cost per plant	# Plants	Total Cost
Trees	$6.00	203	$1,215.66
	Total	203	$1,215.66

Total Cost of Plants		$1,215.66

7.0 MONITORING AND CONTINGENCY PLAN

7.1 Monitoring Methodology

The monitoring program will be conducted for a period of five (5) years as outlined by OMC 18.32.136(D). A baseline assessment will be conducted at the end of the construction phase. This information will be used as a baseline to compare subsequent monitoring events.

Field visits will be completed as follows:

i. At completion of construction of Restoration project (as-built report);

ii. Thirty (30) days after completion;

iii. Early in the first (1st) growing season after construction;

iv. End of the first (1st) growing season after construction;

v. Twice the second (2nd) year; and

vi. Once in years 3, 4, & 5 years

Monitoring will evaluate plant growth and establishment, condition of habitat quality, and wildlife usage in the enhancement area. If objectives are met at an earlier date, the applicant may request to end the monitoring phase earlier.

7.2 Vegetation

Permanent vegetation sampling points or transects will be established in the planting areas to incorporate the installed plants. The same monitoring point will be re-visited throughout the monitoring period. Vegetation will be recorded on the basis of relative percent cover. General plant health, percent survival, and plant species occurrence (including volunteer species) will also be recorded. Qualified personnel or the property owners will conduct all monitoring.

Photo-points will be established from which photographs will be taken throughout the monitoring period. These photographs will document general appearance and progress in plant community establishment in the buffer enhancement area. Review of the photos over time will provide a semi-quantitative representation of success of the buffer enhancement plan.

Monitoring and photo-point locations will be recorded to keep a record of enhancement success.

7.3 Wildlife

Birds, mammals, reptiles, amphibians, and invertebrates, which are readily observable (either by direct or indirect means), will be identified and recorded in the buffer enhancement area. Direct observations would include actual sightings, while indirect observations include tracks, scat, nests, song, or other indicative signs.

7.4 Success Criteria

Success of plant establishment within the enhancement area will be evaluated on the basis of both percent survival and percent cover of installed species. Planting success will be based on at least an eighty percent (80%) survival rate following each monitoring event. Successful plant establishment will also be met if there is at least a sixty percent (60%) areal cover of a combination of planted species and equivalent recruitment of native conifer species by the end of the third to fifth (5^{th})-year monitoring period.

7.5 Performance Standards

7.5.1 Hydrology

- Wetland restoration areas will be monitored for hydrology by installing groundwater monitoring wells in Areas A & B. The restored wetland must meet the USACE technical standard of fourteen (14) or more consecutive days of flooding or ponding, or a water table twelve (12) inches (30 cm) or less below the soil surface, during the growing season at a minimum frequency of five (5) years in ten (10) (50 percent or higher probability).
- Hydrology would be monitored through the installation of shallow groundwater monitoring wells and piezometers fitted with dataloggers.

7.5.2 Vegetation

- Eighty-percent (80%) survival rate following each monitoring event.
- Sixty percent or greater (≥60%) areal cover of a combination of planted species and equivalent recruitment of native woody species by the end of the third (3^{rd}) year monitoring period.
- Less than twenty percent (<20%) cover of invasive weeds that include reed canarygrass, Himalayan blackberry, and Scot's broom within the planting areas.

7.6 Maintenance (M) and Contingency (C)

7.6.1 Planting Plan

- Replace dead plants with the same species or a substitute species that meets the goals and objectives of the plan.
- If the performance standard for vegetation is not satisfied following each monitoring period, re-plant areas after reason for failure has been identified and resolved (*e.g.*, moisture regime, poor plant stock, disease, shade/sun conditions, wildlife damage, etc.). (M & C)
- If the areal cover of reed canarygrass exceeds twenty percent (20%) of the planting areas, measures will be taken to reduce areal cover below twenty percent (20%) through:
  1) adjusting water levels in the wetland using the flood control structure to flood or dry out the reed canarygrass,
  2) use City of Olympia approved herbicides, or
  3) mechanical means to physically remove the reed-canarygrass from the wetland and re-plant the area with native plant species. (M & C)

- Remove/control weedy or exotic invasive plants (e.g., Scot's broom, reed canarygrass, Himalayan blackberry, purple loosestrife, etc.) by manual or chemical means approved by City of Olympia, if not meeting performance standard following each monitoring event. Use of herbicides or pesticides within the buffer enhancement area would only be implemented if other measures failed or were considered unlikely to be successful. (C & M)
- Remove/control weedy or exotic invasive plants (e.g., Scot's broom, reed canarygrass, Himalayan blackberry, purple loosestrife, etc.) by manual or chemical means approved by City of Olympia. Use of herbicides or pesticides within the planting area would only be implemented if other measures failed or were considered unlikely to be successful. (C & M)

7.6.2 Hydrology

Performance standards pertaining to water regime are to be established, as defined below:

- If the wetland restoration areas do not maintain wetland hydrology, additional excavation or the placing of a bentonite mat will occur to retain wetland hydrology. (C)
- If the wetland restoration areas do not maintain wetland hydrology, adjust water levels in the wetland using the flood control structure to increase water levels.

8.0 COST ESTIMATE AND PERFORMANCE BOND

Item	Estimate cost
Plant Stock	$2,940
Planting crew	$1,200
Monitoring	$2,200
Contingency	$1,000
Total	$7,340
Total (125%)	$9,175

9.0 SUMMARY & CONCLUSION

The purpose of this Critical Areas Report is to identify and map Critical Areas on the subject property, satisfying City of Olympia regulatory requirements under Critical Areas. Potential wetlands, streams, steep slopes, and their buffers were evaluated on the subject property and within three hundred (≤300) feet of the subject property.

EnviroVector has been asked to analyze potential wetland and buffer impacts and to prepare a Restoration plan to off-set those potential impacts. This report analyses potential impacts to an on-site wetland to determine the extent of those impacts for the purpose of restoring wetland and buffer functions.

A wetland and stream evaluation were performed on the subject property on 23 March 2023.

Two (2) wetlands, labeled Wetlands A & B, and one (1) stream, Mission Creek, were identified and delineated on the subject property (**Figures 2 & 3; Appendix A, Photos 9-24 & 71-82**). An excavated

channel was identified that drains Wetland A to Mission Creek (**Figures 2 & 3; Appendix A, Photos 57-70**).

Wetlands A & B have been classified as a Category III wetland using the Department of Ecology (2014) Wetland Rating Form for Western Washington as required under Olympia Municipal Code (OMC) Chapter 18.32.510 ---*Wetland – Rating Systems*. Wetland A is a depressional wetland under the Department of Ecology (2014) Wetland Rating System (**Appendix L**).

Under Olympia Municipal Code (OMC) Chapter 18.32.535, Table 32-1---*Wetland Buffer Widths*, wetland buffers are calculated based on the habitat score determined by the Washington State Department of Ecology (2014) Wetland Rating System. Wetland A scored a "Low (L)" potential to provide habitat, a "Low (L)" landscape potential to support habitat, and a "High (H)" potential value to society (**Appendix L**). Wetlands that rate as an L, L, H (order of ratings are not important) receive a score of five (5) points for total habitat functions and require a one hundred forty (140)-foot standard buffer (**Insert 1; Figure 6**).

Impacts in Wetland A and its buffer were identified during the site evaluation (**Figure 6**). Wetland impacts appear to be the result of activities not associated with land use. These activities appear to be the result of one individual's artistic expression or hobby. These activities include wetland fill, tree cutting in the buffer, and grading in the wetland and buffer. Indirect impacts include the invasion of non-native, invasive weeds and the degradation of wetland and buffer habitat.

Wetland fill appears to take the form of a flower where flower peddles were formed using logs cut from trees in the buffer area (**Appendix A, Photos 35 & 36**). Soils were placed in the center of the flower-shaped fill surrounded by rings of concrete & asphalt pieces. This structure sits on a pile of branches. An additional pile of branches and soil occurs south of this flower structure (**Appendix A, Photo 37**). Pieces of concrete and asphalt are scattered around the northern portion of Wetland A and its buffer (**Appendix A, Photos 25-30, 38, 41, & 42**). The southern portion of Wetland A has been excavated, moving around soils (**Appendix A, Photos 47-49**). These soils appear to have been moved around to improve the flow of water to an excavated channel that drains Wetland A to Wetland B and Mission Creek. This channel was excavated on the southern end of Wetland A, draining the wetland and lowering the water level in the wetland.

Grading and tree cutting had occurred in the northern portion of the Wetland A buffer. Grading in the wetland buffer consists of vertical cuts into slopes (**Appendix A, Photos 7, 35, and 43-47**). Trees were cut in the wetland buffer (**Appendix A, Photos 31, 39, 46, & 52**). Roots were cut on at least one (1) of the existing vertical, living trees, creating a hazard for houses east of the subject property (**Appendix A, Photos 40, 50, & 51**). Logs for many of these trees were placed in artistic forms within Wetland A (**Appendix A, Photos 33, 35, & 36**).

The Wetland A buffer is severely degraded without significant wetland buffer functions. Indirect impacts include the invasion of non-native invasive weeds, particularly English ivy and Himalayan blackberry. These non-native invasive weeds displace native plant species with minimal benefit for wildlife species. English ivy kills trees, particularly deciduous (non-conifer) trees. English ivy climbs the trees smothering the tree and limiting the tree's capacity for photosynthesis, while creating a heavy weight for the tree to support (**Appendix A, Photos 53**). Eventually the ivy infested trees weaken and fall (**Appendix A, Photos 54**).

A channel was cut on the southern end of Wetland A, partially draining the wetland (**Appendix A, Photos 57-70**). The lowered water level creates an optimal environment for the proliferation of the non-native, invasive weed reed canarygrass in Wetland A. Reed canarygrass has replaced the wetland vegetation and is now the dominant wetland plant, forming a monotypical vegetation community. The undisturbed portions of Wetland B have little to no reed canarygrass. The excavated area on the southern portion of Wetland A is too deep for the growth of reed canarygrass. Seasonal water levels greater than twelve (>12) inches of the surface kills rhizomes and prevents seed germination.
The southern portion of Wetland A was excavated where soils were moved around. The grading in the southern portion of Wetland A appears to have been directed toward conveying water to the excavated channel to maximize the draining of Wetland A. However, the pond located at the excavated channel provides habitat for waterfowl and amphibians.

The general restoration strategy consists of restoring Wetland A and its buffer to pre-existing conditions prior to recent wetland and buffer impacts. Specifics of the proposed restoration plan includes removing fill material from Wetland A, restoring pre-existing contours in the buffer area, repair the Wetland A outlet, manage non-native invasive weeds, and install native plant species. The goal of the restoration plan is to restore and enhance Wetland A to improve wetland and buffer functions. Wetland structural diversity would be improved through the management of non-native invasive weeds and through the installation of native plant species.

Hydrological functions would be restored to pre-existing conditions through the restoration of the Wetland A outlet. Restoring the contours at the Wetland A outlet would increase water levels in Wetland A managing the current infestation of reed canarygrass.

Native plant species would be installed to replace the existing non-naïve, invasive weeds that have infested the wetland and buffer. The management of non-native invasive weeds would ensure planting success in the re-establishment of the wetland and buffer vegetation communities. The weed-infested wetland buffer would be transformed into a forested buffer vegetation community. Western red cedar would be installed to eventually shade out and discourage the germination of non-native, invasive weeds. Conifer needles acidify soils discouraging the growth and germination of non-native invasive weeds. A complete canopy of conifers would discourage the recolonization of non-native invasive weeds in the wetland buffer.

10.0 REFERENCES

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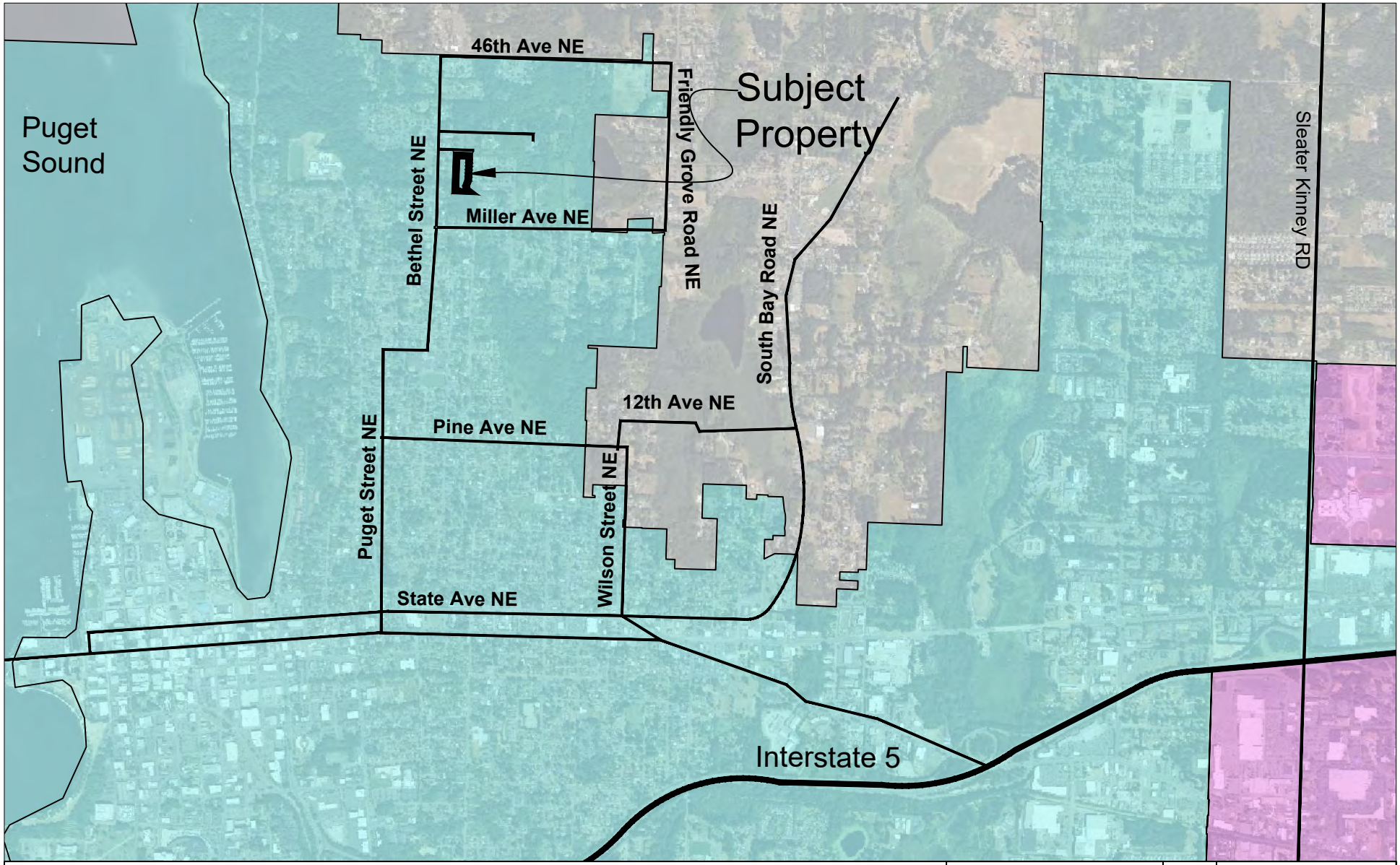
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FIGURES



