2nd DRT Submittal
1st Review of New Storm Report
P21-0142
April 2023

PRELIMINARY
Drainage Report and Stormwater Pollution Prevention Plan

Cascade Shaw

City of Puyallup, Washington
Parcel No. 0420351003

2/22/2023

Project Address: 808 Shaw Rd
Puyallup

Property Owner:
Cascade Shaw Development LLC
Contact: Greg Helle

Engineer: McInnis Engineering, LLC
535 Dock Street, Suite 111
Tacoma, WA 98402
Contact: Will McInnis

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Project Engineer's Certification:

"I hereby state that this Storm Drainage Report and Stormwater Pollution Prevention Plan for the Cascade Shaw 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 City of Puyallup does not and will not assume liability for the sufficiency, suitability, or performance of drainage facilities prepared by me."

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Section 1: Proposed Project Description

Callout the existing parcel acreage.

The project address is 808 Shaw Rd, Puyallup. Parcel Numbers 0420351003. See Figure 1: Vicinity Map in Appendix A for a vicinity map showing the site in context. The project consists of a mixed-use project that will include 7.26 acres of multifamily housing, and 0.67 acres of a commercial area. Also included is the associated parking, utilities, and stormwater design. The project includes 170 residential multifamily units, 7,163 sq ft of commercial buildings, and the associated vehicular and pedestrian routes.

This storm report details the proposed stormwater plans and the calculations to support the design. The breakdown of impervious surfaces pre and post developed is shown below in Table 1.

Provide exhibits delineating: 1) the Preliminary Basin; 2) the Mitigated Basin areas; and 3) any undisturbed area with the acreage indicated. [Storm Report; Page 5 of 272]

Table 1: Impervious/ Pervious Areas

Project Land Use	Existing Area (Acres)	Proposed Area (Acres)	Area Change (Acres)	Frontage Improvement Area (Acres)
Roof	0	1.8	1.8	-
Asphalt Parking/Driveway	0.42	3.08	2.66	0.26
Undisturbed	7.51	0	-7.51	-
Landscaping	0	2.35	2.35	0.11
Walkways/Concrete	0	0.7	0.7	0.06
Total Impervious	0.42	5.58	5.16	0.32
Total Pervious	7.51	2.35	-5.16	0.11
Project Area	7.93	7.93	7.93	0.43

Section 2: Existing Conditions Description

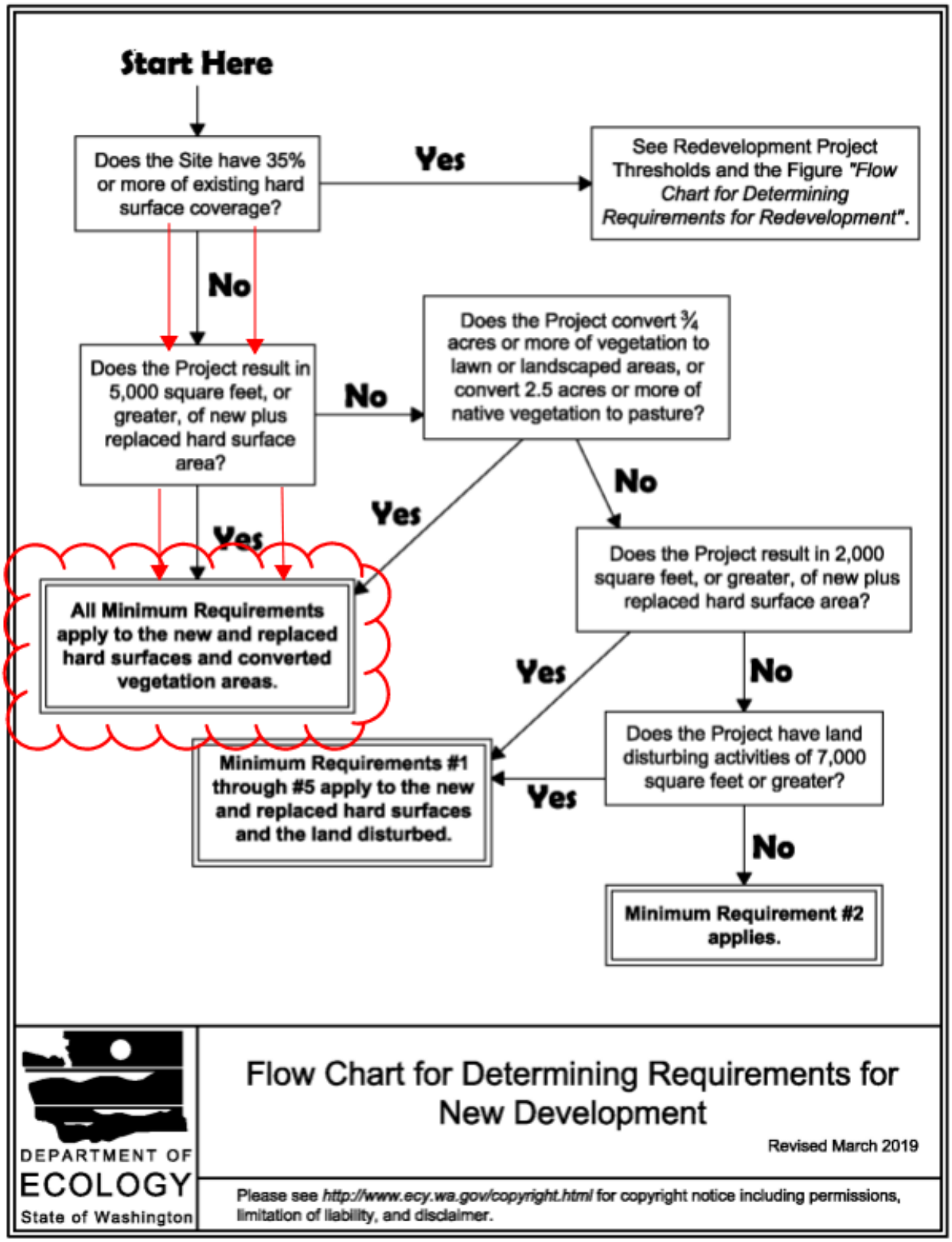
In existing conditions, the land is grassy with a an access road and round about. The existing site has been preliminary graded recently.

Add commentary that the site was temporarily filled for preload under Permit E19-0156. [Storm Report; Page 5 of 272]

Compliance with Minimum Requirement

The proposed project improvements consist of approximately 5.16 acres of new hard surfaces and will result in coverage of 65% of the project area being covered by impervious surfaces. Per the 2021 City of Puyallup Stormwater Management Manual, this project must comply with all minimum requirements 1-9. See flowchart below:

The City has adopted the 2019 Ecology Manual (although this project can be considered vested to the 2014 Ecology Manual). NOTE: If the applicant elects to use the 2014 manual, MR8 will require matching the hydroperiod of the two Category IV wetlands onsite. However, the 2019 manual would not require this hydroperiod analysis although Section 1-C.2 and 1-C.3 would still apply. [Storm Report; Page 6 of 272]


Start Here
Does the Site have 35% or more of existing hard surface coverage?
Yes
See Redevelopment Project Thresholds and the Figure "Flow Chart for Determining Requirements for Redevelopment".
No
Does the Project result in 5,000 square feet, or greater, of new plus replaced hard surface area?
No
Does the Project convert ¾ acres or more of vegetation to lawn or landscaped areas, or convert 2.5 acres or more of native vegetation to pasture?
Yes
No
Yes
Does the Project result in 2,000 square feet, or greater, of new plus replaced hard surface area?
All Minimum Requirements apply to the new and replaced hard surfaces and converted vegetation areas.
Yes
No
Does the Project have land disturbing activities of 7,000 square feet or greater?
Minimum Requirements #1 through #5 apply to the new and replaced hard surfaces and the land disturbed.
Yes
No
Minimum Requirement #2 applies.
DEPARTMENT OF ECOLOGY
State of Washington
Flow Chart for Determining Requirements for New Development
Revised March 2019
Please see http://www.ecy.wa.gov/copyright.html for copyright notice including permissions, limitation of liability, and disclaimer.

Minimum Requirement # 1: Preparation of Stormwater Site Plan

A stormwater site plan has been prepared to provide water quality and flow control to the site and will be submitted with this report. Additionally, see Figure 3: Temporary Erosion and Sediment Control Plan and Figure 4: Grading and Drainage Plan in Appendix A.

To be reviewed at time of civil application.

Minimum Requirement # 2: Construction Stormwater Pollution Prevention

A temporary erosion and sediment control plan is part of the construction documents provided with this report and Figure 3: Temporary Erosion and Sediment Control Plan is included in Appendix A.

See below for how each of the 13 elements of the Stormwater Pollution Prevention Plan (SWPPP) are addressed as follows.

Element # 1: Preserve vegetation/mark clearing limits

- Clearing limits are shown on the plan and as noted, they shall be marked using high visibility plastic fencing. All vegetated area outside the marked clearing limits shall be preserved in existing conditions.

Element # 2: Established Construction Entrance

- As shown on the plans, a construction entrance is provided at the north east corner of the site per City of Puyallup standards.

Element # 3: Control Flow Rates

- The proposed silt fence will be placed along all the downgradient boundaries of the proposed project limits to remove any sediment laden runoff from leaving the site, as shown on plans. The silt fence meets flow control requirements based on slopes and proposed flow path. Additionally, exposed soils not worked for a period of 7 days between May 1st- September 30th and for a period of 2 days between October 1st and April 30th will be hydroseeded and stabilized.

Contractor shall adjust silt fencing as necessary to keep sediment laden runoff onsite.

Element # 4: Install Sediment Control

o Silt fence will be placed along all the downgradient boundaries of the proposed project limits to remove any sediment laden runoff from leaving the site, as shown on plans. The contractor needs to protect all catch basins and adjust silt fencing as necessary to keep sediment laden runoff onsite.

Element # 5: Stabilize Soils

o Per the standard erosion control notes provided on the plans, all exposed soils shall be hydroseeded and exposed soils shall be covered if left unworked for longer than 7 days.

Element # 6: Protect Slopes

o The site has flat slopes of 0-3% on the majority of the site. The west end of the property slopes into the flood plain. Minor work will be done in the flood plain with only pipes being added. All exposed soils not covered will be hydroseeded, and there will be no slopes greater than 2:1.

Element # 7: Protect Drain Inlets

o Drain inlets are being protected from sediment and high energy flows through the use of catch basin inserts. Catch basin inserts will be installed in any existing catch basins within 500 feet from the project site including structures on Shaw Road.

Element # 8: Stabilize Channels and Outlets

o There are no proposed channels or outlets proposed as part of the SWPPP. There is an existing floodplain and creek on the west of the property that will not be graded into.

Element # 9: Control Pollutants

o The only pollutants generated by this project are those that are commonly associated with the construction of a multi-family complex and commercial lots.

Contractor is responsible to follow all City of Puyallup pollution prevention measures. Contractor to follow all City of Puyallup pollution control standard, particularly when handling concrete and vehicle activity.

Element # 10: Control De-watering

o After consulting with the contractor, it was concluded that the project improvements are at a height above the observed groundwater so that dewatering will not be required. If dewatering is required, the contractor will be required to hire an experienced dewatering contractor and obtain any necessary permits.

Element # 11: Maintain BMPs

o The contractor and property owner will be responsible for checking and maintaining all stormwater BMPs. Contractor to repair as needed.

Element # 12: Manage the Project

o The owner and contractor will be tasked with managing the project and are responsible for ensuring all SWPPP measures are followed per the provided plans and this report.

Element # 13: Protect Low Impact Development BMPs

o The proposed TESC plan includes details on a Filter Fabric Fence, Inlet protection, and a construction entrance. The TESC plan provided in Figure 1 outlines more details on each of these preventative measures taken to protect the area during construction. The contractor shall inspect LID proposed facility location pre and post construction to ensure no sediment laden water can enter the LID facilities area.

To be reviewed at time of civil application.

Minimum Requirement # 3: Source Control of Pollution

The plans provided with this report will be followed in the field to reduce the potential of pollution. It is anticipated that the only source of pollution generated on site will be from the minimal disturbance of soils which will be controlled by following the provided SWPPP and TESC plan. However, construction equipment can be a big source of pollution, so it is important to adhere to the recommendations in the SWPPP and TESC plan. New construction equipment will be used, and drip plans will be placed under them when at rest. There is no anticipated pollutant post construction other than

It is a conservative assumption to provide 100% detention for the preliminary storm design, but at the time of civil application, the applicant must show MR5 compliance. If the intent is to meet the LID Performance Standard rather than the List Options, then provide the LID Duration Analysis (curves) at time of civil application.

pollutants from vehicular traffic typical of a multifamily complex and commercial lots. The property owner is responsible for the control of pollutants on their property, post construction.

To be reviewed at time of civil application. Please see comment on preliminary grading plan, Sht C-5, Page 25 of 272.

Minimum Requirement # 4: Preservation of Natural Drainage System and Outfalls

The site naturally drains into the floodplain are and into Deer Creek at the west end of the property. This discharge will be maintained along with proper flow control to preserve the natural drainage system.