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City of Olympia

City of Lacey

Figure 1

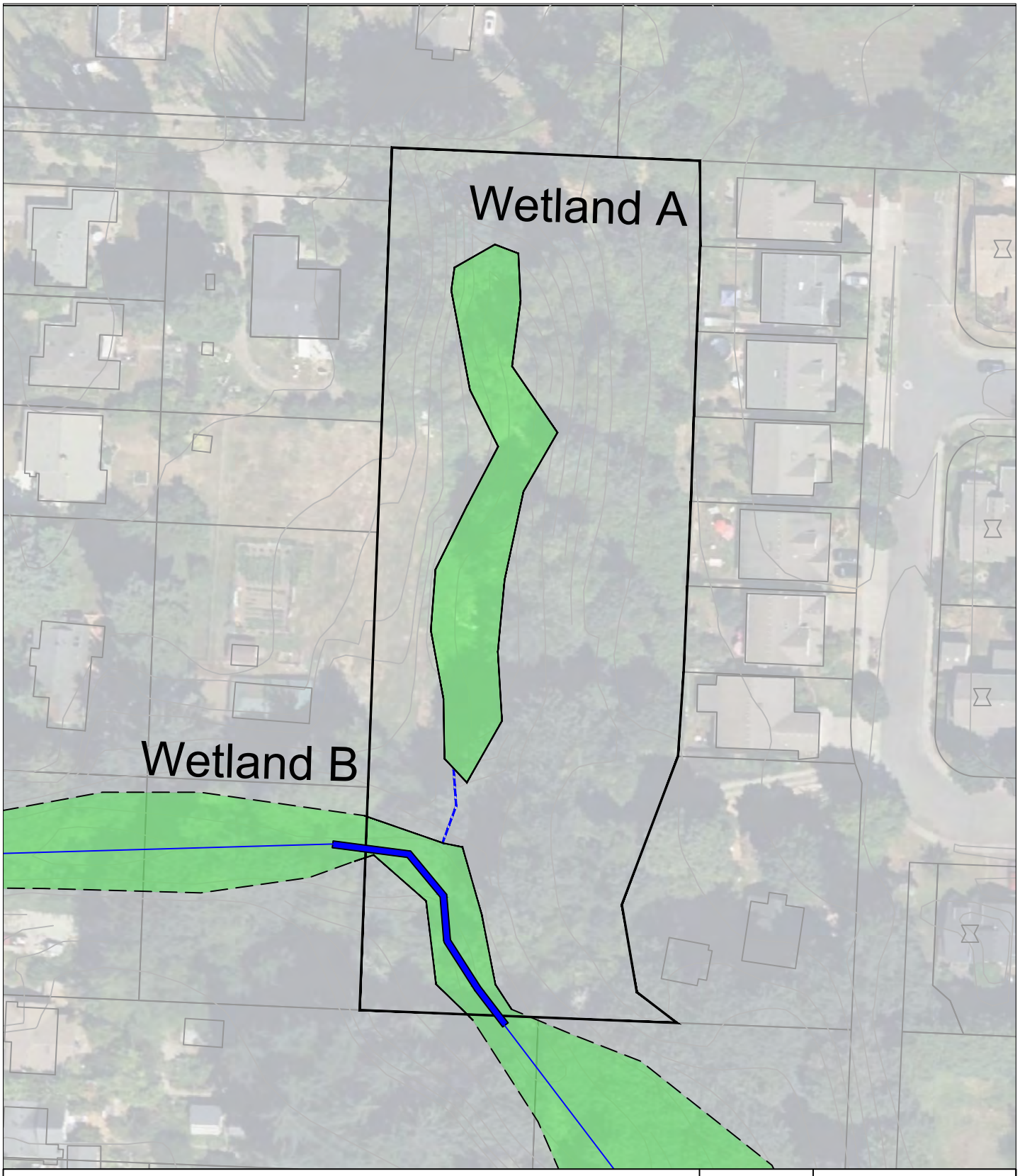
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Vicinity Map

Scale: 1" = 2000'

0 2000'

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Wetlands (Delineated)
Wetland (Estimated Offsite)
Stream (OHWM)
Ditch (OHWM)

Figure 2

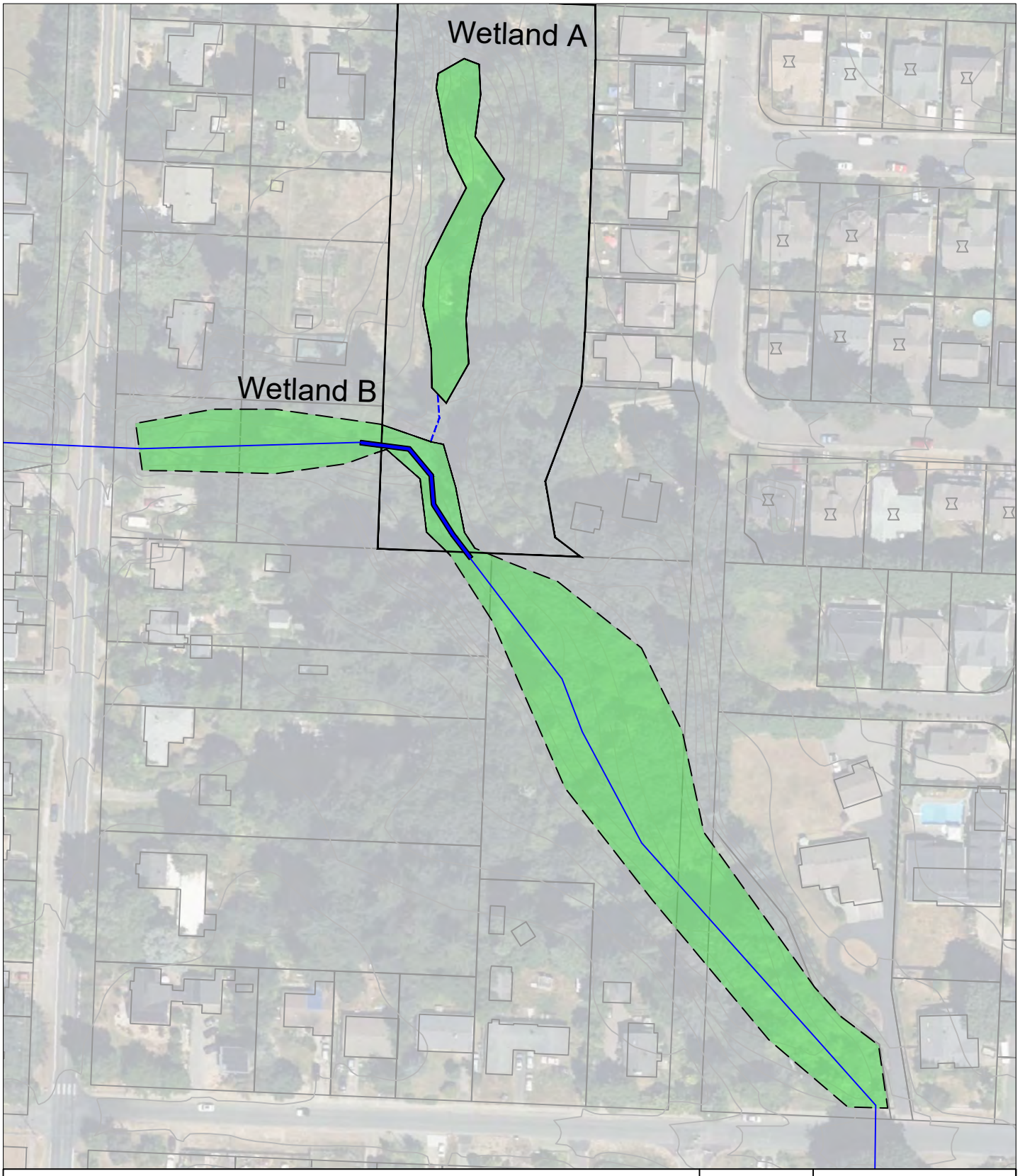
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Existing Conditions

Scale: 1" = 80'

0 80'

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Wetlands (Delineated)
Wetland (Estimated Offsite)
Stream (OHWM)
Ditch (OHWM)

Figure 3

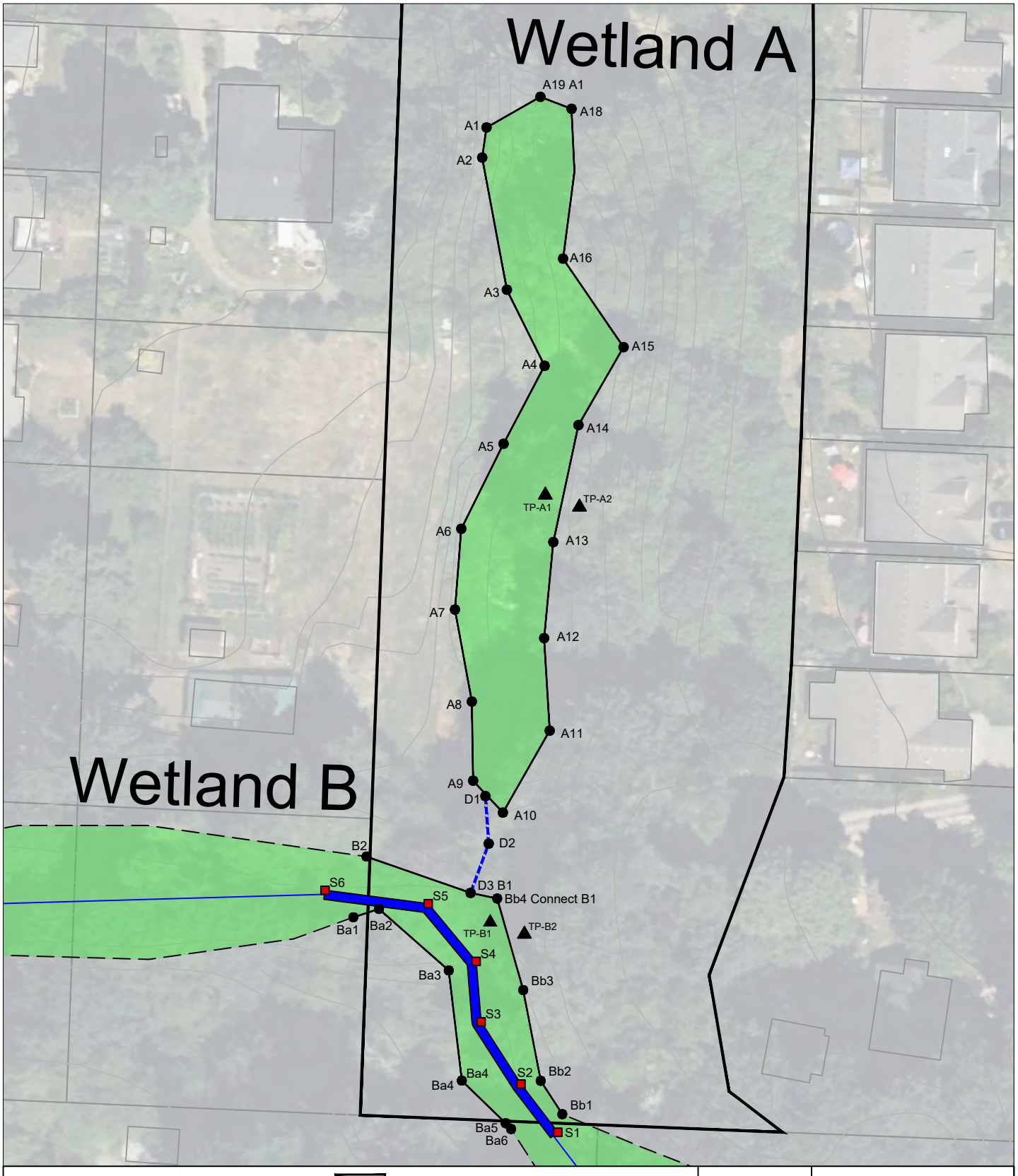
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Existing Conditions

Scale: 1" = 125'

0 125'

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Wetlands (Delineated)

Wetland (Estimated Offsite)

Stream (OHWM)

Ditch (OHWM)

A-1 — A-2 Wetland Delineation

TP A-2 Test Plot

Figure 4

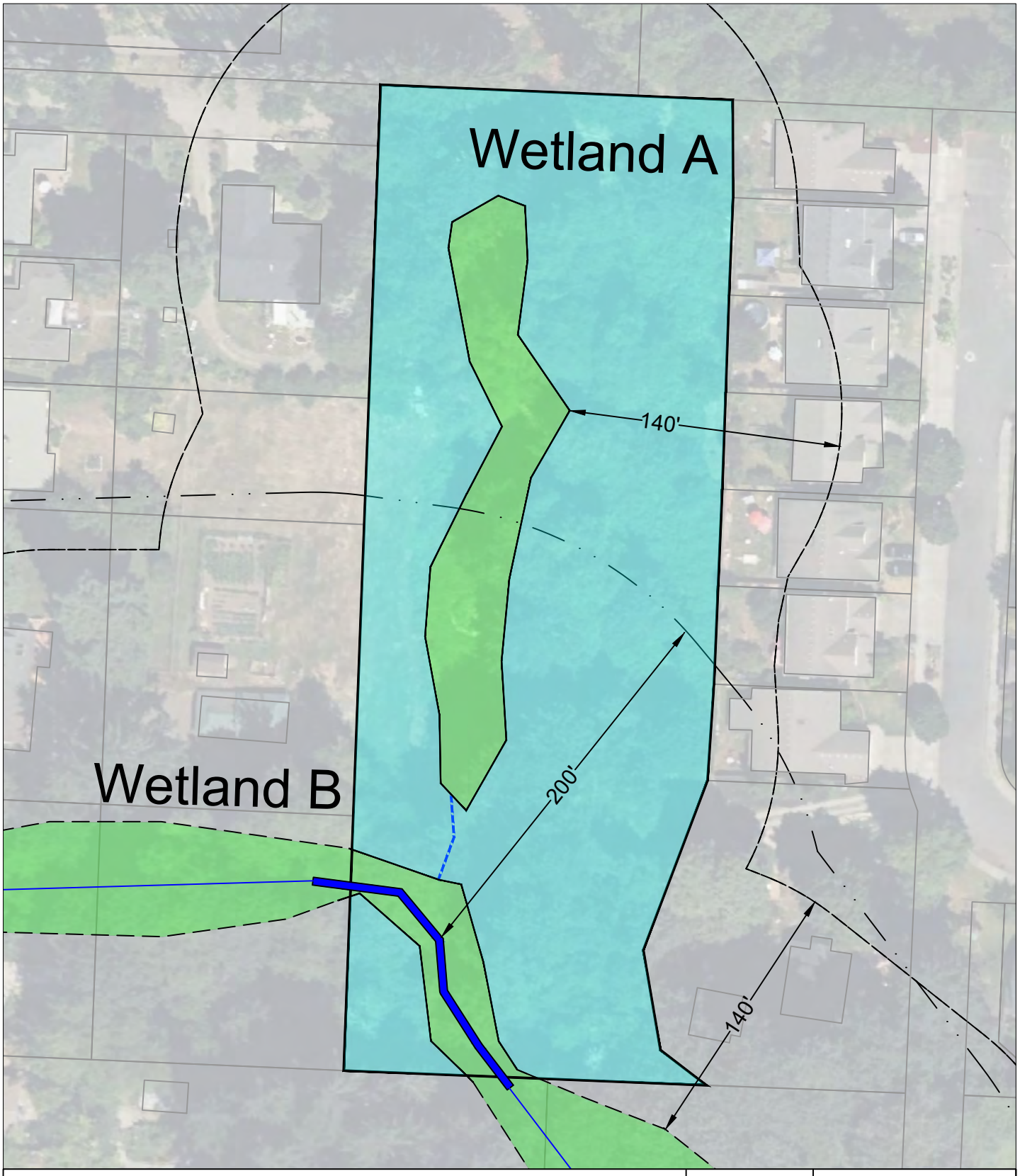
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Wetland Delineation

Scale: 1" = 60'

0 60'

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Wetland (Delineated, GNSS Located)
Wetland (Estimated)
Standard Buffer Onsite
Stream (OHWM)
Ditch (OHWM)

Figure 5

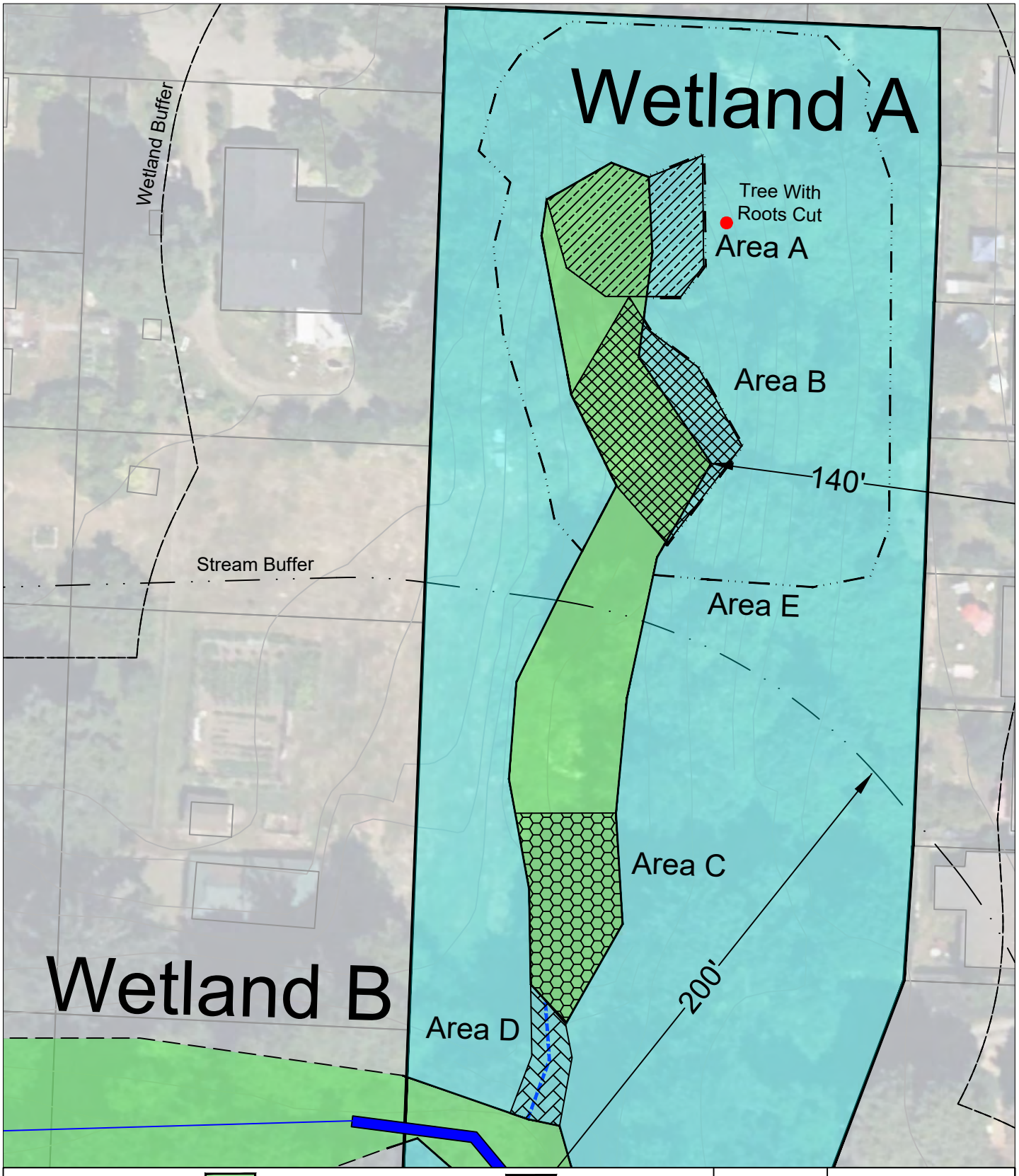
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Wetland and Stream Buffers

Scale: 1" = 70'

0 70'

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Wetland (Verified, GNSS Located)
Wetland (County Mapped, Unverified)
Standard Buffer Onsite
Area E: Trees Cut
Impact Area A: Wetland fill, soil alteration, plant disturbance
Impact Area B: Wetland fill, soil alteration, plant disturbance
Impact Area C: Excavation within wetland
Impact Area D: Cut deep channel draining wetland

Figure 6

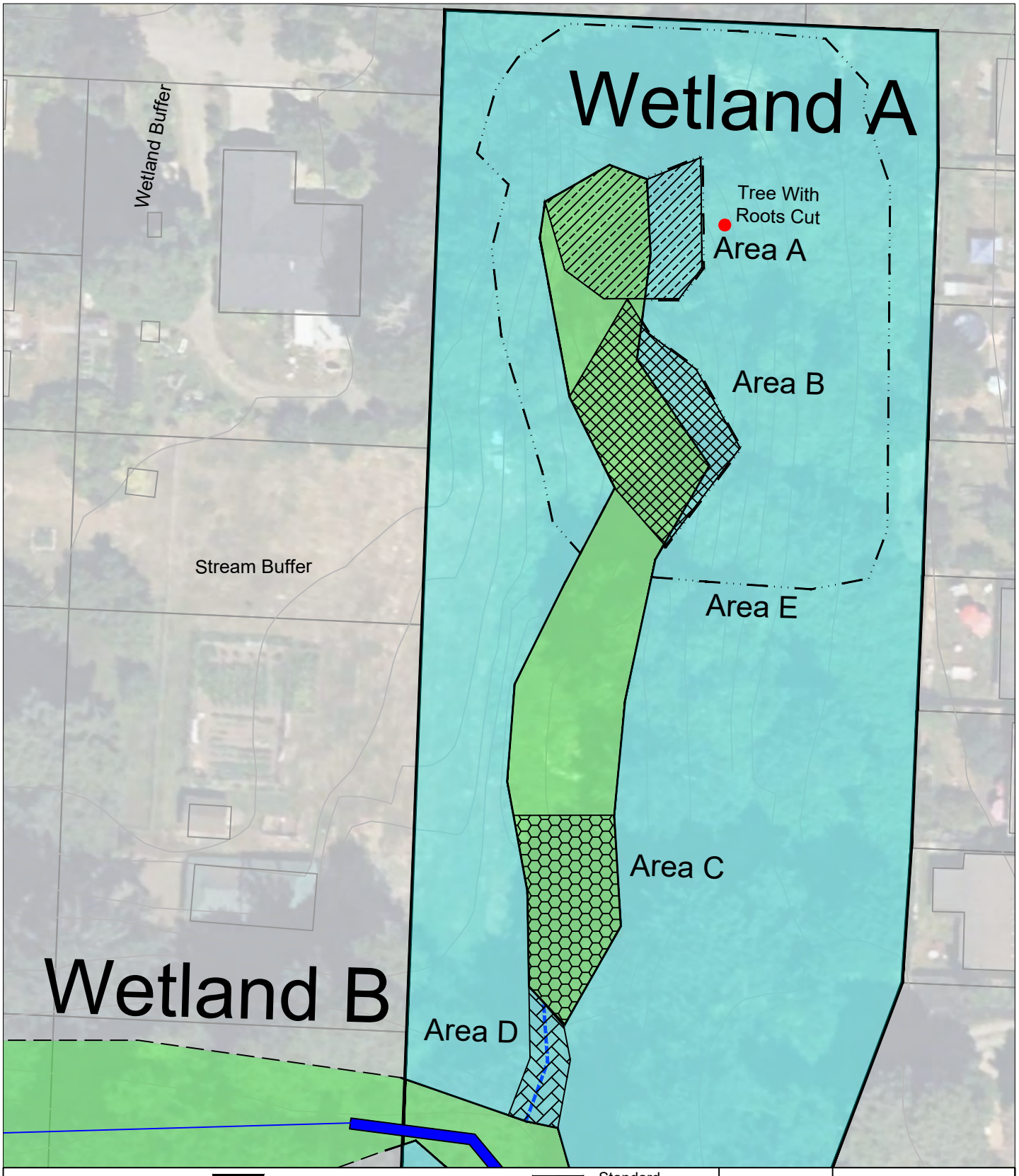
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Wetland & Buffer Impacts

Scale: 1" = 50'

0 50'

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Wetland (Verified, GNSS Located)

Wetland (County Mapped, Unverified)

Standard Buffer Onsite

Impact Area A: Remove wetland fill, repair buffer, install plants

Impact Area B: Remove wetland fill, repair buffer, install plants

Impact Area C: No Action

Area E: Install Western Red Cedar

Impact Area D: Fill in cut channel

Figure 7

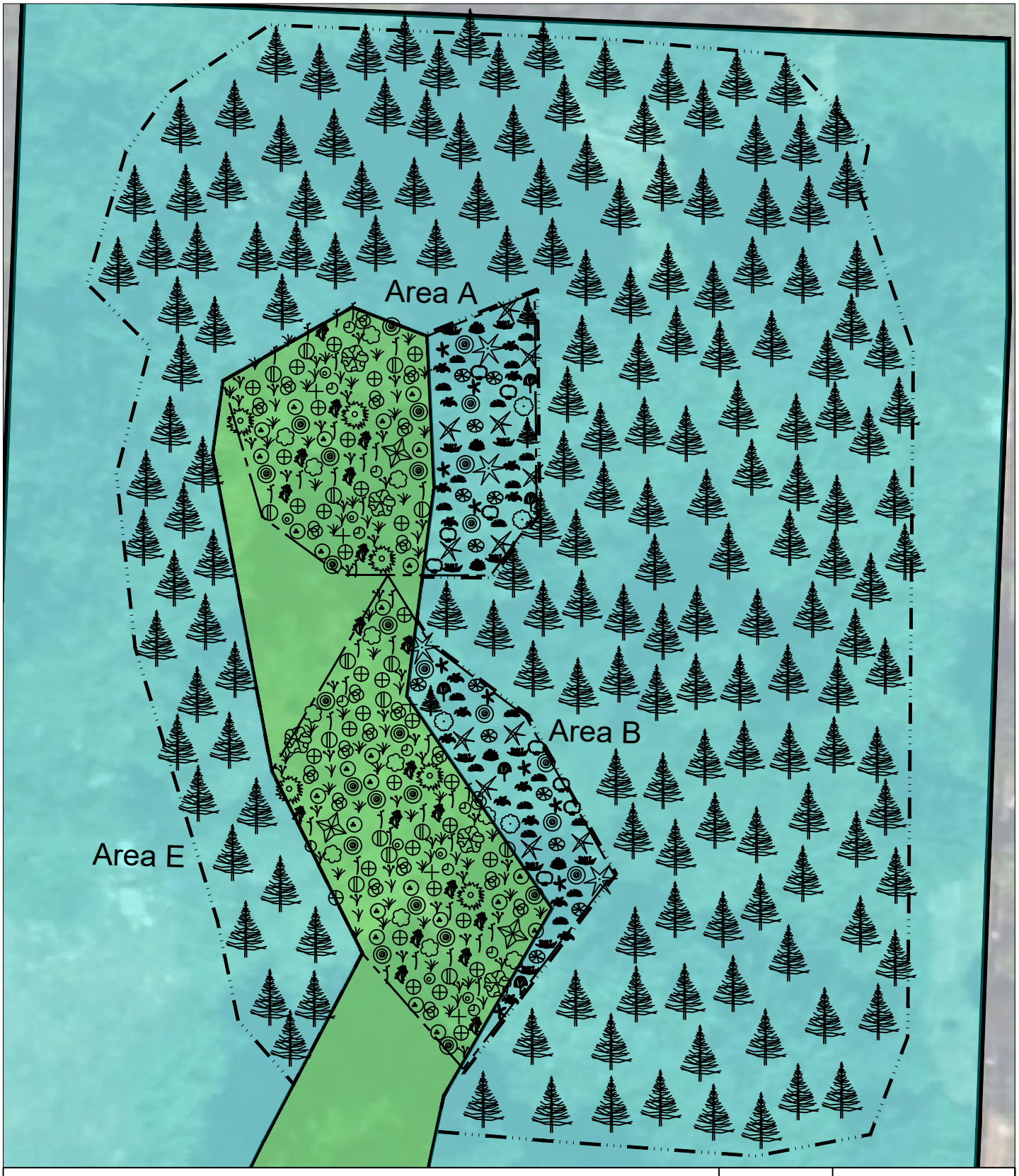
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Wetland Delineation

Scale: 1" = 50'

0 50'

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Wetland (Verified, GNSS Located)

Standard Buffer Onsite

Western Red Cedar (203)

Note: Plant legend is on Figure 10

Figure 8

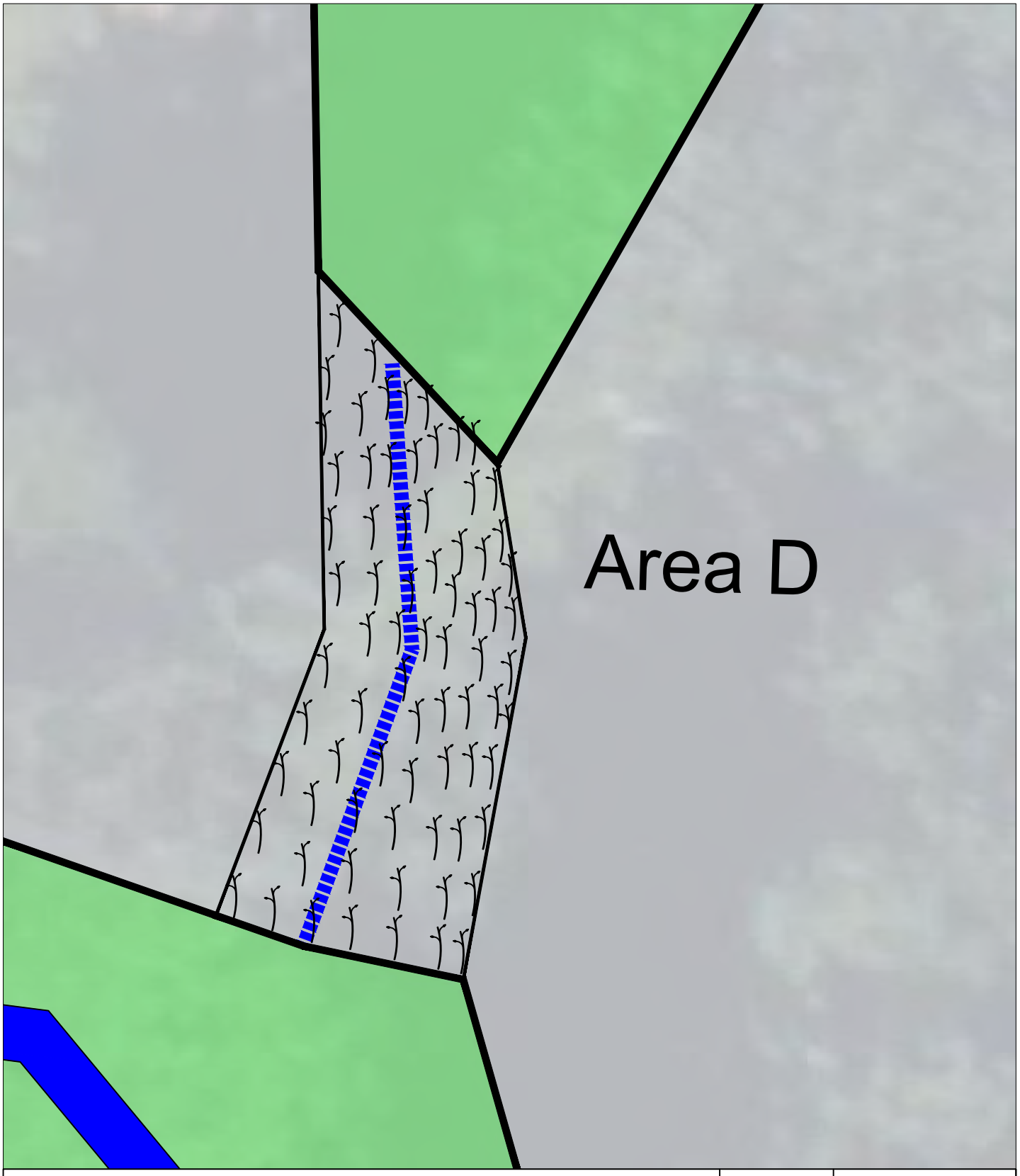
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Planting Plan

Scale: 1" = 25'

0 25'

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Wetland (Verified, GNSS Located)

Standard Buffer Onsite

Willow Cuttings (74; 3-ft on center in 660 sf)

Figure 9

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Planting Plan

Scale: 1" = 10'

0 10'

8 April 2023

Wetland Planting Schedule


Western Red Cedar


Oregon Ash


Sitka Spruce


Black Twinberry


Salmonberry


Pacific Ninebark


Douglas spirea


Small-fruited bulrush


Clustered Rose


Nootka Rose


Soft Rush


Slough Sedge


Lady Fern


Red-osier Dogwood


Dagger-leaf rush


Hard-stem bulrush


Willow

Buffer Planting Schedule


Western Red Cedar


Douglas Fir


Western Hemlock


Red Elderberry


False lily of the valley


Vine Maple


Osoberry


Thimbleberry


Clustered Rose


Nootka Rose


Snowberry


Trailing Blackberry


Cascade Oregongrape


Salal


Deer Fern


Sword Fern

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Figure 10
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Plant Legend

NTS

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Scrub-shrub Seasonally-flooded