Minimum Requirement # 5: Onsite Stormwater Management

Using the LID approach to onsite stormwater management the Contech Modular Wetlands systems were used to provide enhanced water quality on the site. To provide flow control detention pipes were sized. These passed the LID duration standards shown in the WWHM report in Appendix D.

The site will also utilize a piped conveyance system, consisting of catch basins and roof drain lines around each building, to convey stormwater. The detention will be in corrugated metal arch pipes sized to meet the requirements. The stormwater will then go through the Modular Wetlands system and be released to the Deer Creek ultimately.

The project required additional Pollution Generating Hard Surface in Shaw Road, as well. The runoff will be collected and brought onsite to be properly detained and go through the modular wetland. 2 WWHM reports are included, one for the sizing of the site, and one for sizing of the frontage.

It is not acceptable to mix public runoff with private runoff. If the disturbed PGHS in the ROW is less than 2,000sf, then no need for a public WQ facility. To be resolved at time of civil application.

The storm system is shown on Figure 4: Drainage Plan in Appendix A

Minimum Requirement # 6: Stormwater Treatment

The entire site will be treated for water quality via Contech Modular Wetlands systems. A stormwater biofiltration system will be located on the commercial site in the northwest corner of the site and will intercept the discharge pipe that discharges water from the flow control vaults on the site. The water quality system was designed by Contech to meet Ecology requirements and is detailed on the plans submitted with this report. As this water quality system is downstream of the detention system, a smaller system can be used. In addition, due to elevation constraints on the site, a system with 1.5' of elevation head loss across the unit was chosen for this project.

Per the Ecology Manual, WQ facilities located downstream of detention must be designed for the full 2-yr release rate. To be resolved at time of civil application.

The provided report in Appendix E is the biologist's "wetland assessment" and is not a compliant wetland-protection analysis meeting the requirements of MR8. It should be noted that this project is vested to the 2014 Ecology Manual, but the 2014 manual specifies Category IV wetlands must meet the hydroperiod protection requirements. However, the current city adopted 2019 Ecology Manual would not require the existing wetlands to be evaluated for hydroperiod protection due to the low habitat score and the fact the wetlands do not currently support endangered, threatened, or sensitive species or amphibians. NOTE: If the applicant elects to use the 2014 manual, then an MR8 hydroperiod analysis will be required prior to landuse approval to ensure the proposed project does not negatively affect the existing wetlands. [Storm Report; Page 12 of 272]

Minimum Requirement # 7: Flow Control

The stormwater system designed for the site includes arch detention pipes at a 0% slope. The pipes will also be used for conveyance and will use 36" stubs to connect to the site's catch basin.

control structure

To be reviewed at time of civil application. Please see comment on preliminary grading plan, Sht C-5, Page 25 of 272.

The water will convey to the modular wetland and then conveyed to Deer Creek.

Minimum Requirement # 8: Wetlands Protection

On the Puyallup GIS there are wetlands marked. A wetland analysis is attached in Appendix E.

Minimum Requirement # 9: Operations and Maintenance

Sediment control structures need to be cleaned at least once every 3 months in the winter and fall months. Catch basin shall be checked per maintenance recommendations and after major storm events.

A separate stormwater facilities maintenance and operation agreement shall be approved and recorded prior to Occupancy. The agreement shall be on a city provided form and utilize the "City of Puyallup Site Management Plan for Stormwater Operations and Maintenance" for BMP descriptions and maintenance criteria.

Section 3: Infiltration Rates / Soils Report

The Soil Conservation Service identifies this land as Briscot loam and Puyallup fine sandy loam. A geotechnical engineering report was prepared for the project by Krazan and Associates and is included in Appendix B.

Section 4: Wells and Septic Systems.

There are no existing wells identified on the property, nor are there any known septic systems on the site. Neither a well nor a septic is proposed for the site.

Section 5: Fuel Tanks

There are no identified fuel tanks on the property.

At time of civil application, provide additional commentary on how the proposed project is complying with the criteria specified in the "chosen" stormwater manual (either the 2014 or 2019 Ecology Manual...see comment above). Refer to either the 2014 Manual, Vol. I, Appendix I-D; or the 2019 Manual, Vol. I, Appendix 1-C for requirements. Note: the preliminary civil plans indicate the project storm conveyance pipe routed through the wetland which does not comply with Ecology Manual General Protection requirements.

Section 6: Subbasins Description

The site has a slope from the east to west of the project site. The proposed storm water design utilizes a catch and convey system to collect water from project area basin. The water will flow into the detention pipes. The stormwater from Shaw Road will also be collected into the onsite system.

There is an existing storm system within Shaw Road that conveys ROW runoff to a different basin. Any disturbed areas within the ROW shall be evaluated at time of civil application, but may necessitate the private onsite flow control system be oversized to account for bypass runoff.

Clarify-2014 or 2019 Ecology Manual? (See comment associated with MR8). [Storm Report; Pg 13 of 272]

All stormwater facilities proposed for the site have been designed per the current City of Puyallup Surface Water Management Manual.

Section 7: Floodplain Analysis

The floodplain delineation noted on the LOMR dated April 4, 2019 is approximate and the actual limits of the floodplain shall be verified using the FEMA determined flood profile, BFEs, and the existing topography of the project site. See additional comments on Sheet C-4, Page 24 of 272. [Storm Report; Pg 13 of 272]

The Deer Creek Floodplain is at the west end of the property. The floodplain will not be graded into. See attached Floodplain analysis in Appendix C.

Section 8: Aesthetic Consideration for Facilities

The proposed facilities for stormwater quality and management are based on City of Puyallup standards and contractor shall take aesthetic into consideration when installing stormwater management BMPs. Most of the stormwater facilities will not be visible as they are underground systems.

Section 9: Facility Sizing and Downstream Analysis

Facility Sizing

Clarify-2014 or 2019 Ecology Manual? (See comment associated with MR8). [Storm Report; Pg 13 of 272]

The proposed stormwater facilities were designed and sized per the 2021 City of Puyallup Stormwater Management Manual. We are proposing an LID method of Contech Modular Wetlands water quality and a storage vault for flow control.

Water Quality

Odd wording as neither the modular wetland nor the storage tanks are an LID BMP.

Contech Modular Wetlands water quality systems will treat stormwater onsite from the impervious pollution generating surfaces. The Modular Wetlands system has been designed by Contech Engineers to meet the Ecology requirements. The water quality system sizing was done by Contech Engineering using the water quality output from the WWHM report provided in Appendix D.

Flow Control

Per the Ecology Manual, WQ facilities located downstream of detention must be designed for the full 2-yr release rate. To be resolved at time of civil application.

Arch Pipes will be used for both conveyance and storage. The pipes will have a slope of 0% and be placed under the asphalt. The total pipes will amount to 1,800 LF which will provide 121,320 cubic feet of detention volume. These values meet/exceed the values calculated in the WWHM reports provided in Appendix D.

Conveyance System

Steel alloy pipes shall be asphalt coated, Treatment 1 or better.

At time of civil application, provide a downstream analysis in accordance with City Stds Section 201.2(2) and the Ecology Manual, Volume I, Section 2.6.2 (2014 Manual) or Section I-3.5.3 (2019 Manual), Tasks 1, Task 2, Task 3, and particularly the bulleted points contained in Task 4. The analysis shall include an evaluation of the existing culvert and ditch system in accordance with City Stds Section 204.5 and 204.6 and assuming existing conditions for the tributary basin and developed conditions for the proposed project.

The conveyance system consists of roof drain lines for each building, which will connect to 12" pipes that will flow stormwater from the impervious surfaces the conveyance/detention system. From the storage pipes, the stormwater stubs to a 36" and ultimately 12" pipe that will be treated using a Contech Modular Wetlands system. Once treated the stormwater will flow out of a 12" pipe and flow into Deer Creek.

At time of civil application, provide a backwater analysis of the proposed project conveyance system as outlined in City Stds Section 204.3 considering the Deer Creek tailwater elevations at the outfall location.

Downstream Analysis

The system will flow to the Deer Creek ditch on the west end of the property. The water then flows into a storm drain box that goes through the neighboring Cascade Christian property and ultimately is directed to the system on E Pioneer. The stream will continue and ultimately end up at the Puyallup River, for this reason it is especially important to have water quality treatment.

If any work is proposed within Deer Creek (ditch rework; culvert upgrade; project outfall construction; etc) verify HPA permit requirements with WDFW.

Section 10: Utilities

All utilities will be designed and installed per City of Puyallup standards. Storm facilities and conveyance systems will be designed and constructed with appropriate cover and separation from water and sanitary sewer systems.

Section 11: Covenants, Dedications, Easements

There are no covenants, dedications, or easements necessary at this time.

Section 12: Property Owners' Association Articles of Incorporation

There are no articles on incorporation available for this property at this time.

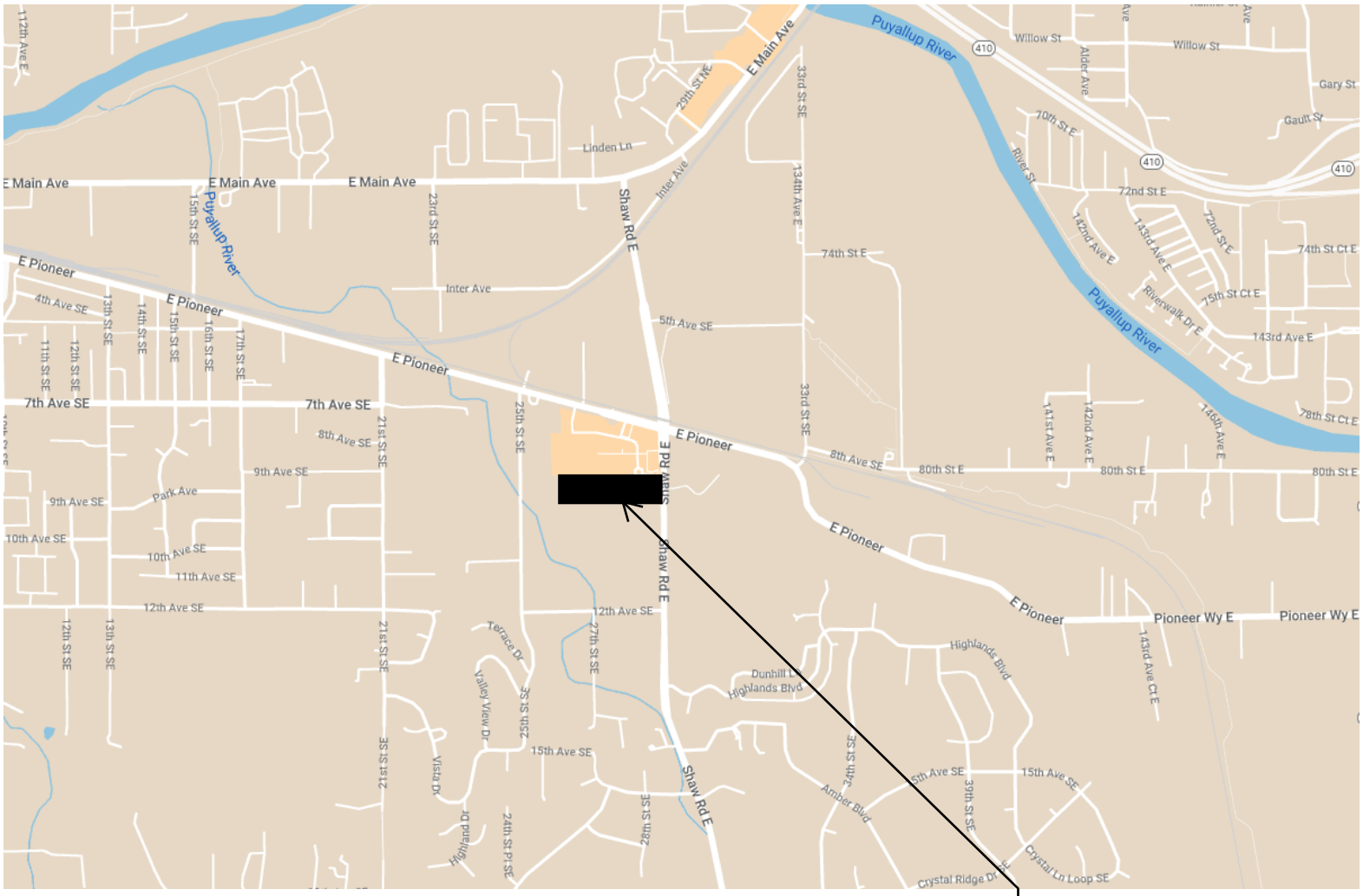
Section 13: Other Permits or Conditions Placed on the Project

No other permits or conditions are necessary at this time.

Dedication of additional ROW along 25th St SE will be required prior to civil permit issuance and an easement or other agreement will be required for public access and pedestrian circulation between Shaw Road and 25th St SE.