Emergent Seasonally-flooded

Figure 11

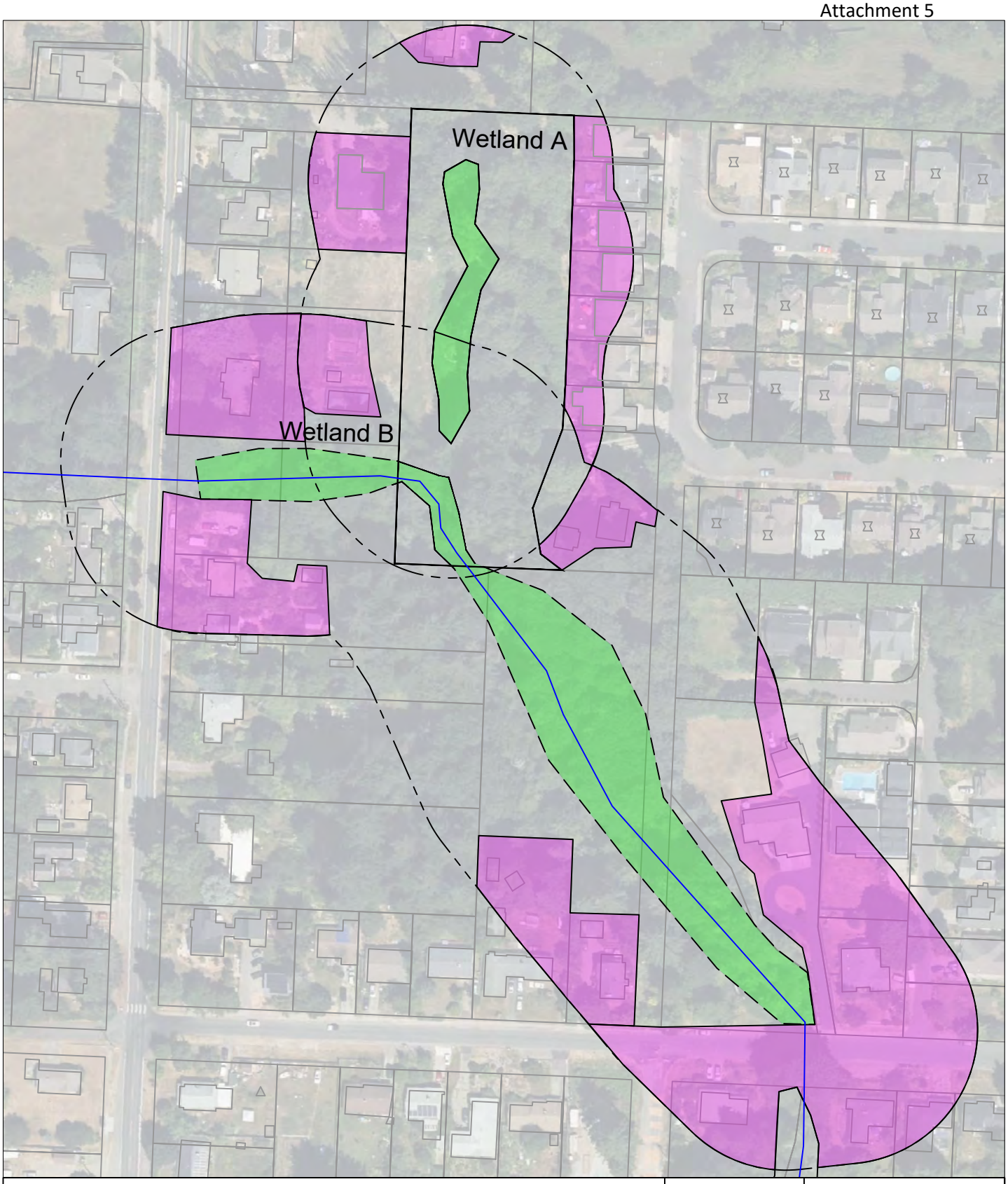
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Veg Class & Hydroperiod

Scale: 1" = 125'

0 125'

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Wetland (Delineated)
Wetland (Not Delineated)
Potential Pollutants
Wetland A (>10%)
Wetland B (>10%)

Figure 12

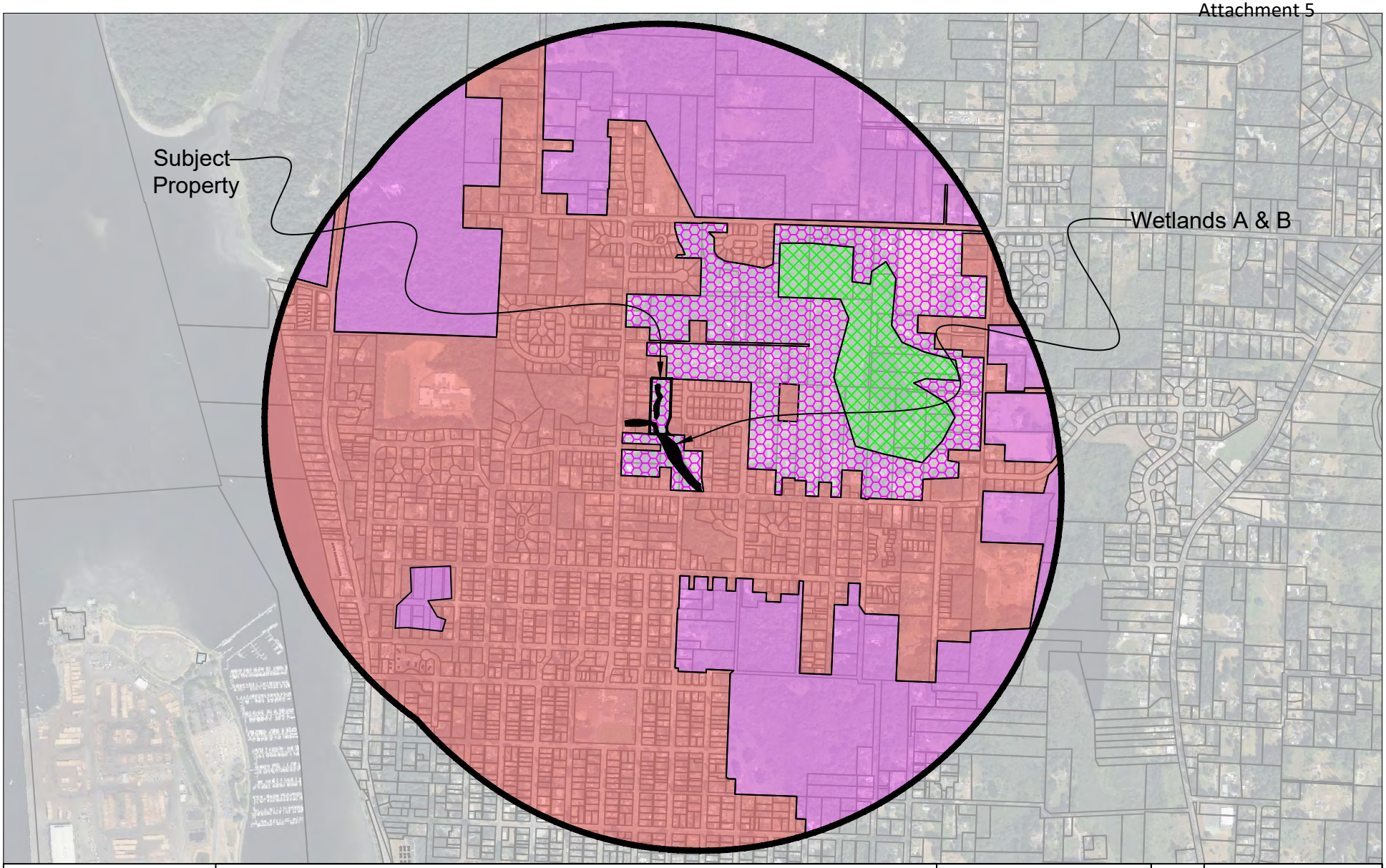
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Pollutants within 150'

Scale: 1" = 150'

0 150'

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Accessible Habitat (1,505,152 sf, 35 acres, 3.6%)

Accessible Moderate to Low Intensity Land Use (4,243,310 sf, 97 acres, 10%)

Total Undisturbed Habitat + Accessible Habitat (1,505,152 sf, 35 acres, 3.6%)

Low to Moderate Intensity Land Use (17,203,899 sf, 395 acres, 40.9%)

High Intensity Land Use (23,277,984 sf, 534 acres, 55%)

1km Polygon 42,074,606 sf, 965 acres

H2.1: 3.6% + 10.1%/2 = 8.65% (0 points) H2.2: 3.6% + 40.9%/2 = 24.05% (2 point) H2.3: High Intensity = 55.3% (-2 points)

Figure 13

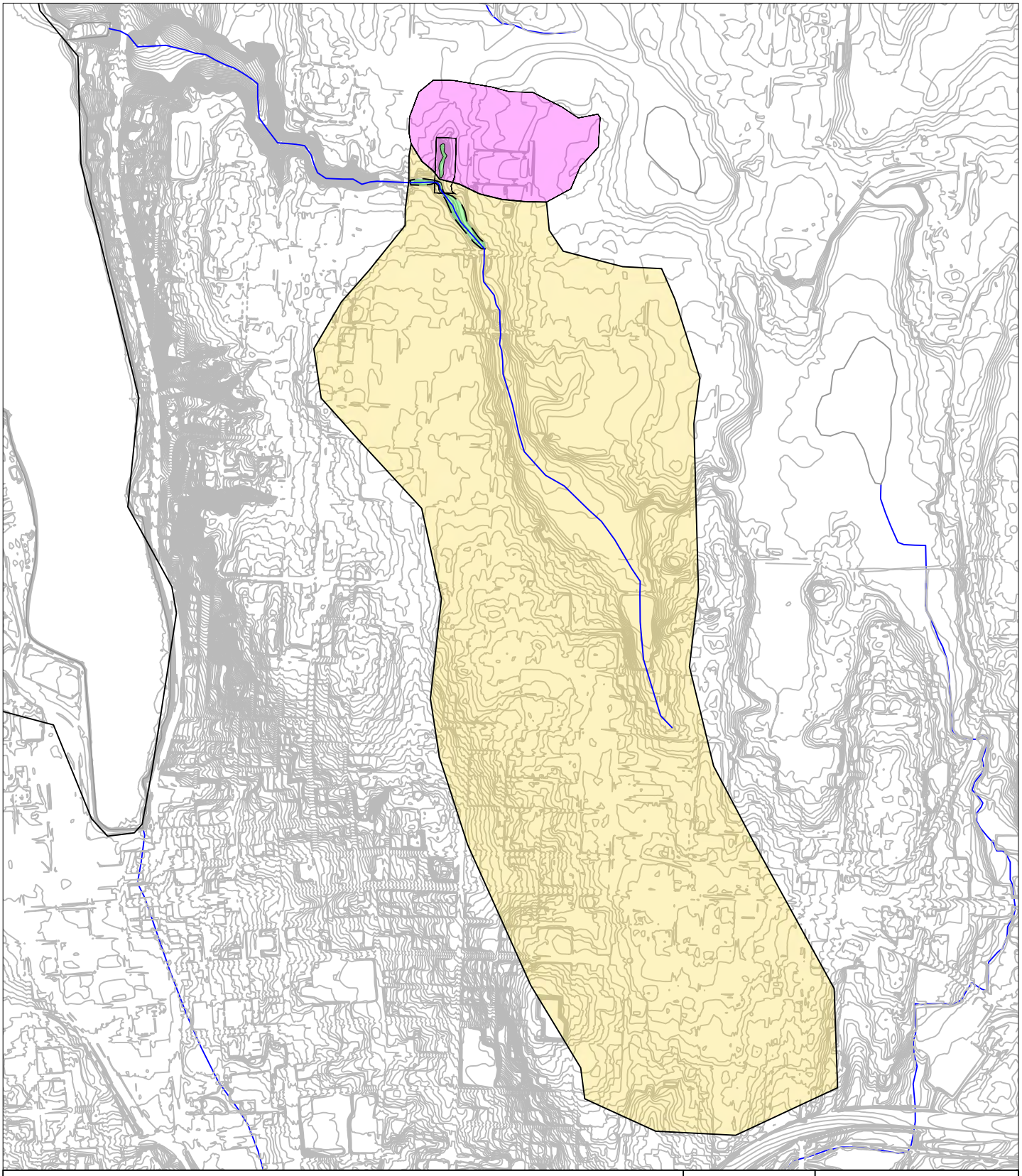
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1 KM Polygon

Scale: 1" = 1250'

0 1250'

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Wetland

Wetland A: Contributing Basin (>100x)

Wetland B: Contributing Basin (>100x)

Figure 14

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Contributing Basin

Scale: 1" = 1250'

0 1250'

8 April 2023

APPENDIX A

PHOTOGRAPHS

Subject Property


Photo 1. Neighbors appear to encroach onto subject property


Photo 2. North facing south on subject property


Photo 3. Reed canarygrass in Wetland A


Photo 4. Northern portion of subject property facing north


Photo 5. Neighbors appear to encroach onto subject property


Photo 6. Upland portion of property, trees cut


Photo 7. Cut material from slopes pushed into wetland


Photo 8. Central portion of property

Wetland A


Photo 9. Skunk cabbage (OBL) in Wetland A


Photo 10. Northern portion of Wetland A and buffer


Photo 11. Excavated area in southern portion of Wetland A


Photo 12. Skunk cabbage (OBL) in Wetland A



Photo 13. Flag A-7 on boundary of Wetland A



Photo 14. Flag A-8 on boundary of Wetland A



Photo 15. Flag A-14 on boundary of Wetland A

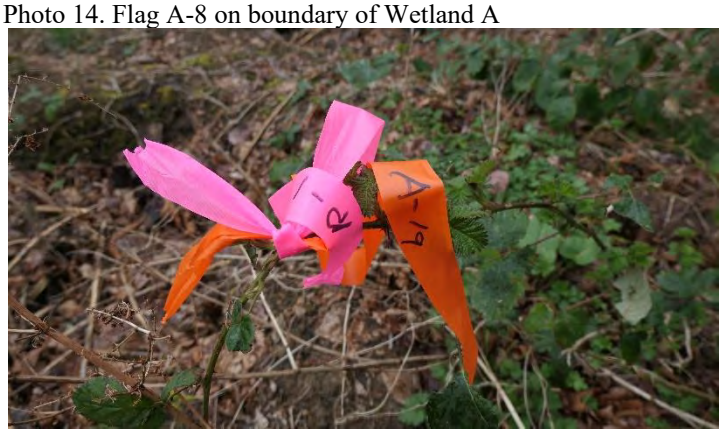


Photo 16. Flag A-19 on boundary of Wetland A


Photo 17. Record flag locations with Trimble at sub-foot accuracy


Photo 18. Excavated southern portion of Wetland A


Photo 19. Excavated southern portion of Wetland A

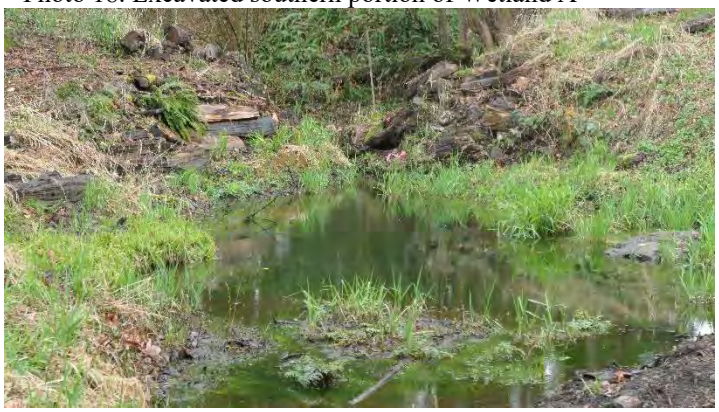

Photo 20. Excavated southern portion of Wetland A



Photo 21. Test Plot TP-A1, soils & reed canarygrass



Photo 22. Test Plot TP-A1, water parsley (OBL)