Appendix A – Supporting Figures

Figure 1: Vicinity Map



SITE

McInnis ENGINEERING

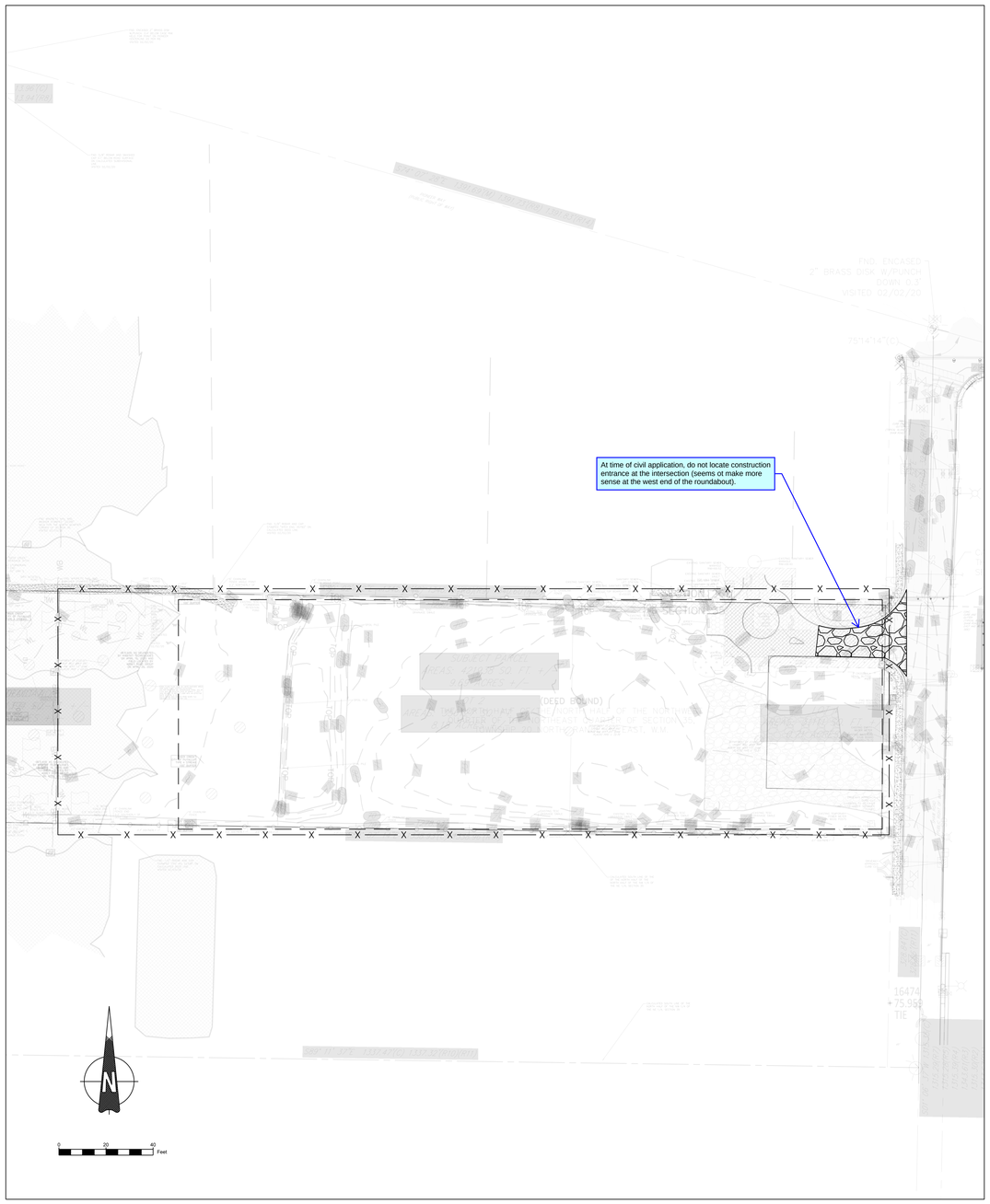
CASCADE SHAW
VICINITY MAP

Figure 2: Soils Map

Figure 3: Temporary Erosion and Sediment Control Plan

CASCADE SHAW

ESC



TESC INSPECTION NOTES:

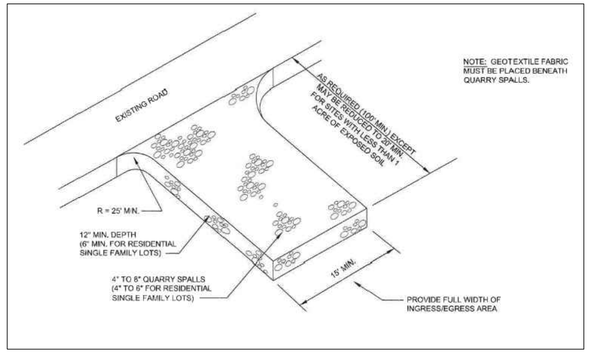
1. INSPECT ALL INLET PROTECTION ON CATCH BASINS. CLEAN OR REPLACE IF FULL OF SEDIMENT /DEBRIS AND REPAIR/REPLACE AS NEEDED IF DAMAGED TO MAINTAIN PROTECTION.
2. INSPECT ALL PERMANENT AND TEMPORARY STABILIZED SLOPES. REPAIR ANY DAMAGED SECTIONS AND RE-VEGETATE AS NEEDED TO ENSURE THE ESTABLISHMENT OF VEGETATION AND THAT NO EROSION OF THE SLOPES OCCUR.
3. INSPECT ALL FILTER FABRIC FENCING FOR SIGNS OF EROSION, DAMAGE OR FAILURES. REPAIR AND/OR REPLACE AS NEEDED. SEE FILTER FABRIC NOTES. SEDIMENT BUILD-UP ALONG FENCE SHALL BE REMOVED WHEN REACHES 1/3 THE FENCE HEIGHT. IF EROSION IS OCCURRING, CONTRACTOR SHALL INSTALL ADDITIONAL EROSION CONTROL MEASURES AS NEEDED TO PREVENT EROSION.
4. ANY FILL/CUT SLOPES SHALL BE INSPECTED FOR EROSION. IF SIGNS OF EROSION ARE PRESENT, INSTALL APPROPRIATE BMPS AS NEEDED TO STOP EROSION AND STABILIZE SLOPES.
5. TESC LEAD RESPONSIBLE FOR NOTIFYING ENGINEER IF ADDITIONAL MEASURES ARE WARRANTED.

PERMANENT STABILIZATION NOTES:

1. ALL EXPOSED SOILS AND SLOPES SHALL BE SEEDED OR OTHERWISE STABILIZED IMMEDIATELY AFTER CONSTRUCTION AND GRADING ACTIVITIES HAVE BEEN COMPLETED.
2. SILT FENCE, IF DEEMED APPROPRIATE, SHALL REMAIN FOR A MINIMUM OF 30 DAYS AFTER THE FINAL STABILIZATION OF THE SLOPES HAS OCCURRED.
3. ALL TEMPORARY EROSION CONTROL BMP'S SHALL BE REMOVED 30 DAYS AFTER FINAL STABILIZATION HAS OCCURRED AS DIRECTED BY CITY OR COUNTY INSPECTOR.
4. CONTRACTOR SHALL REFER TO THE CONSTRUCTION SWPP FOR APPLICABLE BMPS.

CONSTRUCTION ENTRANCE NOTES:

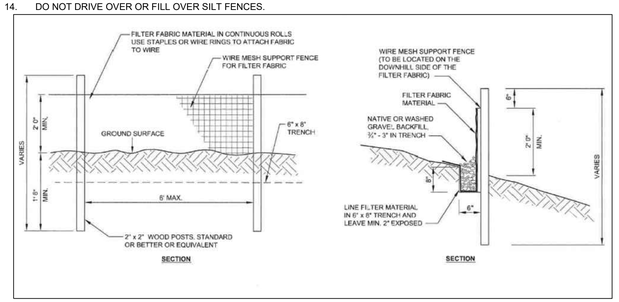
1. MATERIAL SHALL BE 4" TO 8" QUARRY SPALLS (4 TO 6 INCH FOR RESIDENTIAL SINGLE FAMILY LOTS) AND MAY BE TOP-DRESSED WITH 1 TO 3 INCH ROCK.
2. THE ROCK PAD SHALL BE AT LEAST 12" THICK AND 100' LONG (REDUCED TO 20 FEET FOR SITES LESS THAN 1 ACRE OF DISTURBED SOIL) WIDTH SHALL BE FULL WIDTH OF INGRESS AND EGRESS AREA. SMALLER PADS MAY BE APPROVED FOR SINGLE-FAMILY RESIDENTIAL AND COMMERCIAL SITES
3. ADDITIONAL ROCK SHALL BE ADDED PERIODICALLY TO MAINTAIN FUNCTION OF THE PAD.
4. IF THE PAD DOES NOT ADEQUATELY REMOVE MUD FROM THE VEHICLE WHEELS, THE WHEELS SHALL BE HOSED OFF BEFORE THE VEHICLE ENTERS A PAVED STREET.THE WASHING SHALL BE DONE ON AN AREA COVERED WITH CRUSHED ROCK AND WASH WATER SHALL DRAIN TO A SEDIMENT RETENTION FACILITY OR THROUGH A SILT FENCE.



1 CONSTRUCTION ENTRANCE
SCALE:NTS

FILTER FABRIC FENCE NOTES:

1. SUPPORT POST, WITH A MINIMUM 6-INCH OVERLAP. AND SECURELY FASTENED AT BOTH ENDS TO POSTS.
2. POSTS SHALL BE SPACED A MAXIMUM OF 6 FEET APART AND DRIVEN SECURELY INTO THE GROUND (MINIMUM OF 30 INCHES).
3. A TRENCH SHALL BE EXCAVATED APPROXIMATELY 8 INCHES WIDE AND 12 INCHES DEEP ALONG THE LINE OF POSTS
4. AND UPSLOPE FROM THE BARRIER. THIS TRENCH SHALL BE BACKFILLED WITH WASHED GRAVEL.
5. WHEN STANDARD STRENGTH FILTER FABRIC IS USED, A WIRE MESH SUPPORT FENCE SHALL BE FASTENED SECURELY TO THE UPSLOPE SIDE OF THE POSTS USING HEAVY-DUTY WIRE STAPLES AT LEAST 1 INCH LONG, TIE WIRES OR HOG RINGS. THE WIRE SHALL EXTEND INTO THE TRENCH A MINIMUM OF 4 INCHES AND SHALL NOT EXTEND MORE THAN 24 INCHES ABOVE THE ORIGINAL GROUND SURFACE.
6. THE STANDARD STRENGTH FILTER FABRIC SHALL BE STAPLED OR WIRED TO THE FENCE, AND 20 INCHES OF THE FABRIC SHALL BE EXTENDED INTO THE TRENCH. THE FABRIC SHALL NOT EXTEND MORE THAN 24 INCHES ABOVE THE ORIGINAL GROUND SURFACE. FILTER FABRIC SHALL NOT BE STAPLED TO EXISTING TREES.
7. WHEN EXTRA-STRENGTH FILTER FABRIC AND CLOSER POST SPACING IS USED, THE WIRE MESH SUPPORT FENCE MAY BE ELIMINATED. IN SUCH A CASE, THE FILTER FABRIC IS STAPLED OR WIRED DIRECTLY TO THE POSTS WITH ALL OTHER PROVISIONS OF ABOVE NOTES APPLYING.
8. FILTER FABRIC FENCES SHALL NOT BE REMOVED BEFORE THE UPSLOPE AREA HAS BEEN PERMANENTLY STABILIZED.
9. FILTER FABRIC FENCES SHALL BE INSPECTED IMMEDIATELY AFTER EACH RAINFALL AND AT LEAST DAILY DURING PROLONGED RAINFALL. ANY REQUIRED REPAIRS SHALL BE MADE IMMEDIATELY.
10. SILT FENCES WILL BE INSTALLED PARALLEL TO ANY SLOPE CONTOURS.
11. CONTRIBUTING LENGTH TO FENCE WILL NOT BE GREATER THAN 100 FEET.
12. DO NOT INSTALL BELOW AN OUTLET PIPE OR WEIR.
13. INSTALL DOWNSLOPE OF EXPOSED AREAS.
14. DO NOT DRIVE OVER OR FILL OVER SILT FENCES.