Photo 23. Test Plot TP-A1, upland soils and plants, no hydro


Photo 24. Test Plot TP-A1, upland soils and plants, no hydro

Wetland A Impacts


Photo 25. Asphalt, logs, concrete, and fill in wetland A


Photo 26. Asphalt, concrete, logs, and fill in wetland A


Photo 27. Asphalt, concrete, logs, and fill in wetland A


Photo 28. Asphalt, concrete, logs, and fill in wetland A


Photo 29. Concrete chunks in Wetland A


Photo 30. Asphalt chunks in Wetland A


Photo 31. Trees cut in Wetland A buffer


Photo 32. Trees cut in Wetland A buffer


Photo 33. Artistic fill in Wetland A, logs, soils, asphalt, concrete


Photo 34. Asphalt in Wetland A and wetland buffer


Photo 35. Artistic fill in Wetland A, logs, soils, asphalt, concrete


Photo 36. Artistic fill in Wetland A, logs, soils, asphalt, concrete


Photo 37. Large log and brush pile in Wetland A


Photo 38. Concrete chunks in Wetland A


Photo 39. Trees cut in Wetland buffer


Photo 40. Roots cut on standing tree causes hazard


Photo 41. Concrete trash in Wetland A and buffer


Photo 42. Concrete trash in Wetland A and buffer


Photo 43. Cut slopes and wetland fill


Photo 44. Slopes cut in buffer on northern portion of property


Photo 45. Slopes cut in buffer on northern portion of property


Photo 46. Cut slopes and cut trees in wetland buffer


Photo 47. Cut slopes in wetland buffer


Photo 48. Impact areas are flagged


Photo 49. Log and brush pile


Photo 50. Roots cut on standing tree, causing hazard


Photo 51. Roots cut on standing tree, causing hazard


Photo 52. Trees cut in buffer area


Photo 53. English ivy is killing trees in buffer


Photo 54. English Ivy covers the ground in buffer


Photo 55. Soils were excavated and placed in soils pile


Photo 56. Excavation in southern portion of Wetland A

Cut Channel Draining Wetland A


Photo 57. Excavated ditch draining Wetland A


Photo 58. Excavated ditch draining Wetland A


Photo 59. Excavated ditch draining Wetland A


Photo 60. Excavated ditch draining Wetland A


Photo 61. Logs from cut trees used to armor excavated ditch


Photo 62. Logs from cut trees used to armor excavated ditch


Photo 63. Logs from cut trees used to armor excavated ditch


Photo 64. Logs from cut trees used to armor excavated ditch

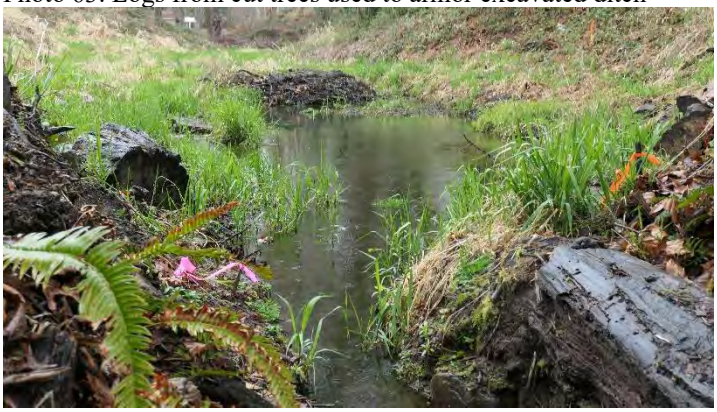

Photo 65. Excavations in wetland to enhance draining of wetland


Photo 66. Cut channel and armored bank


Photo 67. Delineated cut ditch at Flag D-2



Photo 68. Delineated cut ditch at Flag D-2


Photo 69. Delineated cut ditch at Flag D-3


Photo 70. Delineated cut ditch at Flag D-3

Wetland B


Photo 71. Wetland B Flag Ba-1, well-defined wetland boundary


Photo 72. Wetland B Flag Ba-1, well-defined wetland boundary


Photo 73. Wetland B, well-defined wetland edge


Photo 74. Scrub-shrub wetland


Photo 75. Wetland B, disturbed area near cut ditch


Photo 76. Wetland B, disturbed area near cut ditch

Mission Creek



Photo 77. Mission Creek at Flag S-1



Photo 78. Mission Creek at Flag S-2


Photo 79. Mission Creek in Wetland B



Photo 80. Mission Creek at Flag S-6


Photo 81. Mission Creek through Wetland B

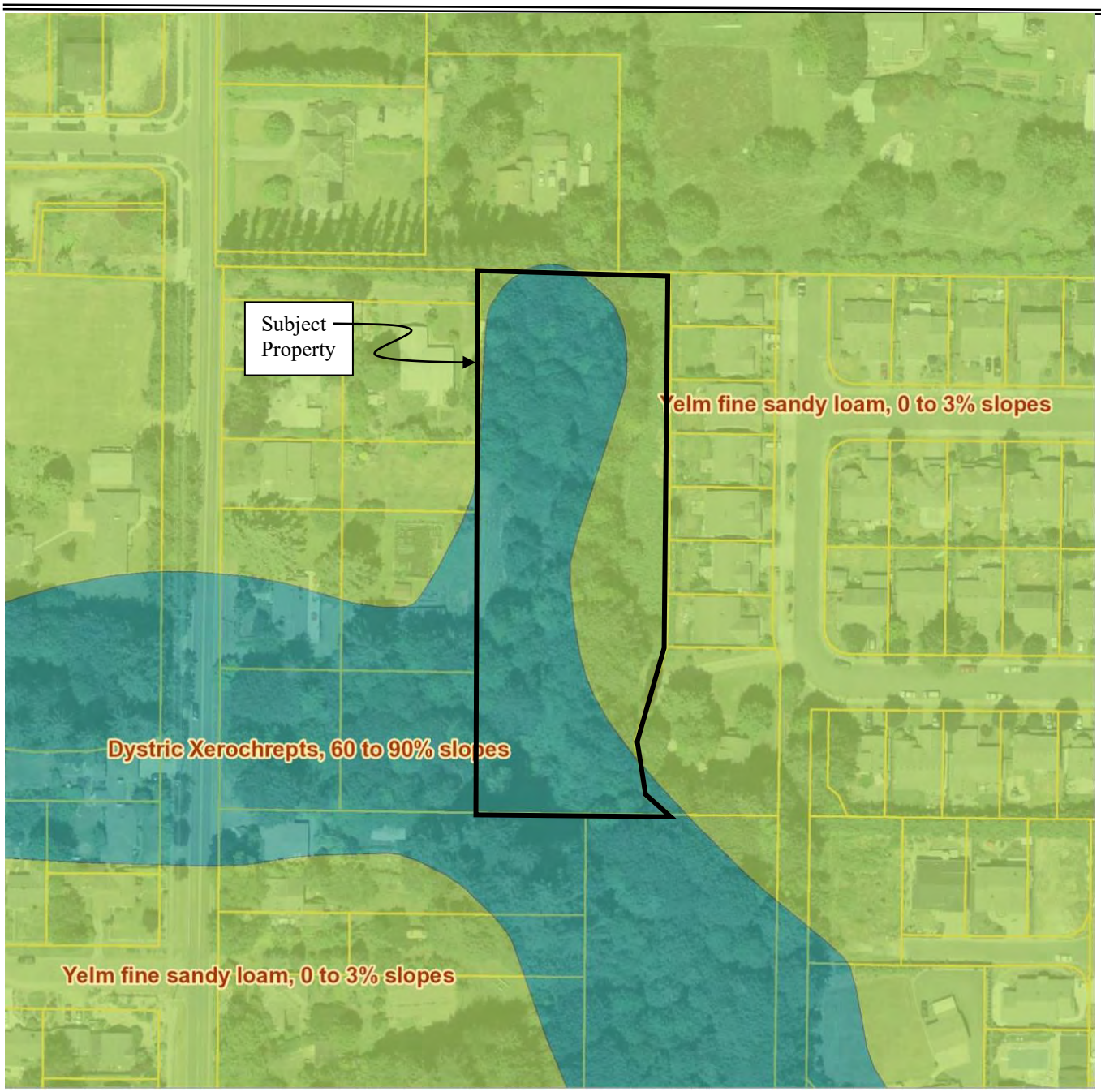

Photo 82. Mission Creek delineation of OHWM

Appendix B

Thurston County

Geodata Center

Soils Survey


Subject Property
Yelm fine sandy loam, 0 to 3% slopes
Dystric Xerochrepts, 60 to 90% slopes
Yelm fine sandy loam, 0 to 3% slopes

Appendix C

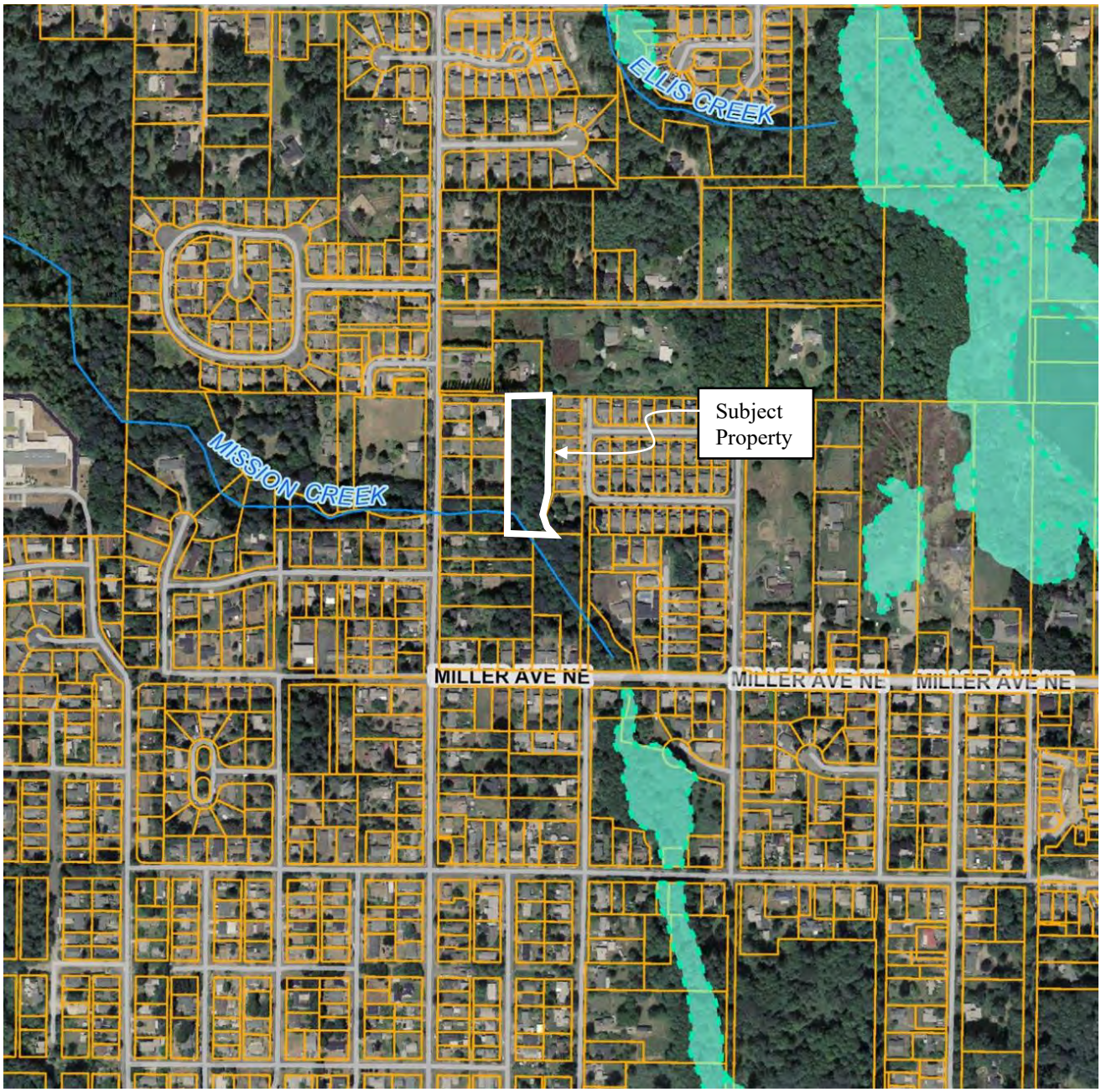
National Wetlands Inventory (NWI)


National Wetlands Inventory
surface waters and wetlands
ABOUT
GET DATA
PRINT
FIND LOCATION
BASEMAPS
MAP LAYERS
Wetlands
Riparian
Riparian Mapping Areas
Data Source
Source Type
Image Scale
Image Year
Areas of Interest
FWS Managed Lands
Historic Wetland Data
Measure
LEGEND
Subject Property
RIUBH
Mission Creek
1:1,128
47.063 | -122.884
U.S. Fish and Wildlife Service, National Standards and Support Team, wetlands_team@fws.gov | Maxar, Microsoft | City of Olympia, Esri, HER...
esri

Appendix E

Thurston County

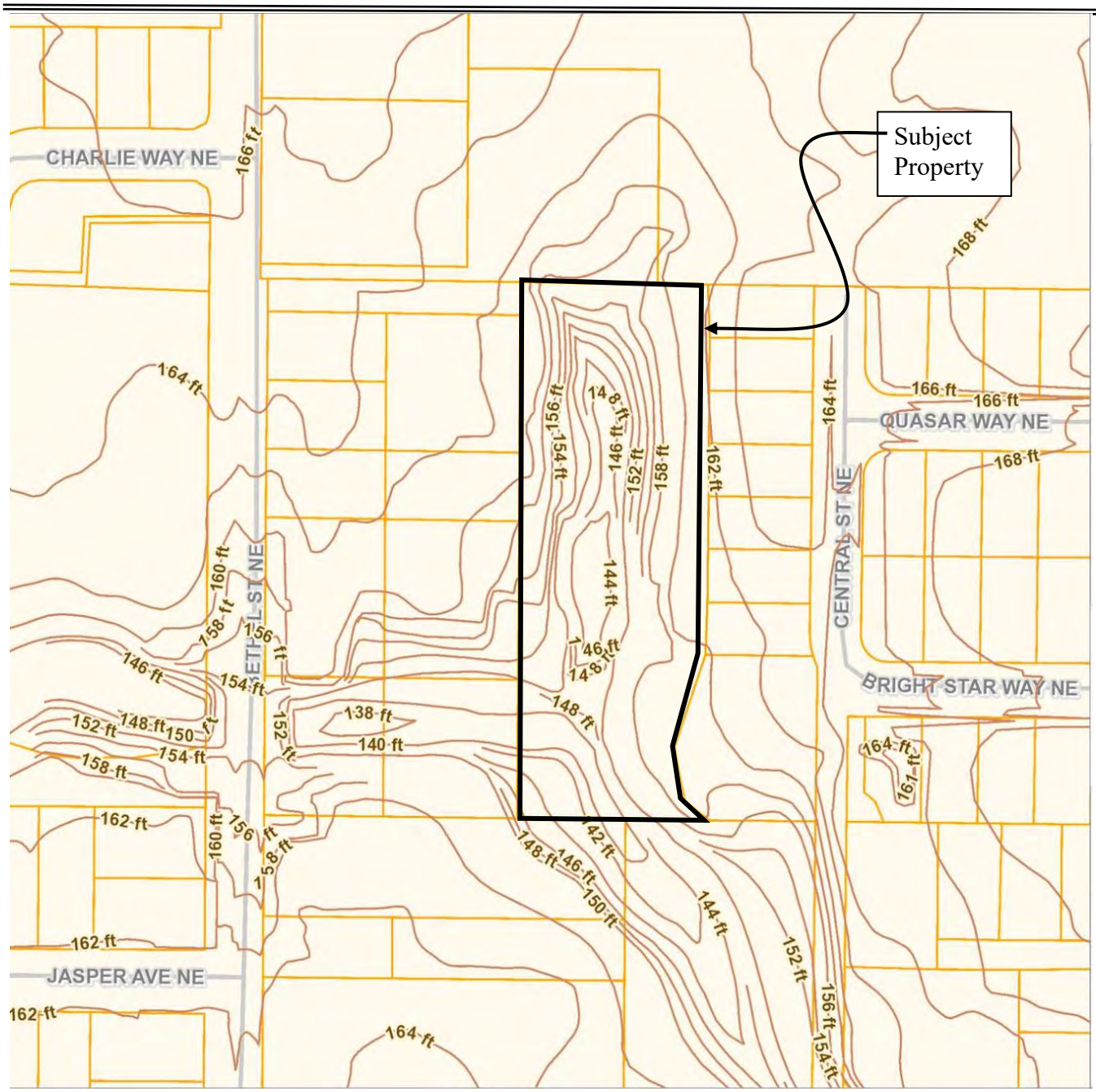
Geodata Center Database


ELLIS CREEK
Subject Property
MISSION CREEK
MILLER AVE NE
MILLER AVE NE
MILLER AVE NE

Appendix F

Thurston County

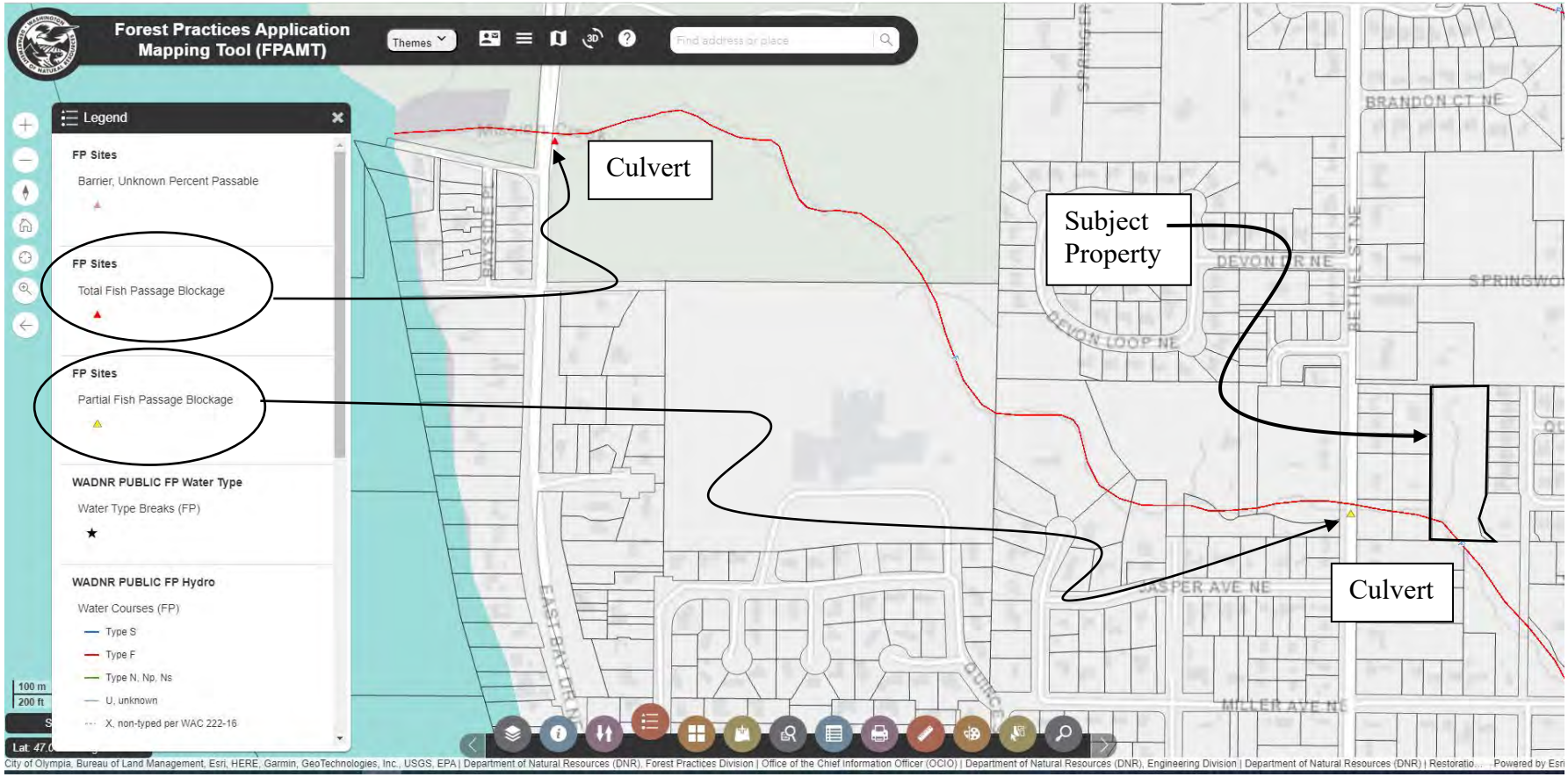
Contours


Subject Property
CHARLIE WAY NE
QUASAR WAY NE
BRIGHT STAR WAY NE
JASPER AVE NE
SETH L ST NE
CENTRAL ST NE
166 ft
168 ft
164 ft
162 ft
160 ft
158 ft
156 ft
154 ft
152 ft
150 ft
148 ft
146 ft
144 ft
142 ft
140 ft
138 ft
161 ft