2 FILTER FABRIC FENCE
SCALE:NTS

AMENDED SOILS NOTES:

- SOIL AMENDMENTS ARE REQUIRED FOR ALL DISTURBED AREAS IN ACCORDANCE WITH BMP L613: POST-CONSTRUCTION SOIL QUALITY AND DEPTH OF THE 2021 SURFACE WATER MANAGEMENT MANUAL
- AMENDED SOILS SHALL BE A MINIMUM OF 8" (NON-COMPACTED) WITH SUBSOILS SCARIFIED AT LEAST 4" WITH INCORPORATION OF THE UPPER MATERIAL TO AVOID STRATIFIED LAYERS, WHERE FEASIBLE.
- QUALITY OF COMPOST AND OTHER MATERIALS USED TO MEET THE ORGANIC CONTENT REQUIREMENTS ARE AS FOLLOWS:

a. THE ORGANIC CONTENT FOR "PRE-APPROVED" AMENDMENT RATES CAN BE MET ONLY USING COMPOST THAT MEETS THE DEFINITION OF "COMPOSTED MATERIALS" IN WAC 173-350-220. THE WAC IS AVAILABLE ONLINE AT: HTTP://WWW.ECY.WA.GOV/PROGRAMS/SWFA/FACILITIES/350.HTML THE COMPOST MUST ALSO HAVE AN ORGANIC MATTER CONTENT OF 35% TO 65%, AND A CARBON TO NITROGEN RATIO BELOW 25:1. THE CARBON TO NITROGEN RATIO MAY BE AS HIGH AS 35: 1 FOR PLANTINGS COMPOSED ENTIRELY OF PLANTS NATIVE TO THE PUGET SOUND LOWLANDS REGION.
b. CALCULATED AMENDMENT RATES MAY BE MET THROUGH USE OF COMPOSTED MATERIALS AS DEFINED ABOVE; OR OTHER ORGANIC MATERIALS AMENDED TO MEET THE CARBON TO NITROGEN RATIO REQUIREMENTS, AND MEETING THE CONTAMINANT STANDARDS OF GRADE A COMPOST.

- USE ONE OF THE FOLLOWING OPTIONS TO MEET THE POST CONSTRUCTION SOIL QUALITY AND DEPTH REQUIREMENTS. USE THE MOST RECENT VERSION OF "GUIDELINES FOR RESOURCES FOR IMPLEMENTING SOIL QUALITY AND DEPTH BMP T5.13" TO MEET THE REQUIREMENTS OF THIS BMP. THIS GUIDANCE CAN BE FOUND ONLINE AT:WWW.SOILSFORSALMON.ORG

a. LEAVE NATIVE VEGETATION AND SOIL UNDISTURBED, AND PROTECT FROM COMPACTION DURING CONSTRUCTION
b. AMEND EXISTING SITE TOPSOIL OR SUBSOIL EITHER AT DEFAULT "PRE-APPROVED" RATES, OR AT CUSTOM CALCULATED RA TES BASED ON SPECIFIC TESTS OF THE SOIL AND AMENDMENT
c. STOCKPILE EXISTING TOPSOIL DURING GRADING, AND REPLACE IT PRIOR TO PLANTING. STOCKPILED TOPSOIL MUST ALSO BE AMENDED IF NEEDED TO MEET THE ORGANIC MATTER OR DEPTH REQUIREMENTS, EITHER AT A DEFAULT "PRE-APPROVED" RATE OR AT A CUSTOM CALCULATED RATE.
d. IMPORT TOPSOIL MIX OF SUFFICIENT ORGANIC CONTENT AND DEPTH TO MEET THE REQUIREMENTS. MORE THAN ONE METHOD MAY BE USED ON DIFFERENT PORTIONS OF THE SAME SITE. SOIL THAT ALREADY MEETS THE DEPTH AND ORGANIC MATTER QUALITY STANDARDS, AND IS NOT COMPACTED, DOES NOT NEED TO BE AMENDED.

- AMENDED SOILS SHALL BE MAINTAINED AS FOLLOWS:

a. SOIL QUALITY AND DEPTH SHOULD BE ESTABLISHED TOWARD THE END OF CONSTRUCTION AND ONCE ESTABLISHED, SHOULD BE PROTECTED FROM COMPACTION, SUCH AS FROM LARGE MACHINERY USE, AND FROM EROSION.
b. SOIL SHOULD BE PLANTED AND MULCHED AFTER INSTALLATION.
c. PLANT DEBRIS OR ITS EQUIVALENT SHOULD BE LEFT ON THE SOIL SURFACE TO REPLENISH ORGANIC MA TIER.
d. IT SHOULD BE POSSIBLE TO REDUCE USE OF IRRIGATION, FERTILIZERS, HERBICIDES AND PESTICIDES. THESE ACTIVITIES SHOULD BE ADJUSTED WHERE POSSIBLE,RATHER THAN CONTINUING TO IMPLEMENT FORMERLY ESTABLISHED PRACTICES.

- SEE PROJECT CONSTRUCTION SWPPP FOR ADDITIONAL INFORMATION OR SECTION 2.2.1.4 OF CHAPTER 2 OF VOLUME 6 OF THE 2021 SURFACE WATER MANAGEMENT MANUAL

MULCHING NOTES:

1. MULCH MATERIALS USED SHALL BE STRAW OR HAY, AND SHALL BE APPLIED AT THE RATE OF 75-100 POUNDS PER 1000 SQ. FT. (APPX 2" THICK).
2. MULCH SHALL BE APPLIED IN ALL AREAS WITH EXPOSED SLOPES GREATER THAN 2: 1.
3. MULCHING SHALL BE USED IMMEDIATELY AFTER SEEDING OR IN AREAS WHICH CANNOT BE SEEDED BECAUSE OF THE SEASON.
4. ALL AREAS NEEDING MULCH SHALL BE COVERED BY NOVEMBER 1.

CONTRACTOR NOTES:

1. INLET PROTECTION SHALL BE INSTALLED IN ALL NEWLY CONSTRUCTED CATCH BASINS AND ALONG ALL IMPACTED FRONTAGE AND OFFSITE AREAS PER THE REQUIREMENTS OF THE COUNTY INSPECTOR PER DETAIL 5 ON THIS SHEET 5.
2. CONSTRUCTION FENCE CAN BE UTILIZED IN PLACE OF FILTER FABRIC FENCE ONLY IN AREAS WHERE THE GRADES DO NOT ALLOW THE POTENTIAL FOR ANY STORMWATER TO LEAVE THE SITE.
3. ALL DEMOLISHED MATERIALS SHALL BE REMOVED FROM THE SITE AND DISPOSED OF AT A CITY APPROVED LOCATION AND IN A MANNER CONSISTENT WITH CURRENT REGULATIONS AND REQUIREMENTS.
4. ALL AREAS THAT WILL BE UNWORKED FOR MORE THAN SEVEN (7) DAYS DURING THE DRY SEASON OR TWO (2) DAYS DURING THE WET SEASON, SHALL BE COVERED WITH STRAW, WOOD FIBER MULCH, COMPOST, PLASTIC SHEETING, OR OTHER EQUIVALENT PER CURRENT CITY OR COUNTY STANDARDS. SEE SEEDING NOTES AND MULCHING NOTES ON THIS SHEET.
5. CONTRACTOR SHALL DESIGNATE A WASHINGTON DEPT OF ECOLOGY CERTIFIED EROSION CONTROL LEAD PERSON, AND SHALL COMPLY WITH THE CONSTRUCTION STORMWATER POLLUTION PREVENTION PLAN (SWPPP) PREPARED FOR THE PROJECT.
6. AT ANY TIME DURING CONSTRUCTION IT IS DETERMINED BY THE CITY OR COUNTY THAT MUD AND DEBRIS ARE BEING TRACKED ONTO PUBLIC STREETS WITH INSUFFICIENT CLEANUP, ALL WORK SHALL CEASE ON THE PROJECT UNTIL THIS CONDITION IS CORRECTED. THE CONTRACTOR AND/OR THE OWNER SHALL IMMEDIATELY TAKE ALL STEPS NECESSARY TO PREVENT FUTURE TRACKING OF MUD AND DEBRIS INTO THE PUBLIC ROW, WHICH MAY INCLUDE THE INSTALLATION OF A WHEEL WASH FACILITY ON-SITE.
7. SEDIMENT LADEN RUNOFF SHALL NOT BE ALLOWED TO DISCHARGE BEYOND THE LIMITS OF THE IMPROVEMENTS. ADDITIONAL MEASURES SHALL BE INSTALLED AS NEEDED.
8. SAND BAGS SHALL BE SECURELY PLACED AROUND INSTALLED CATCH BASINS WITH INLET PROTECTION AS FIELD AND WEATHER CONDITIONS WARRANT SO TO PROTECT ALL DISPERSION AND INFILTRATION TRENCHES SEDIMENT LADEN RUNOFF.
9. TREES WITHIN WORKING LIMITS TO BE SAVED, SHALL BE MARKED AS SUCH ON SITE AND PROTECTION FENCE PLACED AROUND EACH TREE.

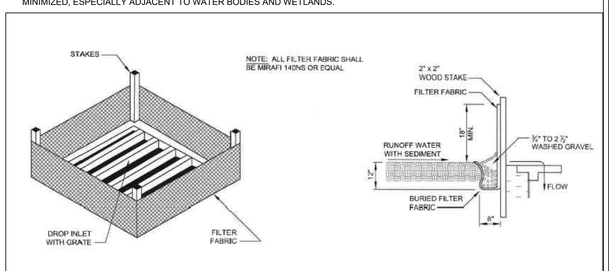
SEEDING NOTES:

1. THE FOLLOWING SEED MIXTURE SHALL BE AS BELOW AND SHALL BE APPLIED AT THE RATE RECOMMENDED BY THE SUPPLIER.

TABLE D.3.2.B TEMPORARY EROSION CONTROL SEED MIX

	% WEIGHT	% PURITY	% GERMINATION
CHEWINGS OR RED FESCUE FESTUCA *RUBRA VAR. COMMUTATA OR FESTUCA RUBRA*	40	98	90
ANNUAL OR PERENNIAL RYE *LOLIUM MULTIFLORUM OR LOLIUM PERENNE*	40	98	90
REDTOP OR COLONIAL BENTGRASS *AGROSTIS ALBA OR AGROSTIS TENUIS*	10	92	85
WHITE DUTCH CLOVER *TRIFOLIUM REPENS*	10	98	90

2. SEED BEDS PLANTED BETWEEN MAY 1 AND OCTOBER 31 WILL REQUIRE IRRIGATION AND OTHER MAINTENANCE AS NECESSARY TO FOSTER AND PROTECT THE ROOT STRUCTURE.
3. FOR SEED BEDS PLANTED BETWEEN OCTOBER 31 AND APRIL 30, ARMORING OF THE SEED BED WILL BE NECESSARY. (E.G., GEOTEXTILES, JUTE MAT, CLEAR PLASTIC COVERING).
4. BEFORE SEEDING, INSTALL NEEDED SURFACE RUNOFF CONTROL MEASURES SUCH AS GRADIENT TERRACES, INTERCEPTOR DIKES, SWALES, LEVEL SPREADERS AND SEDIMENT BASINS.
5. THE SEEDBED SHALL BE FIRM WITH A FAIRLY FINE SURFACE, FOLLOWING SURFACE ROUGHENING. PERFORM ALL OPERATIONS ACROSS OR AT RIGHT ANGLES TO THE SLOPE.
6. FERTILIZERS ARE TO BE USED ACCORDING TO SUPPLIER'S RECOMMENDATIONS. AMOUNTS USED SHOULD BE MINIMIZED, ESPECIALLY ADJACENT TO WATER BODIES AND WETLANDS.



3 INLET PROTECTION
SCALE:NTS

TESC LEGEND:

CL	CLEARING/ GRADING/ DISTURBED LIMITS
FF	FILTER FABRIC FENCE SEE DETAIL
CE	CONSTRUCTION ENTRANCE
IP	INLET PROTECTION

PRELIMINARY NOT FOR CONSTRUCTION

McInnis ENGINEERING
253.414.1992
mcinnisengineering.com
535 Dock Street, Suite 111, Tacoma, WA 98402

CASCADE SHAW

ESC

NUM	DATE	DESCRIPTION

DESIGNED W. MCINNIS	SCALE 1"=20'
DRAWN W. MCINNIS	CHECKED CHCK
DATE 2/22/23	APPROVED APRD

SHEET

OF

Figure 4: Grading and Drainage Plan

CASCADE SHAW

GRADING PLAN I

SECTION 35, TOWNSHIP 20 N, RANGE 4 E, W.M.

At time of civil application, cross sections will be required at various points along the property lines to ensure no impact from storm water damming or runoff onto neighboring properties. See City Stds Section 502 and 503.

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mcinnisengineering.com
535 Dock Street, Suite 111, Tacoma, WA 98402

CASCADE SHAW
SECTION 35, TOWNSHIP 20 N, RANGE 4 E, W.M.

NUM	DATE	DESCRIPTION

DESIGNED	SCALE
W. MCINNIS	1"=20'
DRAWN	CHECKED
W. MCINNIS	CHCK
DATE	APPROVED
2/22/23	APRD

SHEET 2 OF 10

C-2

CASCADE SHAW

GRADING PLAN II

SECTION 35, TOWNSHIP 20 N, RANGE 4 E, W.M.

GRADE AWAY MAX 2:1 SLOPE

STD COMMERCIAL APPROACH
4 / C7

TC: 74.05
BC: 73.55

TC: 73.65
BC: 73.15

TC: 74.47
BC: 73.97

TC: 74.08
BC: 73.58

TC: 73.18
BC: 72.68

TC: 74.04
BC: 73.54

TC: 72.45
BC: 71.95

TC: 71.44
BC: 70.94

TC: 71.50
BC: 71.00

TC: 73.94
BC: 73.44

TC: 73.79
BC: 73.29

TC: 74.00
BC: 73.50

TC: 73.95
BC: 73.45

TC: 74.30
BC: 73.80

407 sq ft

1,688 sq ft

COVERED MAIL BOXES

BUS STOP

FF= 74.80'

FF= 74.80'

FF= 74.80'

FF= 74.80'

COURTYARD7,390 sq ft

47,039 sq ft

3,380 sq ft

2,822 sq ft

COURTYARD6,662 sq ft

COMMERCIAL LOT AREA:29,078 sq ft

TC: 73.96
BC: 73.46

TC: 74.68
BC: 74.18

TC: 73.79
BC: 73.29

TC: 74.53
BC: 74.03

TC: 74.20
BC: 73.70

TC: 74.08
BC: 73.58

TC: 73.51
BC: 73.01

TC: 73.69
BC: 73.19

OUTDOOR SPACE3,319 sq ft

TC: 74.20
BC: 73.70

TC: 74.39
BC: 73.89

2,324 sq ft

TC: 74.11
BC: 73.61

TC: 73.99
BC: 73.49

TC: 74.25
BC: 73.75

TC: 73.77
BC: 73.27

TC: 73.48
BC: 72.98

TC: 73.84
BC: 73.34

TC: 73.89
BC: 73.39

TC: 73.69
BC: 73.19

TC: 74.38
BC: 73.88

TC: 73.83
BC: 73.33

TC: 74.13
BC: 73.63

TC: 73.75
BC: 73.25

TC: 73.60
BC: 73.10

TC: 73.96
BC: 73.46

TC: 74.27
BC: 73.77

TC: 74.65
BC: 74.15

TC: 73.92
BC: 73.42

TRASH & RECYCLE655 sq ft

TC: 73.89
BC: 73.39

TC: 74.13
BC: 73.63

SHAW ROAD

ASPHALT DETAIL
2 / C7

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535 Dock Street, Suite 111, Tacoma, WA 98402

CASCADE SHAW

SECTION 35, TOWNSHIP 20 N.
RANGE 4 E, W.M.

NUM	DATE	DESCRIPTION

DESIGNED W. MCINNIS	SCALE 1"=20'
DRAWN W. MCINNIS	CHECKED CHCK
DATE 2/22/23	APPROVED APRD

SHEET 3 OF 10

C-3

CASCADE SHAW

SECTION 35, TOWNSHIP 20 N, RANGE 4 E, W.M.

At time of civil application, see BMP 209 for outlet protection requirements.

OUTLET @ 61.43'

23 LF CPEP @0.3%

SDMH TYPE 2
RIM:72.78
SUMP:63.53
INV IN:63.53 36"

27' of 137" ARCH PIPE @ 0%

SDMH TYPE 2
RIM:72.78
SUMP:63.53
INV IN:63.53 36"
INV IN:63.53 36"
INV IN:63.53 36"

99' of 137" ARCH PIPE @ 0%

SDMH TYPE 2
RIM:72.78
SUMP:63.53
INV IN:63.53 36"
INV IN:63.53 36"

106' of 137" ARCH PIPE @ 0%

SDMH TYPE 2
RIM:72.78
SUMP:63.53
INV IN:63.53 136"
INV IN:63.53 36"
INV OUT:63.53 36"

105' of 137" ARCH PIPE @ 0%

The storm conveyance pipe is shown routed through the wetland which does not comply with Ecology Manual MR8 and the wetland General Protection requirements. [Storm Report; Pg 24 of 272]

MODULAR WETLAND

1
C9

9' of 137" ARCH PIPE @ 0%

188 LF CPEP @0.3%

104' of 137" ARCH PIPE @ 0%

BFE 67

Existing Contour 67'

The floodplain delineation noted on the LOMR dated April 4, 2019 is approximate and the actual limits of the floodplain shall be verified using the FEMA determined flood profile, BFEs, and the existing topography of the project site. Based on this preliminary grading plan and the existing topography (surveyed points), it appears that portions of the project will encroach into the floodplain triggering floodplain regulations. Revise site plan or clarify how the project proposes to comply with PMC 21.07, particularly the compensatory storage provisions PMC 21.07.060(f). [Storm Report; Pg 24 of 272]

106' of 137" ARCH PIPE @ 0%

SDMH TYPE 2
RIM:72.78
SUMP:63.53
INV IN:63.53 36"
INV OUT:63.53 36"

BFE 68

Existing Contour 68'

52' of 137" ARCH PIPE @ 0%

SDMH TYPE 2
RIM:72.78
SUMP:63.53
INV IN:63.53 36"

101' of 137" ARCH PIPE @ 0%

SDMH TYPE 2
RIM:72.78
SUMP:63.53
INV IN:63.53 36"
INV IN:63.53 36"
INV IN:63.53 36"

SDMH TYPE 2
RIM:72.78
SUMP:63.53
INV IN:63.53 36"
INV IN:63.53 36"

105' of 137" ARCH PIPE @ 0%

106' of 137" ARCH PIPE @ 0%

SDMH TYPE 2
RIM:72.78
SUMP:63.53
INV IN:63.53 36"
INV OUT:63.53 36"

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mcinnisengineering.com
2522 N. Proctor Street, Suite 283, Tacoma, WA 98406

CASCADE SHAW

SECTION 35, TOWNSHIP 20 N, RANGE 4 E, W.M.

JEFFREY W. MCINNIS
STATE OF WASHINGTON
37399
REGISTERED PROFESSIONAL ENGINEER

NUM	DATE	DESCRIPTION

DESIGNED W. MCINNIS	SCALE 1"=20'
DRAWN W. MCINNIS	CHECKED CHCK
DATE 2/22/23	APPROVED APRD

SHEET 4 OF 10

C-4

CASCADE SHAW

SECTION 35, TOWNSHIP 20 N, RANGE 4 E, W.M.

It is not acceptable to mix public runoff with private runoff. If the disturbed PGHS in the ROW is less than 2,000sf, then no need for a public WQ facility. To be resolved at time of civil application.

In addition, there is an existing storm system within Shaw Road that conveys ROW runoff to a different basin. Any disturbed areas within the ROW shall be evaluated at time of civil application, but likely will necessitate the private onsite flow control system be oversized to account for bypass of public runoff.

SDMH TYPE 2
RIM:72.78
SUMP:63.53
INV IN:63.53 36"
INV OUT:63.53 36"

105' of 137" ARCH PIPE @ 0%

SDMH TYPE 2
RIM:72.78
SUMP:63.53
INV IN:63.53 36"
INV OUT:63.53 36"

106' of 137" ARCH PIPE @ 0%

SDMH TYPE 2
RIM:72.78
SUMP:63.53
INV IN:63.53 36"
INV OUT:63.53 36"

39' of 137" ARCH PIPE @ 0%

SDMH TYPE 2
RIM:72.78
SUMP:63.43
INV IN:63.53 136"
INV IN:63.43 12"
INV OUT:63.53 36"

SDMH TYPE 2
RIM:70.10
SUMP:65.73
INV OUT:65.73 12"

169' of 12" CPEP @ 1%

SDMH TYPE 2
RIM:71.08
SUMP:64.04
INV IN:64.04 12"
INV OUT:64.04 12"

SDMH TYPE 2
RIM:72.78
SUMP:63.53
INV IN:63.53 36"
INV IN:63.53 36"

126' of 137" ARCH PIPE @ 0%

69' of 12" CPEP @ 1%

51' of 137" ARCH PIPE @ 0%

SDMH TYPE 2
RIM:72.78
SUMP:63.53
INV OUT:63.53 36"
INV OUT:63.53 36"

69' of 137" ARCH PIPE @ 0%

SDMH TYPE 2
RIM:73.45
SUMP:69.24
INV OUT:69.24 12"

SDMH TYPE 2
RIM:72.78
SUMP:63.53
INV IN:63.53 36"
INV IN:63.53 36"
INV IN:63.53 36"

SDMH TYPE 2
RIM:72.78
SUMP:63.53
INV IN:67.05 12"
INV OUT:63.53 36"

SDMH TYPE 2
RIM:72.78
SUMP:63.53
INV IN:63.53 36"
INV OUT:63.53 36"

106' of 137" ARCH PIPE @ 0%

SDMH TYPE 2
RIM:72.78
SUMP:63.53
INV IN:63.53 36"
INV OUT:63.53 36"

106' of 137" ARCH PIPE @ 0%

SDMH TYPE 2
RIM:72.78
SUMP:63.53
INV OUT:63.53 36"
INV OUT:63.53 36"

119' of 137" ARCH PIPE @ 0%

120' of 137" ARCH PIPE @ 0%

75' of 12" CPEP @ 3%

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CASCADE SHAW

PROJECT ADDRESS

JEFFREY W. McINNIS
STATE OF WASHINGTON
37199
REGISTERED
PROFESSIONAL ENGINEER

NUM	DATE	DESCRIPTION

DESIGNED W. MCINNIS	SCALE 1"=20'
DRAWN W. MCINNIS	CHECKED CHCK
DATE 2/22/23	APPROVED APRD

SHEET 5 OF 10

C-5

Appendix B – Geotechnical Analysis

GEOTECHNICAL ENGINEERING INVESTIGATION
PROPOSED CASCADE SHAW ROAD DEVELOPMENT
ABBEY ROAD GROUP JOB NUMBER: 03-143-6
PUYALLUP, WASHINGTON

PROJECT NO. 062-20004
MAY 26, 2020

Prepared for:

ABBEY ROAD GROUP LAND DEVELOPMENT SERVICES COMPANY, LLC
ATTN: MR. GIL HULSMANN
P.O. BOX 1224
PUYALLUP, WA 98371

Prepared by:

KRAZAN & ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING DIVISION
825 CENTER STREET, STE A
TACOMA, WASHINGTON 98409
(253) 939-2500

Krazan & ASSOCIATES, INC.

GEOTECHNICAL ENGINEERING • ENVIRONMENTAL ENGINEERING
CONSTRUCTION MATERIALS TESTING & INSPECTION

May 26, 2020 KA Project No. 062-20004

Abbey Road Group Land Development Services Company, LLC
P.O. Box 1224
Puyallup, Washington 98371

Attn: Mr. Gil Hulsmann Email: Gil.Hulsmann @AbbeyRoadgroup.com
Tel: (253) 435-3699

Reference: Geotechnical Engineering Investigation
Proposed Cascade Shaw Road Development
808 Shaw Road East
Puyallup, Washington

Dear Mr. Hulsmann,

In accordance with your request, we have completed a Geotechnical Engineering Investigation for the referenced site. The results of our investigation are presented in the attached report.

If you have any questions, or if we can be of further assistance, please do not hesitate to contact our office.

Respectfully submitted,
KRAZAN & ASSOCIATES, INC.

Theresa R. Nunan
Project Manager

TABLE OF CONTENTS

May 26, 2020 KA Project No. 062-20004

GEOTECHNICAL ENGINEERING INVESTIGATION
PROPOSED CASCADE SHAW ROAD DEVELOPMENT
808 SHAW ROAD EAST
PUYALLUP, WASHINGTON

INTRODUCTION

This report presents the results of our Geotechnical Engineering Investigation for the proposed Cascade Shaw Road Development project located at 808 Shaw Road in Puyallup, Washington, as shown on the Vicinity Map in Figure 1. Discussions regarding site conditions are presented in this report, together with conclusions and recommendations pertaining to site preparation, excavation, foundations, structural fill, utility trench backfill, concrete slabs and exterior flatwork, drainage, erosion control, and pavements.

A site plan showing the approximate locations of the exploratory test pits and seismic Cone Penetration Test (sCPT) is presented following the text of this report in Figure 2. A description of the field investigation and laboratory testing, as well as the exploratory test pit and CPT logs, is presented in Appendix A. Appendix B contains a guide to aid in the development of earthwork specifications. Pavement design guidelines are presented in Appendix C. The recommendations in the main text of the report have precedence over the more general specifications in the appendices.

PURPOSE AND SCOPE

This investigation was conducted to evaluate the subsurface soil and groundwater conditions at the site, to develop geotechnical engineering recommendations for use in design of specific construction elements, and to provide criteria for site preparation and earthwork construction.

Our scope of services was performed in general accordance with our proposal number G20008WAT for this project dated February 21, 2020 and our Change Order #1 (G20016WAT) dated March 19, 2020, and included the following:

- An exploration of the subsurface soil and groundwater conditions by conducting twelve (12) test pit explorations and one (1) seismic Cone Penetration Test (sCPT) using subcontracted equipment operators, excavator, and CPT rig under the direction of a Krazan geotechnical engineer;

- Installation of three (3) groundwater monitoring wells using a drilling subcontractor;

- A site plan showing the test pit and CPT locations, and comprehensive logs including soil stratification and classification, and groundwater levels where applicable;
- Recommended foundation type for the proposed structure;
- Recommendations for foundation design, including allowable foundation bearing pressure, anticipated settlements (both total and differential), coefficient of horizontal friction for footing design, and frost penetration depth;
- Recommendations for seismic design considerations including site coefficient and ground acceleration based on the 2015 IBC;
- Recommendations for structural fill materials, placement, and compaction;
- Recommendations for suitability of onsite soils as structural fill;
- Recommendations for temporary excavations;
- Recommendations for site drainage and erosion control;
- Recommendations for flexible and rigid pavements.