Appendix G

State Department of Natural Resources (DNR)

Water Typing Database

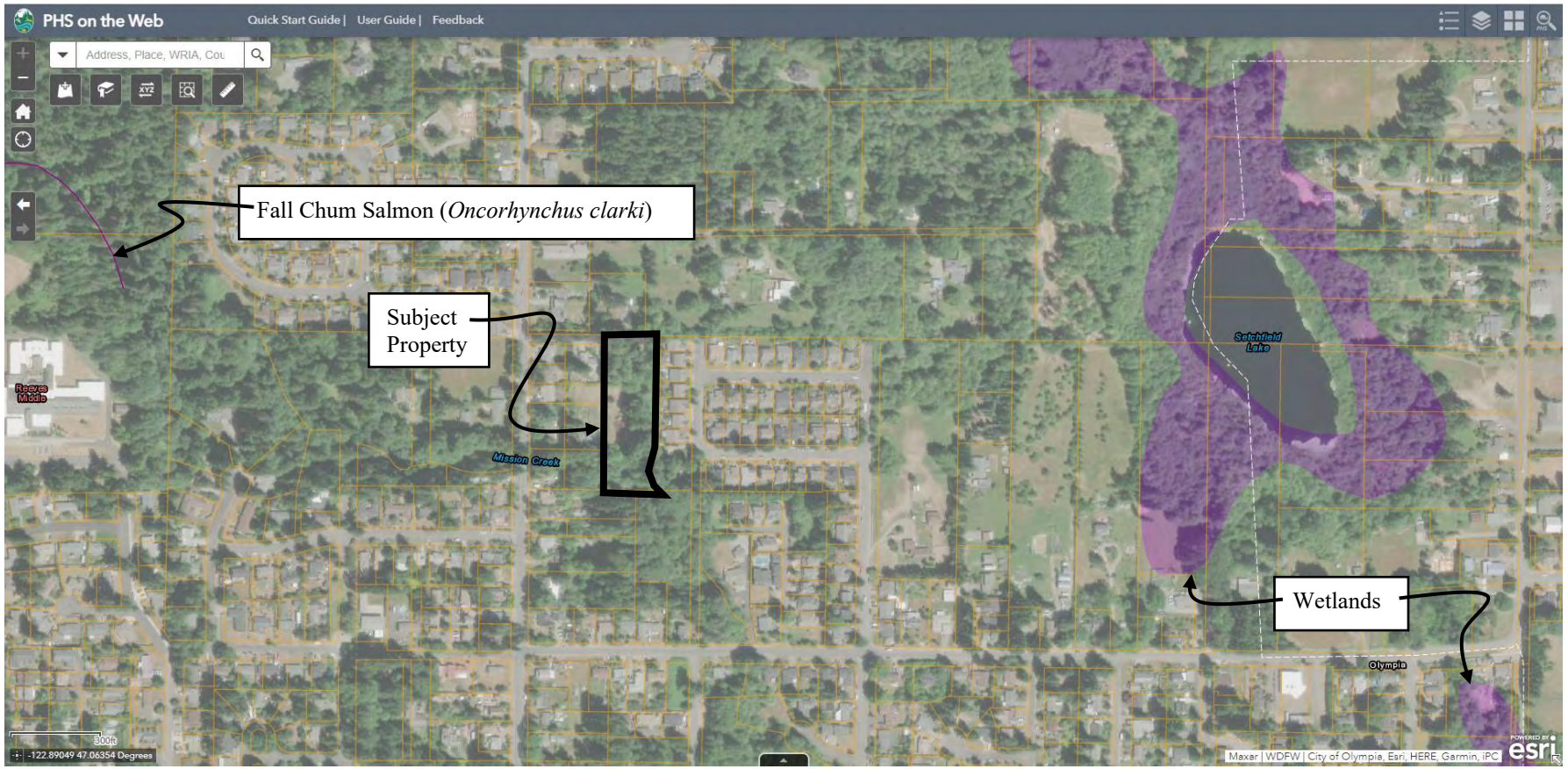

Forest Practices Application Mapping Tool (FPAMT)
Themes
Find address or place
Legend
FP Sites
Barrier, Unknown Percent Passable
FP Sites
Total Fish Passage Blockage
FP Sites
Partial Fish Passage Blockage
WADNR PUBLIC FP Water Type
Water Type Breaks (FP)
WADNR PUBLIC FP Hydro
Water Courses (FP)
Type S
Type F
Type N, Np, Ns
U, unknown
X, non-typed per WAC 222-16
Culvert
Subject Property
Culvert
BRANDON CT NE
DEVON LOOP NE
JASPER AVE NE
MILLER AVE NE
EAST BAY DR NE
City of Olympia, Bureau of Land Management, Esri, HERE, Garmin, GeoTechnologies, Inc., USGS, EPA | Department of Natural Resources (DNR), Forest Practices Division | Office of the Chief Information Officer (OCIO) | Department of Natural Resources (DNR), Engineering Division | Department of Natural Resources (DNR) | Restoratio...
Powered by Esri

Appendix H

Washington Department of Fish and Wildlife (WDFW)

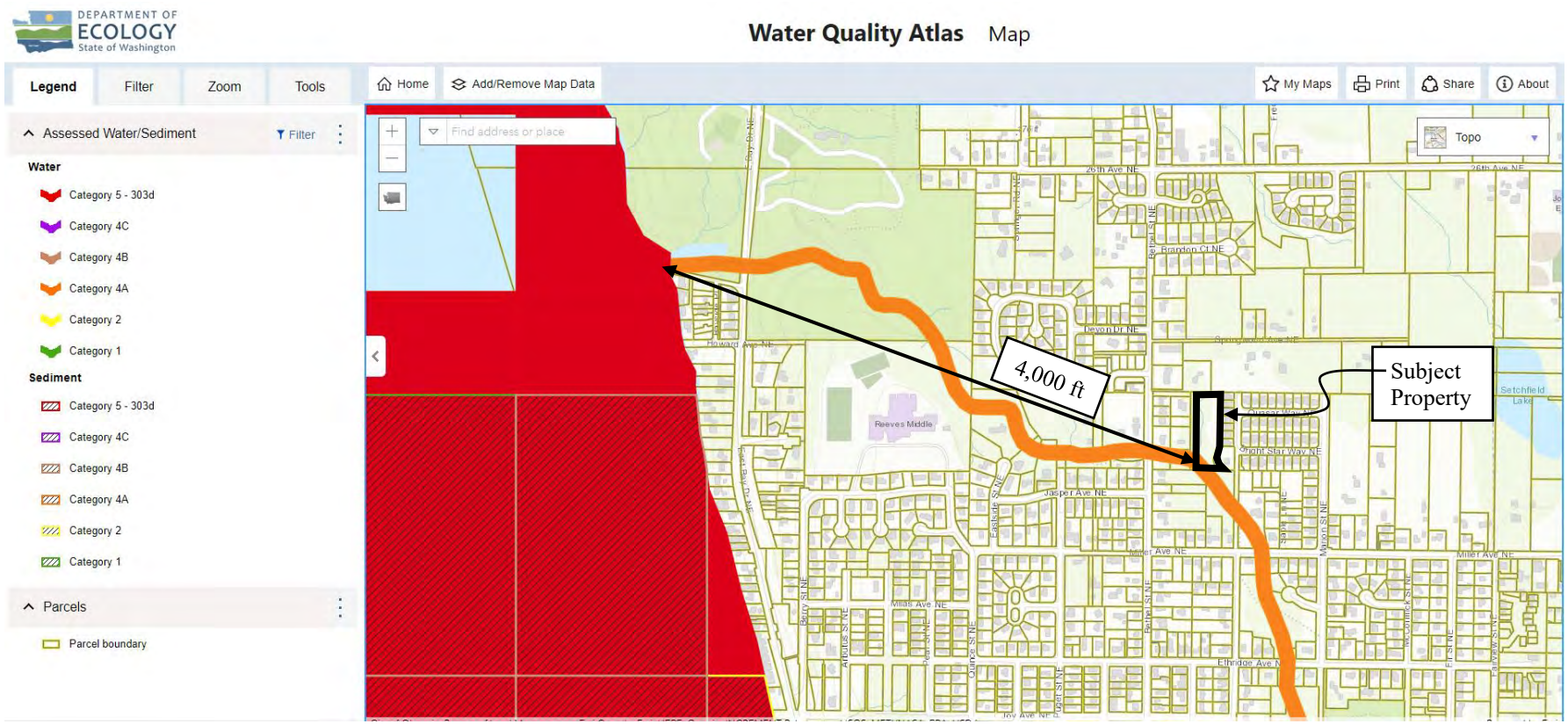
Priority Habitats and Species (PHS)

Database


PHS on the Web
Quick Start Guide | User Guide | Feedback
Address, Place, WRIA, Cou
Fall Chum Salmon (*Oncorhynchus clarki*)
Subject Property
Wetlands
Reeves Middle
Mission Creek
Selchfield Lake
Olympia
300ft
-122.89049 47.06354 Degrees
Maxar | WDFW | City of Olympia, Esri, HERE, Garmin, iPC
esri

Appendix I

303(d)


DEPARTMENT OF ECOLOGY State of Washington
Water Quality Atlas Map
Legend
Filter
Zoom
Tools
Home
Add/Remove Map Data
My Maps
Print
Share
About
Assessed Water/Sediment
Filter
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
Parcels
Parcel boundary
Find address or place
Topo
4,000 ft
Subject Property
Reeves Middle
Howard Ave NE
Jasper Ave NE
Miller Ave NE
Millas Ave NE
Ethridge Ave NE
Brandon Ct NE
Devon Dr NE
Bright Star Way NE
26th Ave NE
Setchfield Lake