Environmental services, such as chemical analysis of soil and groundwater for possible environmental contaminants, were not included in our geotechnical engineering scope of services for this project.

PROPOSED CONSTRUCTION

We understand that the project will include development of the portion of the site with residential and commercial buildings. Two commercial buildings covering a footprint of about 4,800 square feet (sf) each are planned to front Shaw Road. Fifteen residential structures will be constructed on the remainder of the site, with the exception of the westernmost portion of the parcel which will remain undeveloped. Site grading and building loads were unavailable at the time of this report.

We have assumed that the residential buildings will be 1- to 3-story structures with a slab-on-grade floor system, with column and wall loads not exceeding 60 kips and 3 kips per lineal foot, respectively.

Other site developments will include paved parking areas and access drives, as well as installation of the associated site utilities. We have assumed cut and fill thicknesses of no more than 2 feet will be required to attain final site grades. At the time of this report, we do not have any details regarding the potential use of an onsite stormwater system, including the possible location(s) or type(s) of infiltration systems.

SITE LOCATION AND DESCRIPTION

The subject property consists of one assessor parcel number (APN) 042035-1003 encompassing approximately 9.1 acres of land located west of the intersection of East Pioneer Way and Shaw Road. The site has been used in the past for agricultural purposes. The eastern portion of the property functioned as a staging area during construction of the adjacent Pioneer Crossing Shopping Center. We understand that the soil within the construction staging area was modified with cement to provide a stable subgrade for the equipment and supplies. Ground cover over this area consists of rock spalls, with sparse patches of grass covering the middle portion of the site.

The property is currently fairly level, with the exception of about a 3 to 4-foot high berm located about two-thirds into the property towards the westerly end. We understand the berm was created using the excess cement-modified soil. A small detention pond is located at the northwest corner of the berm.

Between the time of our test pit exploration and installation of the three groundwater monitoring wells, additional fill material had been placed on the site just west of the rock spall area. The undocumented fill has been placed in random stockpiles and consists of brown silty sand, brown sandy silt, and some clay soils, with occasional concrete debris and tree branches noted. We understand that this undocumented fill material is temporary and that it will be removed prior to site grading and building construction.

GEOLOGIC SETTING

The site lies within the central Puget Lowland. The lowland is part of a regional north-south trending trough that extends from southwestern British Columbia to near Eugene, Oregon. North of Olympia, Washington, this lowland is glacially carved, with a depositional and erosional history including at least four separate glacial advances and retreats. The Puget Lowland is bounded to the west by the Olympic Mountains and to the east by the Cascade Range. The lowland is filled with glacial and nonglacial sediments.

The Washington Division of Geology and Earth Resources, Geologic Map of the South Half of the Tacoma Quadrangle, Washington (Open File Report 87-3) indicates that the property is located in an area that is predominantly underlain by recent alluvium deposited by the Puyallup River. The recent alluvium consists of interbedded silt, sandy silt, silty sand, sand, gravel, local areas of peat and clay. The finer material represents overbank material and local lacustrine deposits, and the coarser materials most likely represent deposits in abandoned channels of the Puyallup River.

FIELD INVESTIGATION

Twelve (12) exploratory test pits were completed to evaluate the subsurface soil and groundwater conditions at the project location. The test pits were conducted on March 2, 2020 using a subcontracted equipment operator and CAT 308E track excavator under the direction of a Krazan geotechnical

engineer. The test pits, designated TP-1 through TP-12, were advanced to depths of 4.0 to 10.2 feet below the existing ground surface (bgs). A field engineer from Krazan and Associates was present during the explorations, continuously examined and visually classified the soils in general accordance with the Unified Soil Classification System (USCS), and maintained logs of the explorations. Logs of the exploratory test pits are included in Appendix A.

Representative samples of the soils encountered in the geotechnical explorations were collected and sealed in plastic bags. These samples were transported to our laboratory for further examination and testing. A more detailed description of the field investigation is presented in Appendix A.

Additionally, one (1) seismic Cone Penetrometer Test (sCPT) was advanced at the site. The exploration using the CPT rig was completed on March 5, 2020. The CPT method consists of pushing an instrumented cone into the ground at a controlled rate and recording measured soil parameters, such as tip resistance, friction ratio, and pore pressure. These parameters are used to determine the geotechnical engineering properties of soils and delineate soil stratigraphy, particularly for use with seismic analyses. The results of the sCPT are included in Appendix A. Three monitoring wells, designated MW-1, MW-2, and MW-3 were installed at the site on April 29, 2020 using a subcontracted driller and geoprobe drill rig under the direction of a Krazan geotechnical engineer. The boreholes for the monitoring wells were advanced to a depth of 20 feet below the existing ground surface. A 15-foot long section of slotted PVC pipe attached to a 5-foot section of solid PVC pipe was inserted into the borehole, and the annular space between the pipe and the augers was backfilled with filter sand to a depth of 3 feet bgs followed by bentonite chips to the ground surface. A metal well cap was then installed over the pipe and cemented in-place to protect the well from unauthorized access.

Outside of the "wet season" window

The approximate locations of the test pits, Scpt, and monitoring wells are shown on the Site Plan in Figure 2.

SOIL PROFILE AND SUBSURFACE CONDITIONS

Our test pits generally exposed undocumented fill material overlying native alluvial soils to the explored depths. Detailed logs of the test pits and sCPT are presented in Appendix A.

Undocumented fill material was encountered up to a depth of 5 feet bgs. The undocumented fill consisted of medium dense sands and stiff sandy silt soils. Concrete debris and tree branches were encountered within the fill material in test pits TP-5 and TP-6. The fill material was underlain by dense to very dense cement-modified soil in test pits TP-1 through TP-4. Test pits TP-9 through TP-12, conducted west of the soil berm, encountered 1 to 1.5 feet of soil that had been tilled for agricultural purposes.

Sand with varying silt content and sandy silt soils were encountered beneath the fill material. The sands were estimated to be in a medium dense condition based on the excavation efforts of the excavator, while the silts exhibited a stiff consistency. The sands and silts were generally brown or grey with

orange mottling. Water bearing black sand was encountered beneath this stratum and extended to the termination depths of the test pits.

The subsurface conditions encountered in the test pits was in general agreement with the conditions revealed by the seismic Cone Penetration Test, designated CPT-1. Below the termination depth of the test pits, CPT-1 encountered interbedded silt and sand seams and layers generally exhibiting a loose to medium dense or stiff consistency to a depth of about 25 feet bgs, followed by very dense sand to the termination depth of 29 feet bgs.

LABORATORY TEST RESULTS

Gradation and Wash No. 200 (percent fines) tests were conducted on representative samples of the soils for classification purposes and for determination of engineering properties. The gradation results are graphically depicted in Appendix A. For additional information about the soils encountered, please refer to the test pit logs in Appendix A.

GROUNDWATER

2 days after install.

With the exception of test pit TP-8 conducted on the berm, groundwater was encountered at a depth of 3 to 9.5 feet bgs in the test pits. A porewater pressure dissipation test conducted in CPT-1 indicated groundwater at a depth of 6.5 feet bgs. The three monitoring wells, designated MW-1 through MW-3, installed on the site were read on May 1, 2020 and indicated groundwater levels at 7.55 feet, 8.60 feet, and 3.58 feet bgs, respectively. Monitoring well MW-3 was installed in the western end of the site where fill material had not been placed over the native soils.

It should be recognized that groundwater elevations may fluctuate with time. The groundwater level will also be dependent upon seasonal precipitation, irrigation, land use, and climatic conditions, as well as other factors. Therefore, water levels at the time of the field investigation may be different from those encountered during the construction phase of the project. The evaluation of such factors is beyond the scope of this report.

GEOLOGIC HAZARDS

Erosion Concern/Hazard

The Natural Resources Conservation Services (NRCS) map for Pierce County Area, Washington, classifies the site area as Briscot loam AND Puyallup fine sandy loam. The NRCS classifies the Briscot loam as Hydrologic Soil Group B/D and Puyallup fine sandy loam as Hydrologic Soil Group A. Group A soils are designated as having low potential for erosion in a disturbed state and Group B/D are designated as having moderate to high potential for erosion in a disturbed state.

It has been our experience that soil erosion can be minimized through landscaping and surface water runoff control. Typically, erosion of exposed soils will be most noticeable during periods of rainfall and

may be controlled by the use of normal temporary erosion control measures, i.e., silt fences, hay bales, mulching, control ditches or diversion trenching, and contour furrowing. Erosion control measures should be in place before the onset of wet weather.

Seismic Hazard

The 2015 International Building Code (IBC), Section 1613.3.2, refers to Chapter 20 of 2010 ASCE-7 for Site Class Definitions. We performed a site-specific liquefaction analysis, which indicated the presence of liquefiable soils to a depth of roughly 23 feet bgs. Per Chapter 20 of 2010 ASCE-7, Site Class F applies to the site if liquefiable soils are present and a site response analysis in accordance with Section 21.1 needs to be performed. However, if the structures have fundamental periods of vibration equal to or less than 0.5s, site response analysis is not required and Site Class can be determined per Section 20.3. We have assumed that the planned structures will have fundamental periods of vibration equal to or less than 0.5s, which will need to be verified by the project structural engineer.

It is our opinion that the overall soil profile corresponds to Site Class D as defined by Table 20.3-1 "Site Class Definitions," according to the 2010 ASCE-7 Standard. Site Class D applies to a "stiff soil" profile. The seismic site class is based on a soil profile extending to a depth of 100 feet. The sCPT conducted on this site extended to a maximum depth of 29.0 feet and this seismic site class designation is based on the assumption that similar soil conditions continue below the depth explored.

We referred to the ATC Hazards by Location Website and 2015 IBC to obtain values for S_S, S_{MS}, S_{DS}, S_1, S_{M1}, S_{D1}, F_a, and F_v. The ATC website includes the most updated published data on seismic conditions. The seismic design parameters for this site are as follows:

Table 1: Seismic Design Parameters
(Reference: 2015 IBC Section 1613.3.2, ASCE, and ATC)

Seismic Item	Value
Site Coefficient F_a	1.003
S_s	1.243
S_{MS}	1.247
S_{DS}	0.831
Site Coefficient F_v	1.524
S_1	0.476
S_{M1}	0.726
S_{D1}	0.484

Liquefaction Hazard: Additional seismic considerations include liquefaction potential and amplification of ground motions by loose/soft soil deposits. Liquefaction usually occurs under vibratory conditions such as those induced by seismic events. The liquefaction potential is highest for loose sand with a high groundwater table. Soil liquefaction is a state where soil particles lose contact with each other and become suspended in a viscous fluid. This suspension of the soil grains results in a complete loss of strength as the effective stress drops to zero. Liquefaction normally occurs under saturated conditions in soils such as sand in which the strength is purely frictional. However, liquefaction has occurred in soils other than clean sand.

We have reviewed "Liquefaction Susceptibility Map of Pierce County, Washington" by Stephen P. Palmer et al., (WA DNR, 2004). The map indicates that the site area is located in a zone of high liquefaction susceptibility. Therefore, we have conducted a site-specific liquefaction analysis for this project.

To evaluate the liquefaction potential of the site, we analyzed the following factors:

1) Soil type
2) Groundwater depth
3) Relative soil density
4) Initial confining pressure
5) Maximum anticipated intensity and duration of ground shaking.

Liquefaction Analysis: The commercially available liquefaction analysis software, LiquefyPro from CivilTech, was used to evaluate the liquefaction potential and the possible liquefaction induced settlement for the site soil and groundwater conditions based on our explorations. The analysis was

performed using the information from the seismic cone penetration test CPT-1. Maximum Considered Earthquake (MCE) was selected in accordance with the 2015 IBC, Chapter 16, and the Applied Technology Council (ATC) Hazards by Location website. For this analysis, a maximum earthquake magnitude of 7.13 and peak horizontal ground surface acceleration of 0.5g were used. Our analysis assumed a groundwater depth of 5 feet bgs during the earthquake.

The maximum liquefaction induced settlement for this type of seismic event is estimated to be on the order of about 2.5 inches, with differential settlements estimated to be on the order of about1.5 inches.

CONCLUSIONS AND RECOMMENDATIONS

General

It is our opinion that the planned improvements at this site are feasible, provided that the geotechnical engineering recommendations presented in this report are included in the project design and implemented during construction, and the potential for seismic-induced settlement is deemed acceptable.