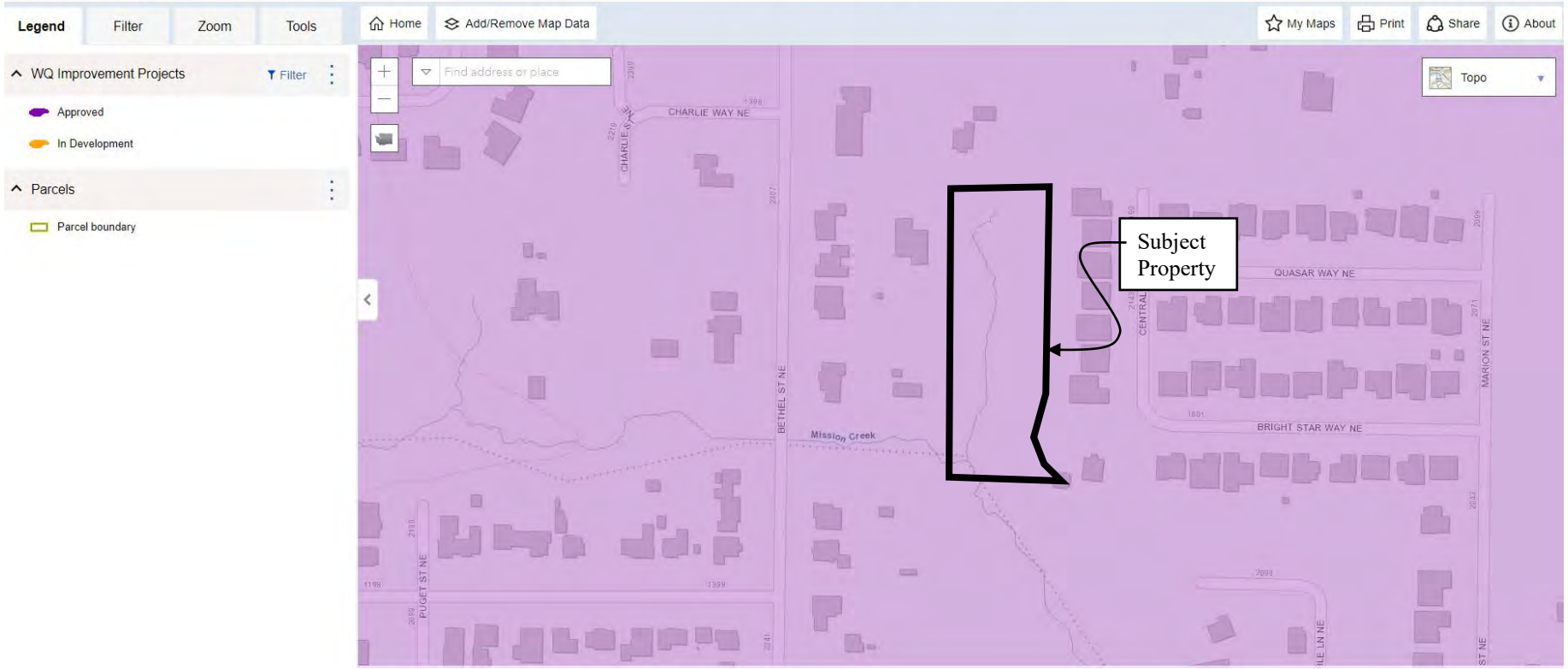
Appendix J

Department of Ecology Water Quality Atlas Database

TMDL

DEPARTMENT OF ECOLOGY State of Washington

Water Quality Atlas Map



Appendix K

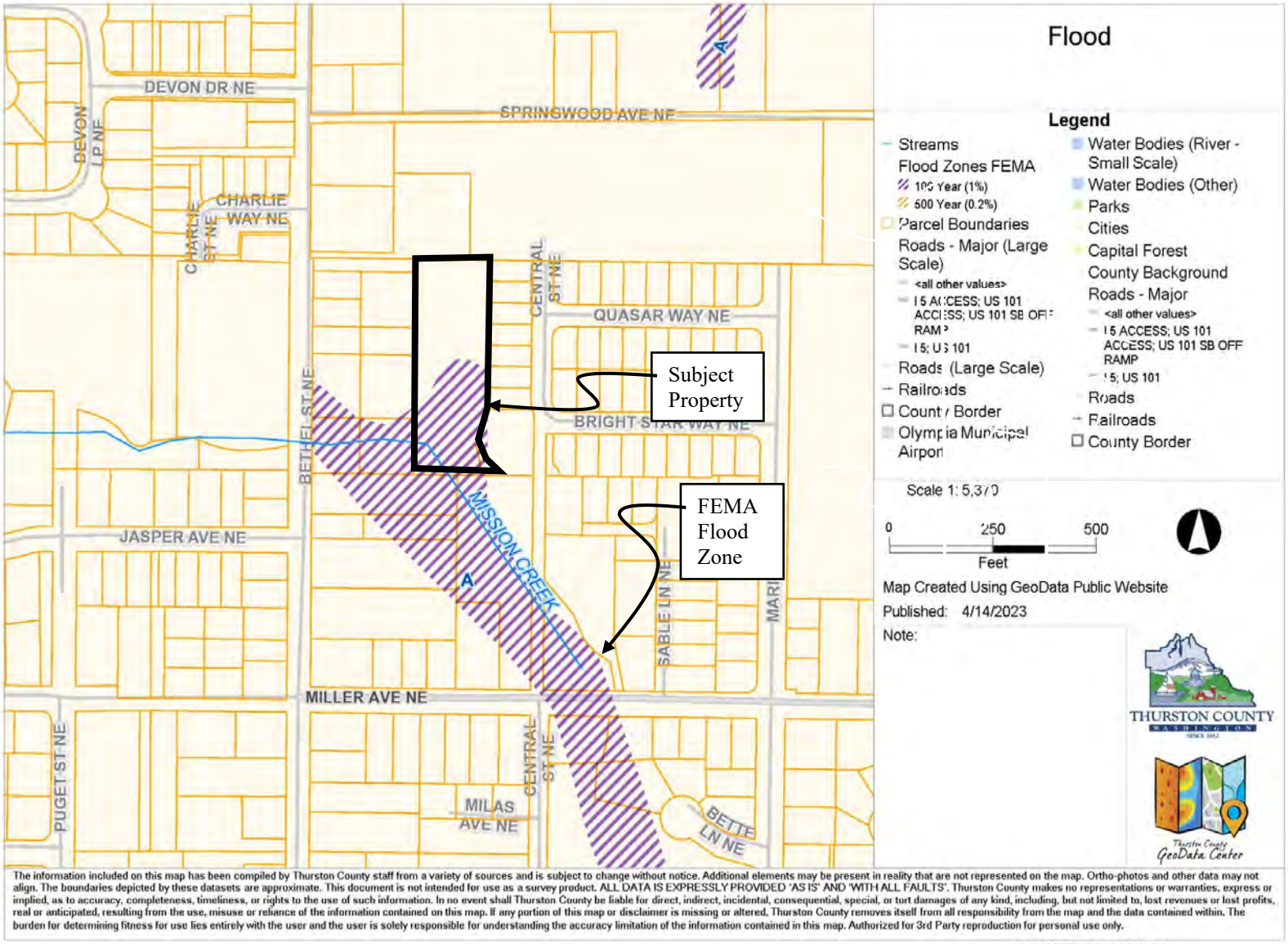
Thurston County

Geodata Center

High Water Hazard Area

&

FEMA Flooding


Flood
Legend
Streams
Flood Zones FEMA
100 Year (1%)
500 Year (0.2%)
Parcel Boundaries
Roads - Major (Large Scale)
<all other values>
I 5 ACCESS; US 101 ACCESS; US 101 SB OFF RAMP
I 5; US 101
Roads (Large Scale)
Railroads
County Border
Olympia Municipal Airport
Water Bodies (River - Small Scale)
Water Bodies (Other)
Parks
Cities
Capital Forest
County Background
Roads - Major
<all other values>
I 5 ACCESS; US 101 ACCESS; US 101 SB OFF RAMP
I 5; US 101
Roads
Railroads
County Border
Scale 1: 5,370
0 250 500
Feet
Map Created Using GeoData Public Website
Published: 4/14/2023
Note:
THURSTON COUNTY
WASHINGTON
Thurston County GeoData Center
Subject Property
FEMA Flood Zone
DEVON DR NE
DEVON LP NE
CHARLIE WAY NE
CHARLIE ST NE
SPRINGWOOD AVE NE
CENTRAL ST NE
QUASAR WAY NE
BRIGHT STAR WAY NE
BETHEL ST NE
JASPER AVE NE
MISSION CREEK
SABLE LN NE
MILLER AVE NE
PUGET ST NE
MILAS AVE NE
BETTE LN NE
The information included on this map has been compiled by Thurston County staff from a variety of sources and is subject to change without notice. Additional elements may be present in reality that are not represented on the map. Ortho-photos and other data may not align. The boundaries depicted by these datasets are approximate. This document is not intended for use as a survey product. ALL DATA IS EXPRESSLY PROVIDED 'AS IS' AND 'WITH ALL FAULTS'. Thurston County makes no representations or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. In no event shall Thurston County be liable for direct, indirect, incidental, consequential, special, or tort damages of any kind, including, but not limited to, lost revenues or lost profits, real or anticipated, resulting from the use, misuse or reliance of the information contained on this map. If any portion of this map or disclaimer is missing or altered, Thurston County removes itself from all responsibility from the map and the data contained within. The burden for determining fitness for use lies entirely with the user and the user is solely responsible for understanding the accuracy limitation of the information contained in this map. Authorized for 3rd Party reproduction for personal use only.
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Appendix L

Rating Forms

RATING SUMMARY – Western Washington

Name of wetland (or ID #): Wetland A Date of site visit: 23-Mar-23

Rated by Curtis Wambach Trained by Ecology? ☑ Yes ☐ No Date of training Continual

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 Google Earth

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
X **Category III** - Total score = 16 - 19
_____ **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	M	L	
Value	H	H	H	**Total**
Score Based on Ratings	7	7	5	**19**

Score for each function based on three ratings (*order of ratings is not important*)

9 = H, H, H
8 = H, H, M
7 = H, H, L
7 = H, M, M
6 = H, M, L
6 = M, M, M
5 = H, L, L
5 = M, M, L
4 = M, L, L
3 = L, L, L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	Category
Estuarine	
Wetland of High Conservation Value	
Bog	
Mature Forest	
Old Growth Forest	
Coastal Lagoon	
Interdunal	
None of the above	

Maps and Figures required to answer questions correctly for Western Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	D 1.3, H 1.1, H 1.4	Figure 11
Hydroperiods	D 1.4, H 1.2	Ffigure 11
Location of outlet (*can be added to map of hydroperiods*)	D 1.1, D 4.1	Figure 3
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	D 2.2, D 5.2	Figure 12
Map of the contributing basin	D 4.3, D 5.3	Figure 14
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	Figure 13
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	Appendix I
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	D 3.3	Appendix J

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:

DEPRESSIONAL AND FLATS WETLANDS

Water Quality Functions - Indicators that the site functions to improve water quality

D 1.0. Does the site have the potential to improve water quality?		
D 1.1. Characteristics of surface water outflows from the wetland: Wetland is a depression or flat depression (QUESTION 7 on key) with no surface water leaving it (no outlet). points = 3 Wetland has an intermittently flowing stream or ditch, OR highly constricted permanently flowing outlet. points = 2 ☐ Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing points = 1 ☐ Wetland is a flat depression (QUESTION 7 on key), whose outlet is a permanently flowing ditch. points = 1		2
D 1.2. The soil 2 in below the surface (or duff layer) is true clay or true organic (*use NRCS definitions*).	Yes = 4 No = 0	0
D 1.3. Characteristics and distribution of persistent plants (Emergent, Scrub-shrub, and/or Forested Cowardin classes): Wetland has persistent, ungrazed, plants > 95% of area points = 5 Wetland has persistent, ungrazed, plants > ½ of area points = 3 Wetland has persistent, ungrazed plants > $^1/_{10}$ of area points = 1 Wetland has persistent, ungrazed plants < $^1/_{10}$ of area points = 0		5
D 1.4. Characteristics of seasonal ponding or inundation: *This is the area that is ponded for at least 2 months. See description in manual.* Area seasonally ponded is > ½ total area of wetland points = 4 Area seasonally ponded is > ¼ total area of wetland points = 2 Area seasonally ponded is < ¼ total area of wetland points = 0		2
Total for D 1	Add the points in the boxes above	**9**

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	1
D 2.3. Are there septic systems within 250 ft of the wetland?	Yes = 1 No = 0	1
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1 - D 2.3? Source	Yes = 1 No = 0	0
Total for D 2	Add the points in the boxes above	**2**

Rating of Landscape Potential If score is: ☐ **3 or 4 = H** ☑ **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	1
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	0
D 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality (*answer YES if there is a TMDL for the basin in which the unit is found*)?	Yes = 2 No = 0	2
Total for D 3	Add the points in the boxes above	**3**

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

DEPRESSIONAL AND FLATS WETLANDS

Hydrologic Functions - Indicators that the site functions to reduce flooding and stream degradation

D 4.0. Does the site have the potential to reduce flooding and erosion?	
D 4.1. Characteristics of surface water outflows from the wetland: Wetland is a depression or flat depression with no surface water leaving it (no outlet) points = 4 Wetland has an intermittently flowing stream or ditch, OR highly constricted permanently flowing 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	2
D 4.2. Depth of storage during wet periods: *Estimate the height of ponding above the bottom of the outlet. For wetlands with no outlet, measure from the surface of permanent water or if dry, the deepest part.* Marks of ponding are 3 ft or more above the surface or bottom of outlet points = 7 Marks of ponding between 2 ft to < 3 ft from surface or bottom of outlet points = 5 ☐ Marks are at least 0.5 ft to < 2 ft from surface or bottom of outlet points = 3 ☐ The wetland is a "headwater" wetland points = 3 Wetland is flat but has small depressions on the surface that trap water points = 1 Marks of ponding less than 0.5 ft (6 in) points = 0	5
D 4.3. Contribution of the wetland to storage in the watershed: *Estimate the ratio of the area of upstream basin contributing surface water to the wetland to the area of the wetland unit itself.* ☐ The area of the basin is less than 10 times the area of the unit points = 5 The area of the basin is 10 to 100 times the area of the unit points = 3 The area of the basin is more than 100 times the area of the unit points = 0 ☐ Entire wetland is in the Flats class points = 5	0
Total for D 4 Add the points in the boxes above	**7**

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	1
Total for D 5 Add the points in the boxes above	**1**

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 ☐ ● Surface flooding problems are in a sub-basin farther down-gradient. points = 1 ☐ Flooding from groundwater is an issue in the sub-basin. points = 1 ☐ The existing or potential outflow from the wetland is so constrained by human or natural conditions that the water stored by the wetland cannot reach areas that flood. Explain why points = 0 ☐ There are no problems with flooding downstream of the wetland. points = 0	2
D 6.2. Has the site been identified as important for flood storage or flood conveyance in a regional flood control plan? Yes = 2 No = 0	0
Total for D 6 Add the points in the boxes above	**2**

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

These questions apply to wetlands of all HGM classes.

HABITAT FUNCTIONS - Indicators that site functions to provide important habitat

H 1.0. Does the site have the potential to provide habitat?

H 1.1. Structure of plant community: *Indicators are Cowardin classes and strata within the Forested class.* Check the Cowardin plant classes in the wetland. *Up to 10 patches may be combined for each class to meet the threshold of ¼ ac 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

0

H 1.2. Hydroperiods

Check the types of water regimes (hydroperiods) present within the wetland. The water regime has to cover more than 10% of the wetland or ¼ ac to count (*see text for descriptions of hydroperiods*).

- ☐ Permanently flooded or inundated
- ☑ 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**

0

H 1.3. Richness of plant species

Count the number of plant species in the wetland that cover at least 10 ft^2.
Different patches of the same species can be combined to meet the size threshold and you do not have to name the species. ***Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Canadian thistle***

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

1

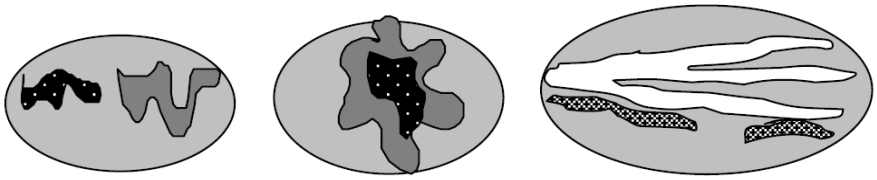
H 1.4. Interspersion of habitats

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



0

H 1.5. Special habitat features: Check the habitat features that are present in the wetland. *The number of checks is the number of points.* ☑ Large, downed, woody debris within the wetland (> 4 in diameter and 6 ft long) ☐ Standing snags (dbh > 4 in) within the wetland ☑ Undercut banks are present for at least 6.6 ft (2 m) **and/or** overhanging plants extends at least 3.3 ft (1 m) over a stream (or ditch) in, or contiguous with the wetland, for at least 33 ft (10 m) ☐ Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 30 degree slope) OR signs of recent beaver activity are present (*cut shrubs or trees that have not yet weathered where wood is exposed*) ☑ At least ¼ ac of thin-stemmed persistent plants or woody branches are present in areas that are permanently or seasonally inundated (*structures for egg-laying by amphibians*) ☐ Invasive plants cover less than 25% of the wetland area in every stratum of plants (*see H 1.1 for list of strata*)	3
Total for H 1 Add the points in the boxes above	**4**

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:* 3.6 % undisturbed habitat + (10.1 % moderate & low intensity land uses / 2) = 8.65% 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	0
H 2.2. Undisturbed habitat in 1 km Polygon around the wetland. *Calculate:* 3.6 % undisturbed habitat + (40.9 % moderate & low intensity land uses / 2) = 24.05% 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	2
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	-2
Total for H 2 Add the points in the boxes above	**0**

Rating of Landscape Potential If Score is: ☐ **4 - 6 = H** ☐ **1 - 3 = M** ☑ **< 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	2

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.

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**	

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

RATING SUMMARY – Western Washington

Name of wetland (or ID #): Wetland B Date of site visit: 23-Mar-23

Rated by Curtis Wambach Trained by Ecology? ☑ Yes ☐ No Date of training Continual

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 Google Earth

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
X **Category III** - Total score = 16 - 19
_____ **Category IV** - Total score = 9 - 15

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
		List appropriate rating (H, M, L)		
Site Potential	M	L	L	
Landscape Potential	M	M	L	
Value	H	H	H	**Total**
Score Based on Ratings	7	6	5	**18**

Score for each function based on three ratings (*order of ratings is not important*)

9 = H, H, H
8 = H, H, M
7 = H, H, L
7 = H, M, M
6 = H, M, L
6 = M, M, M
5 = H, L, L
5 = M, M, L
4 = M, L, L
3 = L, L, L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	Category
Estuarine	
Wetland of High Conservation Value	
Bog	
Mature Forest	
Old Growth Forest	
Coastal Lagoon	
Interdunal	
None of the above	

Maps and Figures required to answer questions correctly for Western Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	D 1.3, H 1.1, H 1.4	Figure 11
Hydroperiods	D 1.4, H 1.2	Ffigure 11
Location of outlet (*can be added to map of hydroperiods*)	D 1.1, D 4.1	Figure 3
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	D 2.2, D 5.2	Figure 12
Map of the contributing basin	D 4.3, D 5.3	Figure 14
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	Figure 13
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	Appendix I
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	D 3.3	Appendix J

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:

DEPRESSIONAL AND FLATS WETLANDS

Water Quality Functions - Indicators that the site functions to improve water quality

D 1.0. Does the site have the potential to improve water quality?	
D 1.1. Characteristics of surface water outflows from the wetland: Wetland is a depression or flat depression (QUESTION 7 on key) with no surface water leaving it (no outlet). points = 3 Wetland has an intermittently flowing stream or ditch, OR highly constricted permanently flowing outlet. points = 2 ☐ Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing points = 1 ☐ Wetland is a flat depression (QUESTION 7 on key), whose outlet is a permanently flowing ditch. points = 1	1
D 1.2. The soil 2 in below the surface (or duff layer) is true clay or true organic (*use NRCS definitions*). Yes = 4 No = 0	0
D 1.3. Characteristics and distribution of persistent plants (Emergent, Scrub-shrub, and/or Forested Cowardin classes): Wetland has persistent, ungrazed, plants > 95% of area points = 5 Wetland has persistent, ungrazed, plants > ½ of area points = 3 Wetland has persistent, ungrazed plants > $^1/_{10}$ of area points = 1 Wetland has persistent, ungrazed plants < $^1/_{10}$ of area points = 0	5
D 1.4. Characteristics of seasonal ponding or inundation: *This is the area that is ponded for at least 2 months. See description in manual.* Area seasonally ponded is > ½ total area of wetland points = 4 Area seasonally ponded is > ¼ total area of wetland points = 2 Area seasonally ponded is < ¼ total area of wetland points = 0	2
Total for D 1 Add the points in the boxes above	**8**

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	1
D 2.3. Are there septic systems within 250 ft of the wetland? Yes = 1 No = 0	1
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1 - D 2.3? Source Yes = 1 No = 0	0
Total for D 2 Add the points in the boxes above	**2**

Rating of Landscape Potential If score is: ☐ **3 or 4 = H** ☑ **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	1
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	0
D 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality (*answer YES if there is a TMDL for the basin in which the unit is found*)? Yes = 2 No = 0	2
Total for D 3 Add the points in the boxes above	**3**

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

DEPRESSIONAL AND FLATS WETLANDS

Hydrologic Functions - Indicators that the site functions to reduce flooding and stream degradation

D 4.0. Does the site have the potential to reduce flooding and erosion?	
D 4.1. Characteristics of surface water outflows from the wetland: Wetland is a depression or flat depression with no surface water leaving it (no outlet) points = 4 Wetland has an intermittently flowing stream or ditch, OR highly constricted permanently flowing 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	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 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	3
D 4.3. Contribution of the wetland to storage in the watershed: *Estimate the ratio of the area of upstream basin contributing surface water to the wetland to the area of the wetland unit itself.* ☐ The area of the basin is less than 10 times the area of the unit points = 5 The area of the basin is 10 to 100 times the area of the unit points = 3 The area of the basin is more than 100 times the area of the unit points = 0 ☐ Entire wetland is in the Flats class points = 5	0
Total for D 4 Add the points in the boxes above	**3**

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	1
Total for D 5 Add the points in the boxes above	**1**

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 ☐ ● Surface flooding problems are in a sub-basin farther down-gradient. points = 1 ☐ Flooding from groundwater is an issue in the sub-basin. points = 1 ☐ The existing or potential outflow from the wetland is so constrained by human or natural conditions that the water stored by the wetland cannot reach areas that flood. Explain why points = 0 ☐ There are no problems with flooding downstream of the wetland. points = 0	2
D 6.2. Has the site been identified as important for flood storage or flood conveyance in a regional flood control plan? Yes = 2 No = 0	0
Total for D 6 Add the points in the boxes above	**2**

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

These questions apply to wetlands of all HGM classes.