The subsurface soils encountered on this site are considered highly moisture-sensitive and may disturb easily in wet conditions. We recommend that construction take place during the drier summer months, if possible. If construction is to take place during wet weather or if perched water conditions in drier months affect the subgrade soils, additional expenses and delays should be expected due to the wet conditions. Additional expenses could include the need for placing a blanket of rock spalls to protect exposed subgrade and construction traffic areas. The lateral extent and depth of rock spalls, if required, should be determined based on evaluation of the near surface soil conditions at the time of construction. Additional measures to minimize disturbance to the subgrade and near-surface soils may include the use of excavators equipped with wide tracks or use of smooth rather than toothed buckets to complete site grading. The prepared subgrade should be protected from construction traffic and surface water should be diverted around the prepared subgrade.

In our opinion, the onsite soils are not considered suitable for re-use as structural fill material due to their high silt content. If soil types other than those revealed during our field exploration are encountered during construction, then Krazan should be consulted regarding the suitability of these soils for use as structural fill.

Site Preparation

General site clearing should include removal of any organics, asphaltic concrete, abandoned utilities, and structures including foundations, slabs, rubble, and rubbish. After stripping operations, the building and pavement areas should be visually inspected to identify any loose/soft areas. Any Loose/soft areas and undocumented fill soils should be removed to expose competent native soils or the cement modified soils and backfilled with structural fill. Additional recommendations for preparation of specific areas

are provided in the Foundations, Pavement Design, and Floor Slabs and Exterior Flatwork subsections of this report.

During wet weather conditions, subgrade stability problems and grading difficulties may develop due to excess moisture, disturbance of sensitive soils, and/or the presence of perched groundwater. Construction during the extended periods of wet weather could result in the need to remove wet disturbed soils if they cannot be suitably compacted due to elevated moisture contents. During our field exploration, groundwater was encountered at depths of 3 to 9.5 feet bgs in the test pits.

The soils that will be encountered during site development are considered extremely moisture sensitive and may disturb easily in wet conditions. The prepared subgrade should be protected from construction traffic and surface water should be diverted around the prepared subgrade. If over-excavation is necessary, it should be confirmed through continuous monitoring and testing by a qualified geotechnical engineer or geologist. Soils that have become unstable may require drying and recompaction. Selective drying may be accomplished by scarifying or windrowing surficial material during extended periods of dry, warm weather (typically during the summer months). If the soils cannot be dried back to a workable moisture condition, remedial measures may be required. These remedial measures could include placement of a blanket of rock spalls to protect exposed subgrade and construction traffic areas. The lateral extent and depth of rock spalls, if required, should be determined based on evaluation of the near surface soil conditions at the time of construction. Additional measures to minimize disturbance to the subgrade and near-surface soils may include the use of excavators equipped with wide tracks or use of smooth rather than toothed buckets to complete site grading.

General project site winterization should consist of the placement of aggregate base and the protection of exposed soils during the construction phase. It should be understood that even if Best Management Practices (BMP's) for wintertime soil protection are implemented and followed there is a significant chance that moisture disturbed soil mitigation work will still be required.

Any buried structures encountered during construction should be properly removed and backfilled. Excavations, depressions, or soft and pliant areas extending below the planned finish subgrade levels should be excavated to expose firm undisturbed soil, and backfilled with structural fill. In general, any septic tanks, underground storage tanks, debris pits, cesspools, or similar structures should be completely removed. Concrete footings should be removed to an equivalent depth of at least 3 feet below proposed footing elevations or as recommended by the geotechnical engineer. The resulting excavations should be backfilled with structural fill.

A representative of our firm should be present during all site clearing and grading operations to test and observe earthwork construction. This testing and observation is an integral part of our service, as acceptance of earthwork construction is dependent upon compaction and stability of the material. The geotechnical engineer may reject any material that does not meet compaction and stability requirements. Further recommendations, contained in this report, are predicated upon the assumption that earthwork

construction will conform to the recommendations set forth in this section and in the Structural Fill Section.

Temporary Excavations

The onsite soils have variable cohesion and/or friction strengths, therefore the safe angles to which these materials may be cut for temporary excavations is variable, as the soils may be prone to caving and slope failures in temporary excavations deeper than 5 feet, especially where seepage or perched water is encountered in the excavation. Temporary excavations in the medium dense to stiff native soils should be sloped no steeper than 1.5H:1V (horizontal to vertical) where room permits.

All temporary cuts should be in accordance with Washington Administrative Code (WAC) Part N, Excavation, Trenching, and Shoring. The temporary slope cuts should be visually inspected daily by a qualified person during construction work activities and the results of the inspections should be included in daily reports. The contractor is responsible for maintaining the stability of the temporary cut slopes and minimizing slope erosion during construction. The temporary cut slopes should be covered with plastic sheeting to help minimize erosion during wet weather and the slopes should be closely monitored until the permanent retaining systems are complete. Materials should not be stored and equipment operated within 10 feet of the top of any temporary cut slope.

A Krazan & Associates geologist or geotechnical engineer should observe, at least periodically, the temporary cut slopes during the excavation work. The reasoning for this is that all soil conditions may not be fully delineated by the limited sampling of the site from the geotechnical explorations. In the case of temporary slope cuts, the existing soil conditions may not be fully revealed until the excavation work exposes the soil. Typically, as excavation work progresses the maximum inclination of the temporary slope will need to be evaluated by the geotechnical engineer so that supplemental recommendations can be made. Soil and groundwater conditions can be highly variable. Scheduling for soil work will need to be adjustable, to deal with unanticipated conditions, so that the project can proceed smoothly and required deadlines can be met. If any variations or undesirable conditions are encountered during construction, Krazan & Associates should be notified so that supplemental recommendations can be made.

Structural Fill

Fill placed beneath foundations, pavement, or other settlement-sensitive structures should be placed as structural fill. Structural fill, by definition, is placed in accordance with prescribed methods and standards, and is monitored by an experienced geotechnical professional or soils technician. Field monitoring procedures would include the performance of a representative number of in-place density tests to document the attainment of the desired degree of relative compaction. The area to receive the fill should be suitably prepared as described in the Site Preparation subsection of this report prior to beginning fill placement.

Best Management Practices (BMP's) should be followed when considering the suitability of the existing materials for use as structural fill. The soils that will be encountered during site development are considered extremely moisture-sensitive and may disturb easily in wet conditions. In our opinion, the onsite soils are not considered suitable for re-use as structural fill material due to their high silt content. If soil types other than those revealed during our field exploration are encountered during construction, then Krazan should be consulted regarding the suitability of these soils for use as structural fill.

During wet weather conditions, the soils with higher silt contents will be moisture sensitive, easily disturbed, and may be difficult or impossible to compact to structural fill requirements. Furthermore, during the winter, soils typically have elevated natural moisture contents, which will limit the use of these materials as structural fill without proper mitigation measures. The contractor should use Best Management Practices to protect the soils during construction activities and be familiar with wet weather and wintertime soil work. An allowance for importing structural fill should be incorporated into the construction cost of the project.

Imported structural fill material should consist of well-graded gravel or a sand and gravel mixture with a maximum grain size of 3 inches and less than 5 percent fines (material passing the U.S. Standard No. 200 Sieve). All structural fill material should be submitted for approval to the geotechnical engineer at least 48 hours prior to delivery to the site.

Fill soils should be placed in horizontal lifts not exceeding 8 inches loose thickness, moisture-conditioned as necessary (moisture content of soil shall not vary by more than ±2 percent of optimum moisture), and the material should be compacted to at least 95 percent of the maximum dry density based on ASTM Test Method D1557. In-place density tests should be performed on all structural fill to document proper moisture content and adequate compaction. Additional lifts should not be placed if the previous lift did not meet the compaction requirements or if soil conditions are not considered stable.

Foundations

The proposed structure may be supported on a shallow foundation system bearing on the medium dense/stiff native soils, or on structural fill extending to the medium dense/stiff or firmer native soils. We recommend that any existing undocumented fill be removed and replaced with structural fill in accordance with the Structural Fill recommendations of this report. Based on our test pit explorations, up to 5 feet of undocumented fill material was encountered, with the greater fill depths encountered in the area of the site where the existing soils were modified with cement. Greater depths of undocumented fill may be encountered in unexplored areas of the site. With the exception of test pits TP-5 and TP-6, the existing fill encountered in the test pits did not contain any debris or deleterious material, or rock greater than 3 inches in dimension.

Conventional shallow spread foundations should be placed on the undisturbed medium dense/stiff or firmer native soils or on structural fill, rock spalls, or Controlled Density Fill (CDF) extending to undisturbed medium dense/stiff or firmer native soils. Where loose soils or undocumented fill are

encountered at the planned footing elevations, the subgrade should be over-excavated to expose suitable bearing soil. Footing excavations should be inspected by Krazan & Associates to verify that the foundations will bear on suitable material.

If rock spalls or structural fill soils are used, the trenches would need to be widened on both sides of the footing a distance equal to the depth of the over-excavation below the bottom of the footing. Structural fill should be compacted to at least 95 percent of the maximum dry density based on ASTM Test Method D1557. To reduce the volume of extra excavation needed for the footing trenches and to simplify structural fill placement, it may be practical to place CDF to fill the deeper footing trenches to the planned footing subgrade elevations. If CDF is used, the trench may be excavated only slightly wider (6 inches wider on each side) than the footing.

Exterior footings should have a minimum depth of 18 inches below pad subgrade (soil grade) or adjacent exterior grade, whichever is lower. Interior footings should have a minimum depth of 12 inches below pad subgrade (soil grade) or adjacent exterior grade, whichever is lower. Footing widths should be based on the anticipated loads and allowable soil bearing pressure. Additionally, footings should conform to current International Building Code (IBC) guidelines. Water should not be allowed to accumulate in footing trenches. Footings should have a minimum width of 12 inches regardless of load. All loose or disturbed soil should be removed from the foundation excavation prior to placing concrete.

For foundations constructed as outlined above, we recommend that an allowable design bearing capacity of 2,500 pounds per square foot (psf) may be used for foundation design for this project. A representative of Krazan and Associates should evaluate the foundation bearing soil prior to footing form construction.

Resistance to lateral footing displacement can be computed using an allowable friction factor of 0.35 acting between the bases of foundations and the supporting subgrade. Lateral resistance for footings can alternatively be developed using an allowable equivalent fluid passive pressure of 250 pounds per cubic foot (pcf) acting against the appropriate vertical footing faces (neglecting the upper 12 inches). The allowable friction factor and allowable equivalent fluid passive pressure values include a factor of safety of 1.5. The frictional and passive resistance of the soil may be combined without reduction in determining the total lateral resistance. A 1/3 increase in the above values may be used for short duration wind and seismic loads.

For foundations constructed as recommended, the total settlement is not expected to exceed 1-inch. Differential settlement, along a 20-foot exterior wall footing, or between adjoining column footings should be less than ½ inch. Most settlement is expected to occur during construction, as the loads are applied. However, additional post-construction settlement may occur if the foundation soils are flooded or saturated. It should be noted that the settlement provided herewith is a static settlement and does not include liquefaction induced settlement. Static settlement is induced by the applied dead load from the structures.

Up to 2.5 inches of total settlement and about 1.5 inches of differential settlement could occur during and/or following a seismic event. The foundation elements, i.e. spread and wall footings, could be structurally tied together to create a stiffer structure, and layers of geotextile could be placed within the upper soils to create a stiff soil mass. It should be noted that although these measures may reduce the damage associated with the anticipated seismic settlement, particularly that caused by differential settlement, they would not mitigate the anticipated seismic settlement. If the anticipated magnitude of the seismic settlement is deemed unacceptable, a deep foundation system could be considered for support of the buildings. Based on the CPT results, suitable bearing soils were encountered at a depth of about 26 feet below the existing ground surface.

Seasonal rainfall, water run-off, and the normal practice of watering trees and landscaping areas around the proposed structures should not be permitted to flood and/or saturate foundation subgrade soils. To prevent the buildup of water within the footing areas, continuous footing drains (with cleanouts) should be provided at the base of the footings. The footing drains should consist of a minimum 4-inch diameter rigid perforated PVC pipe, sloped to drain with perforations placed near the bottom, and enveloped in all directions by washed rock wrapped with filter fabric to limit the migration of silt and clay into the drain.

Floor Slabs and Flatwork

Based on our explorations, the near surface soils at the site are interpreted as medium dense to stiff native soils and medium dense to very dense undocumented fill material. Before the placement of concrete floors or pavements on the site, or before any floor supporting fill is placed, any loose soils and undocumented fill must be removed to expose medium dense, stiff, or firmer undisturbed native soil. The subgrade should then be proof-rolled to confirm that the subgrade contains no soft or deflecting areas.

Where loose/soft soils or undocumented fill are encountered in the slab subgrade, we recommend over-excavation of the loose/soft soil and undocumented fill to at least 12 inches below the planned subgrade elevation. The exposed grade after the over-excavation should be compacted to at least 95 percent of the maximum dry density as determined by ASTM Test Method D1557. The area should then be filled to the planned subgrade elevation with structural fill. The structural fill should be compacted to at least 95 percent of the maximum dry density as determined by ASTM Test Method D1557. In-place density tests should be performed to verify proper moisture content and adequate compaction. The dense to very dense cement-modified soil encountered within the eastern third of the site is considered a suitable subgrade for support of slabs-on-grade.