HABITAT FUNCTIONS - Indicators that site functions to provide important habitat

H 1.0. Does the site have the potential to provide habitat?

H 1.1. Structure of plant community: *Indicators are Cowardin classes and strata within the Forested class.* Check the Cowardin plant classes in the wetland. *Up to 10 patches may be combined for each class to meet the threshold of ¼ ac 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

0

H 1.2. Hydroperiods

Check the types of water regimes (hydroperiods) present within the wetland. The water regime has to cover more than 10% of the wetland or ¼ ac to count (*see text for descriptions of hydroperiods*).

- ☐ Permanently flooded or inundated
- ☑ 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

2

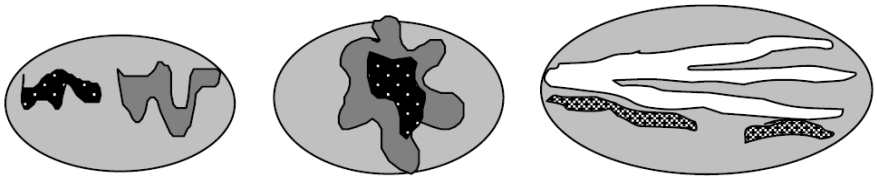
H 1.4. Interspersion of habitats

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



0

H 1.5. Special habitat features: Check the habitat features that are present in the wetland. *The number of checks is the number of points.* ☑ Large, downed, woody debris within the wetland (> 4 in diameter and 6 ft long) ☐ Standing snags (dbh > 4 in) within the wetland ☑ Undercut banks are present for at least 6.6 ft (2 m) **and/or** overhanging plants extends at least 3.3 ft (1 m) over a stream (or ditch) in, or contiguous with the wetland, for at least 33 ft (10 m) ☐ Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 30 degree slope) OR signs of recent beaver activity are present (*cut shrubs or trees that have not yet weathered where wood is exposed*) ☑ At least ¼ ac of thin-stemmed persistent plants or woody branches are present in areas that are permanently or seasonally inundated (*structures for egg-laying by amphibians*) ☐ Invasive plants cover less than 25% of the wetland area in every stratum of plants (*see H 1.1 for list of strata*)	3
Total for H 1 Add the points in the boxes above	**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:* 3.6 % undisturbed habitat + (10.1 % moderate & low intensity land uses / 2) = 8.65% 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	0
H 2.2. Undisturbed habitat in 1 km Polygon around the wetland. *Calculate:* 3.6 % undisturbed habitat + (40.9 % moderate & low intensity land uses / 2) = 24.05% 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	2
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	-2
Total for H 2 Add the points in the boxes above	**0**

Rating of Landscape Potential If Score is: ☐ **4 - 6 = H** ☐ **1 - 3 = M** ☑ **< 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	2

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.

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**	

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

Appendix M

Datasheets

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

Project/Site: Gemini Wetland A City/County: City of Olympia Sampling Date: 23 March 2023

Applicant/Owner: Gemini Corp State: WA Sampling Point: TP-A1

Investigator(s): Curtis Wambach Section, Township, Range: _____

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

Subregion (LRR): _____ Lat: _____ Long: _____ Datum: _____

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 no, Soil no, or Hydrology no significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation no, Soil no, or Hydrology no 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 ☐ Hydric Soil Present? Yes ☒ No ☐ Wetland Hydrology Present? Yes ☒ No ☐	**Is the Sampled Area within a Wetland?** Yes ☒ No ☐

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 20 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 12 ft)			
1. Himalayan Blackberry (Rubus Armeniacus)	5	Y	FAC
2.			
3.			
4.			
5.			
	5 = Total Cover		
Herb Stratum (Plot size: 6 ft)			
1. Reed canarygrass (Phalaris arundinacea)	80	Y	FACW
2. Water parsley (Oenanthe sarmentosa)	10	N	OBL
3. Bitter cress	5	N	FACW
4. Common horsetail	5	N	FAC
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	105 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1. English Ivy (Hedera helix)	5	Y	FACU
2.			
	= Total Cover		

% Bare Ground in Herb Stratum _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 67% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	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:

- ☒ Rapid Test for Hydrophytic Vegetation
- ☒ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 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-A1

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
0-20in	10YR 3/1							Sandy silt 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): surface

Water Table Present? Yes ☒ No ☐ Depth (inches): surface

Saturation Present? (includes capillary fringe) Yes ☒ No ☐ Depth (inches): surface

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: Gemini Wetland A City/County: City of Olympia Sampling Date: 23 March 2023

Applicant/Owner: Gemini Corp State: WA Sampling Point: TP-A2

Investigator(s): Curtis Wambach Section, Township, Range: _____

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

Subregion (LRR): _____ Lat: _____ Long: _____ Datum: _____

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 no, Soil no, or Hydrology no significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation no, Soil no, or Hydrology no 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 ☒ Hydric Soil Present? Yes ☐ No ☒ Wetland Hydrology Present? Yes ☐ No ☒	**Is the Sampled Area within a Wetland?** Yes ☐ No ☒

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 20 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Red alder (Alnus rubra)	60	Yes	FAC
2.			
3.			
4.			
	60 = Total Cover		
Sapling/Shrub Stratum (Plot size: 12 ft)			
1. Himalayan blackberry (Rubus armeniacus)	40	Yes	FAC
2. Osoberry (Oemleria cerasiformis)	5	Yes	FACU
3.			
4.			
5.			
	45 = Total Cover		
Herb Stratum (Plot size: 6 ft)			
1. Sword fern (Polystichum munitum)	15	Yes	FAC
2. Trailing blackberry (Rubus ursinus)	10	Yes	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	25 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1. English Ivy (Hedera helix)	100	Yes	FACU
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: 6 (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 115	x 3 = 345
FACU species 115	x 4 = 460
UPL species _____	x 5 = _____
Column Totals: 230 (A)	805 (B)

Prevalence Index = B/A = 3.5

Hydrophytic Vegetation Indicators:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☐ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 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-A2

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
0-6in	10 YR3/2							sandy silt loam
6-20in	10 YR 3/3							sandy silt 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:

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

Project/Site: Gemini Wetland B City/County: Thurston County Sampling Date: 23 March 2023

Applicant/Owner: Gemini Corp State: WA Sampling Point: TP-B1

Investigator(s): Curtis Wambach Section, Township, Range: _____

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

Subregion (LRR): _____ Lat: _____ Long: _____ Datum: _____

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 no, Soil no, or Hydrology no significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation no, Soil no, or Hydrology no 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 ☐ Hydric Soil Present? Yes ☒ No ☐ Wetland Hydrology Present? Yes ☒ No ☐	**Is the Sampled Area within a Wetland?** Yes ☒ No ☐

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 20 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Red alder (Alnus Rubra)	60	Y	FAC
2.			
3.			
4.			
	60 = Total Cover		
Sapling/Shrub Stratum (Plot size: 12 ft)			
1. Salmonberry (Rubus spectabilis)	40	Y	FAC
2. Vine maple (Acer circinatum)	30	Y	FAC
3. Himalayan Blackberry (Rubus Armeniacus)	10	N	FAC
4.			
5.			
	80 = Total Cover		
Herb Stratum (Plot size: 6 ft)			
1. Slough sedge (Carex obnupta)	20	Y	OBL
2. Reed canarygrass (Phalaris arundinacea)	20	Y	FACW
3. Skunk cabbage (Lysichiton americanus)	10	Y	OBL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 6 (A)

Total Number of Dominant Species Across All Strata: 6 (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:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☒ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 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-B1

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
0-20	10YR 2/1							Sandy silt

[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): Surface

Water Table Present? Yes ☒ No ☐ Depth (inches): Surface

Saturation Present? (includes capillary fringe) Yes ☒ No ☐ Depth (inches): surface

Wetland Hydrology Present? Yes ☒ No ☐

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

Remarks:

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

Project/Site: Gemini Wetland B City/County: Thurston County Sampling Date: 23 March 2023

Applicant/Owner: Gemini Corp State: WA Sampling Point: TP-B2

Investigator(s): Curtis Wambach Section, Township, Range: _____

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

Subregion (LRR): _____ Lat: _____ Long: _____ Datum: _____

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 no, Soil no, or Hydrology no significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation no, Soil no, or Hydrology no 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 ☒ Hydric Soil Present? Yes ☐ No ☒ Wetland Hydrology Present? Yes ☐ No ☒	**Is the Sampled Area within a Wetland?** Yes ☐ No ☒

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 20 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Bitter cherry (Prunus emerginata)	60	Yes	FACU
2. Red alder (Alnus rubra)	30	Yes	FAC
3.			
4.			
	90	= Total Cover	
Sapling/Shrub Stratum (Plot size: 12 ft)			
1. Himalayan blackberry (Rubus armeniacus)	40	Yes	FAC
2. English Ivy (Hedera helix)	40	Yes	FACU
3. English laurel (Prunus laurocerasus)	20	Yes	FACU
4.			
5.			
	100	= Total Cover	
Herb Stratum (Plot size: 6 ft)			
1. Sword fern (Polystichum munitum)	15	Yes	FACU
2. Trailing blackberry (Rubus ursinus)	10	Yes	FACU
3. Salal (Gautheria Shallon)	10	Yes	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	35	= Total Cover	
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
		= Total Cover	

% Bare Ground in Herb Stratum _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 28% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species 70	x 3 = 210
FACU species 155	x 4 = 620
UPL species _____	x 5 = _____
Column Totals: 225 (A)	830 (B)

Prevalence Index = B/A = 3.7

Hydrophytic Vegetation Indicators:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☐ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 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-B2

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
0-6	10YR 3/2							Sandy silt
6-18	10YR 3/3							Gravelly 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:

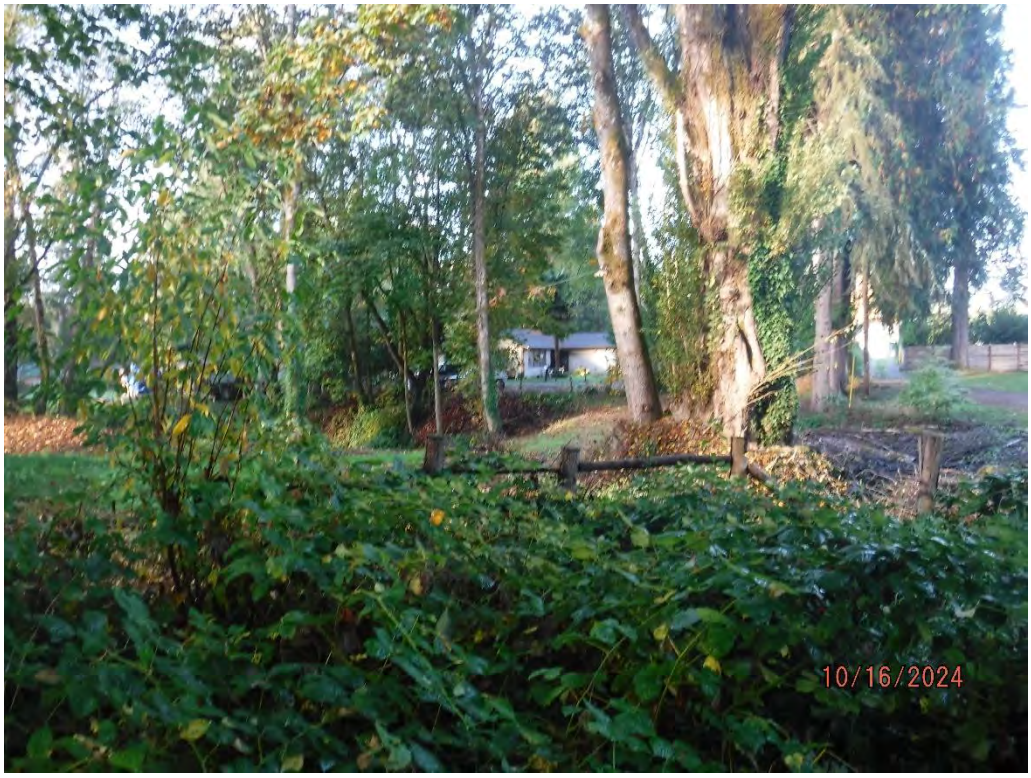
PHOTOS



General view westerly of the managed western portion of the project site.



View easterly from the southwestern portion of the project site.



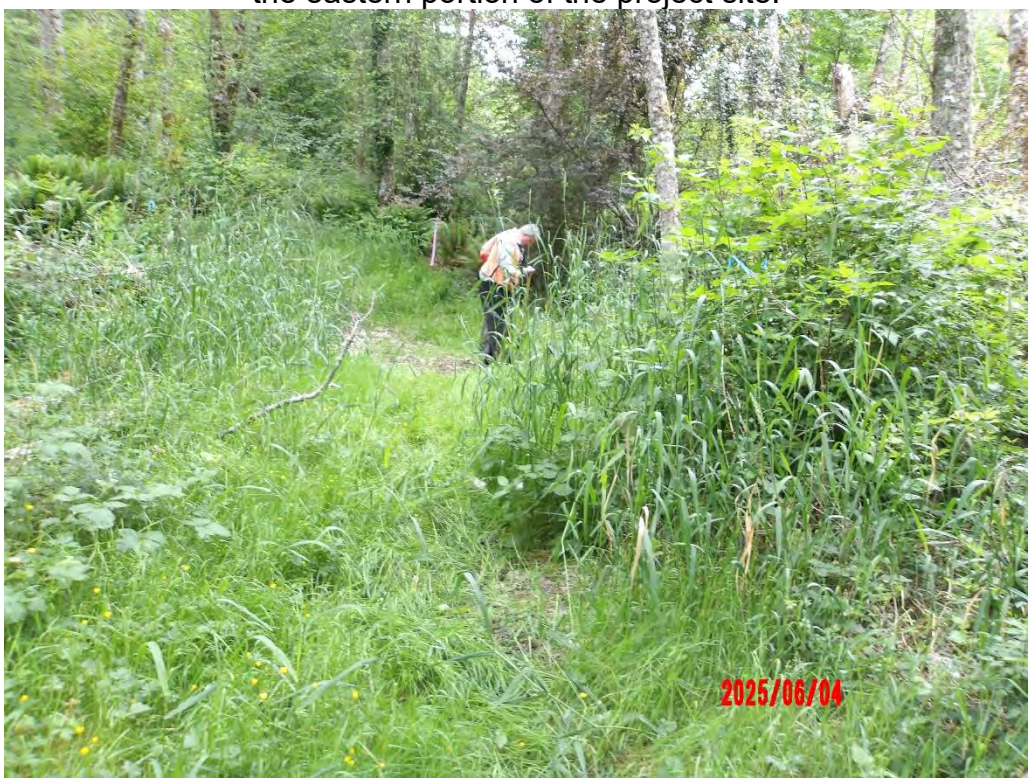
View southerly from the southwestern portion of the project site of Offsite Wetland A.



General view of the upland forest plant community dominating the eastern portion of the project site. At Sample Plot SPT1.



View of the small depression formed in a 90 degree turn along an internal roadway in the eastern portion of the project site.



View of the internal roadway through the eastern portion of the project site outside of the small depression noted in the photo above.



View of the forested upland character of the eastern portion of the project site along the created internal roadway.



View of the soil characteristics within the majority of the created internal roadway in the eastern portion of the project site.



View of the upland forested character of the eastern portion of the project site.



10% for art.