Any additional fill used to increase the elevation of the floor slab should meet the requirements of structural fill. Fill soils should be placed in horizontal lifts not exceeding 8 inches loose thickness, moisture-conditioned as necessary, (moisture content of soil shall not vary by more than ±2 percent of optimum moisture) and the material should be compacted to at least 95 percent of the maximum dry density based on ASTM Test Method D1557.

Floor slabs may be designed using a modulus of subgrade reaction value of k = 200 pounds per cubic inch (pci) for slabs supported on medium dense or firmer native soils or on structural fill extending to medium dense or firmer native soil.

In areas where it is desired to reduce floor dampness, such as areas covered with moisture sensitive floor coverings, we recommend that concrete slab-on-grade floors be underlain by a water vapor retarder system. According to ASTM guidelines, the water vapor retarder should consist of a vapor retarder sheeting underlain by a minimum of 6-inches of compacted clean (less than 5 percent passing the U.S. Standard No. 200 Sieve), open-graded, coarse rock of ¾-inch maximum size. The vapor retarder sheeting should be protected from puncture damage.

The exterior floors should be placed separately in order to act independently of the walls and foundation system. All fill placed in the building pads should be structural fill.

It is recommended that the utility trenches within the building pads be compacted, as specified in our report, to minimize the transmission of moisture through the utility trench backfill. Special attention to the drainage and irrigation adjacent to the buildings is recommended. Grading should establish drainage away from the structures and this drainage pattern should be maintained. Water should not be allowed to collect adjacent to the structures. Excessive irrigation within landscaped areas adjacent to the structures should not be allowed to occur. In addition, ventilation of the structures may be prudent to reduce the accumulation of interior moisture.

Erosion and Sediment Control

Erosion and sediment control (ESC) is used to minimize the transportation of sediment to wetlands, streams, lakes, drainage systems, and adjacent properties. Erosion and sediment control measures should be taken and these measures should be in general accordance with local regulations. At a minimum, the following basic recommendations should be incorporated into the design of the erosion and sediment control features of the site:

1) Phase the soil, foundation, utility, and other work, requiring excavation or the disturbance of the site soils, to take place during the dry season (generally May through September). However, provided precautions are taken using Best Management Practices (BMP's), grading activities can be undertaken during the wet season (generally October through April). It should be noted that this typically increases the overall project cost.

2) All site work should be completed and stabilized as quickly as possible.

3) Additional perimeter erosion and sediment control features may be required to reduce the possibility of sediment entering the surface water. This may include additional silt fences, silt fences with a higher Apparent Opening Size (AOS), construction of a berm, or other filtration systems.

4) Any runoff generated by dewatering discharge should be treated through construction of a sediment trap if there is sufficient space. If space is limited other filtration methods will need to be incorporated.

Groundwater Influence on Structures and Earthwork Construction

With the exception of test pit TP-8, groundwater was encountered in all of the test pits at approximately 3 to 9.5 feet bgs. It should be recognized that groundwater elevations may fluctuate with time. The groundwater level will be dependent upon seasonal precipitation, irrigation, land use, and climatic conditions, as well as other factors. Therefore, groundwater levels at the time of the field investigation may be different from those encountered during the construction phase of the project. The evaluation of such factors is beyond the scope of this report.

Although we do not anticipate deep excavations for this project, perched groundwater may be encountered during excavations for foundations or utility installation. If groundwater is encountered during construction, we should observe the conditions to determine if dewatering will be necessary. Design of temporary dewatering systems to remove groundwater should be the responsibility of the contractor. If earthwork is performed during or soon after periods of precipitation, the subgrade soils may become saturated. These soils may "pump," and the materials may not respond to densification techniques. Typical remedial measures include: disking and aerating the soil during dry weather; mixing the soil with drier materials; removing and replacing the soil with an approved fill material. A qualified geotechnical engineering firm should be consulted prior to implementing remedial measures to observe the unstable subgrade conditions and provide appropriate recommendations.

Drainage

The ground surface should slope away from building pads and pavement areas, toward appropriate drop inlets or other surface drainage devices. It is recommended that adjacent exterior grades be sloped a minimum of 2 percent for a minimum distance of 5 feet away from structures. Roof drains should be tightlined away from foundations and steep slopes. Roof drains should not be connected to the footing drains, but may use the same outfall piping if connected well away from the structure and with enough fall such that roof water will not backup into the footing drains.

Subgrade soils in pavement areas should be inclined at a minimum of 1 percent and drainage gradients should be maintained to carry all surface water to collection facilities and suitable outlets. These grades should be maintained for the life of the project.

Specific recommendations for and design of storm water disposal systems or septic disposal systems are beyond the scope of our services and should be prepared by other consultants that are familiar with design and discharge requirements.

Utility Trench Backfill

Utility trenches should be excavated according to accepted engineering practices following OSHA (Occupational Safety and Health Administration) standards, by a contractor experienced in such work. The responsibility for the safety of open trenches should be borne by the contractor. Traffic and vibration adjacent to trench walls should be minimized; cyclic wetting and drying of excavation side slopes should be avoided. Groundwater was encountered in the test pits conducted on this site. Depending upon the location and depth of some utility trenches, groundwater flow into open excavations could be experienced, especially during or shortly following periods of precipitation.

All utility trench backfill should consist of suitable onsite material or imported granular material. Utility trench backfill placed in or adjacent to buildings and exterior slabs should be compacted to at least 95 percent of the maximum dry density based on ASTM Test Method D1557. The upper 5 feet of utility trench backfill placed in pavement areas should be compacted to at least 95 percent of the maximum dry density based on ASTM Test Method D1557. Below 5 feet, utility trench backfill in pavement areas should be compacted to at least 90 percent of the maximum dry density based on ASTM Test Method D1557. Pipe bedding should be in accordance with the pipe manufacturer's recommendations.

The contractor is responsible for removing all water-sensitive soils from the trenches regardless of the backfill location and compaction requirements. The contractor should use appropriate equipment and methods to avoid damage to the utilities and/or structures during fill placement and compaction.

Pavement Design

Based on our explorations, the near surface soils at the site are interpreted as medium dense to stiff native soils and medium dense to very dense undocumented fill material. Due to the undocumented fill and the high silt content of the anticipated pavement subgrade soils, we recommend that subgrade modification techniques be considered. Subgrade modification typically includes the over-excavation of unsuitable materials, the placement of a geotextile fabric at the bottom of the over-excavated area, and then the placement of structural fill. We recommend the use of a high-strength geotextile separation fabric, such as Mirafi 600X or equivalent, for the geotextile. Subgrade modification such as this is intended to disperse surcharge loads and therefore aid in pavement performance.

We recommend over-excavation of the undocumented fill or the silt soils or any loose/soft soils to at least 12 inches below the planned pavement subgrade elevation. The exposed grade after the over-excavation should be compacted to at least 95 percent of the maximum dry density as determined by ASTM Test Method D1557. We recommend that a high-strength geotextile separation fabric, such as Mirafi 600X or equivalent, then be placed over the compacted soil. After the fabric is placed, the area should be filled to the planned pavement subgrade elevation with structural fill. The structural fill should be compacted to at least 95 percent of the maximum dry density as determined by ASTM Test

Method D1557. In-place density tests should be performed to verify proper moisture content and adequate compaction.

In areas where the pavement subgrade soil consists of firm and unyielding native soils or existing cement-modified soil, a proof roll of the pavement subgrade soil may be performed in lieu of the compaction and in-place density tests.

It should be noted that subgrade soils that have relatively high silt contents may be highly sensitive to moisture conditions. The subgrade strength and performance characteristics of a silty subgrade material may be dramatically reduced if this material becomes wet.

Traffic loads were not provided, however, based on our knowledge of the proposed project, we expect the traffic to range from light duty (passenger automobiles) to heavy duty (delivery and fire trucks). Pavement design life of 20 years was assumed for our analysis. Recommendations for an asphaltic concrete flexible pavement section and Portland Cement Concrete (PCC) rigid pavement section are provided in Tables 2 and 3 below.

Table 2: ASPHALTIC CONCRETE (FLEXIBLE) PAVEMENT

Asphaltic Concrete	Aggregate Base	Compacted Subgrade*
3.0 in.	6.0 in.	12.0 in.

Table 3: PORTLAND CEMENT CONCRETE (RIGID) PAVEMENT
4000 psi with FIBER MESH

Min. PCC Depth	Aggregate Base	Compacted Subgrade*
6.0 in.	4.0 in.	12.0 in.

** A proof roll may be performed in lieu of in-place density tests*

The asphaltic concrete depth listed in Table 2 for the flexible pavement section should be a surface course type asphalt, such as Washington Department of Transportation (WSDOT) ½-inch Hot Mix Asphalt (HMA). The pavement specification in Appendix C provides additional recommendations, including aggregate base material.

Testing and Inspection

A representative of Krazan & Associates, Inc. should be present at the site during the earthwork activities to confirm that actual subsurface conditions are consistent with the exploratory fieldwork. This activity is an integral part of our services as acceptance of earthwork construction is dependent upon compaction testing and stability of the material. This representative can also verify that the intent of these recommendations is incorporated into the project design and construction. Krazan &

Associates, Inc. will not be responsible for grades or staking, since this is the responsibility of the Prime Contractor. Furthermore, Krazan & Associates is not responsible for the contractor's procedures, methods, scheduling, or management of the work site.

LIMITATIONS

Geotechnical engineering is one of the newest divisions of Civil Engineering. This branch of Civil Engineering is constantly improving as new technologies and understanding of earth sciences improves. Although your site was analyzed using the most appropriate current techniques and methods, undoubtedly there will be substantial future improvements in this branch of engineering. In addition to improvements in the field of geotechnical engineering, physical changes in the site either due to excavation or fill placement, new agency regulations, or possible changes in the proposed structure after the time of completion of the soils report may require the soils report to be professionally reviewed. In light of this, the owner should be aware that there is a practical limit to the usefulness of this report without critical review. Although the time limit for this review is strictly arbitrary, it is suggested that two years be considered a reasonable time for the usefulness of this report.

This report has been prepared for the exclusive use of the Abbey Road Group Land Development Services Company, LLC and their assigns, for the specific application to the subject site. Foundation and earthwork construction is characterized by the presence of a calculated risk that soil and groundwater conditions have been fully revealed by the original foundation investigation. This risk is derived from the practical necessity of basing interpretations and design conclusions on limited sampling of the earth. Our report, design conclusions, and interpretations should not be construed as a warranty of the subsurface conditions. Actual subsurface conditions may differ, sometimes significantly, from those indicated in this report.

The recommendations made in this report are based on the assumption that soil conditions do not vary significantly from those encountered during our field investigation. The findings and conclusions of this report can be affected by the passage of time, seasonal weather conditions, manmade influences such as construction on or adjacent to the site, and natural events such as earthquakes, slope instability, flooding, or groundwater fluctuations. If any variations or undesirable conditions are encountered during construction, the geotechnical engineer should be notified so that supplemental recommendations can be made.

The conclusions of this report are based on the information provided regarding the proposed construction. If the proposed construction is relocated or redesigned, the conclusions in this report may not be valid. The geotechnical engineer should be notified of any changes so that the recommendations can be reviewed and re-evaluated.

Misinterpretations of this report by other design team members can result in project delays and cost over-runs. These risks can be reduced by having Krazan & Associates, Inc. involved with the design team's meetings and discussions before and following submission of the geotechnical report. Krazan &

Associates, Inc. should also be retained for reviewing pertinent elements of the design team's plans and specifications. Contractors can also misinterpret this report. To reduce this risk Krazan & Associates should participate in pre-bid and preconstruction meetings, and provide construction observations during the site work.

This report is a geotechnical engineering investigation with the purpose of evaluating the soil conditions in terms of foundation design. The scope of our services did not include any environmental site assessment for the presence or absence of hazardous and/or toxic materials in the soil, groundwater or atmosphere, or the presence of wetlands. Any statements, or absence of statements, in this report or on any test pits regarding odors, unusual or suspicious items, or conditions observed are strictly for descriptive purposes and are not intended to convey engineering judgment regarding potential hazardous and/or toxic assessments.

The geotechnical information presented herein is based upon professional interpretation utilizing standard engineering practices and a degree of conservatism deemed proper for this project. It is not warranted that such information and interpretation cannot be superseded by future geotechnical developments. We emphasize that this report is valid for this project as outlined above, and should not be used for any other site. Our report is prepared for the exclusive use of our client. No other party may rely on the product of our services unless we agree in advance to such reliance in writing. If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office at (253) 939-2500.

Respectfully submitted,

KRAZAN & ASSOCIATES, INC.

5/26/20

Theresa R. Nunan
Project Manager

Vijay Chaudhary, P.E.
Assistant Regional Engineering Manager

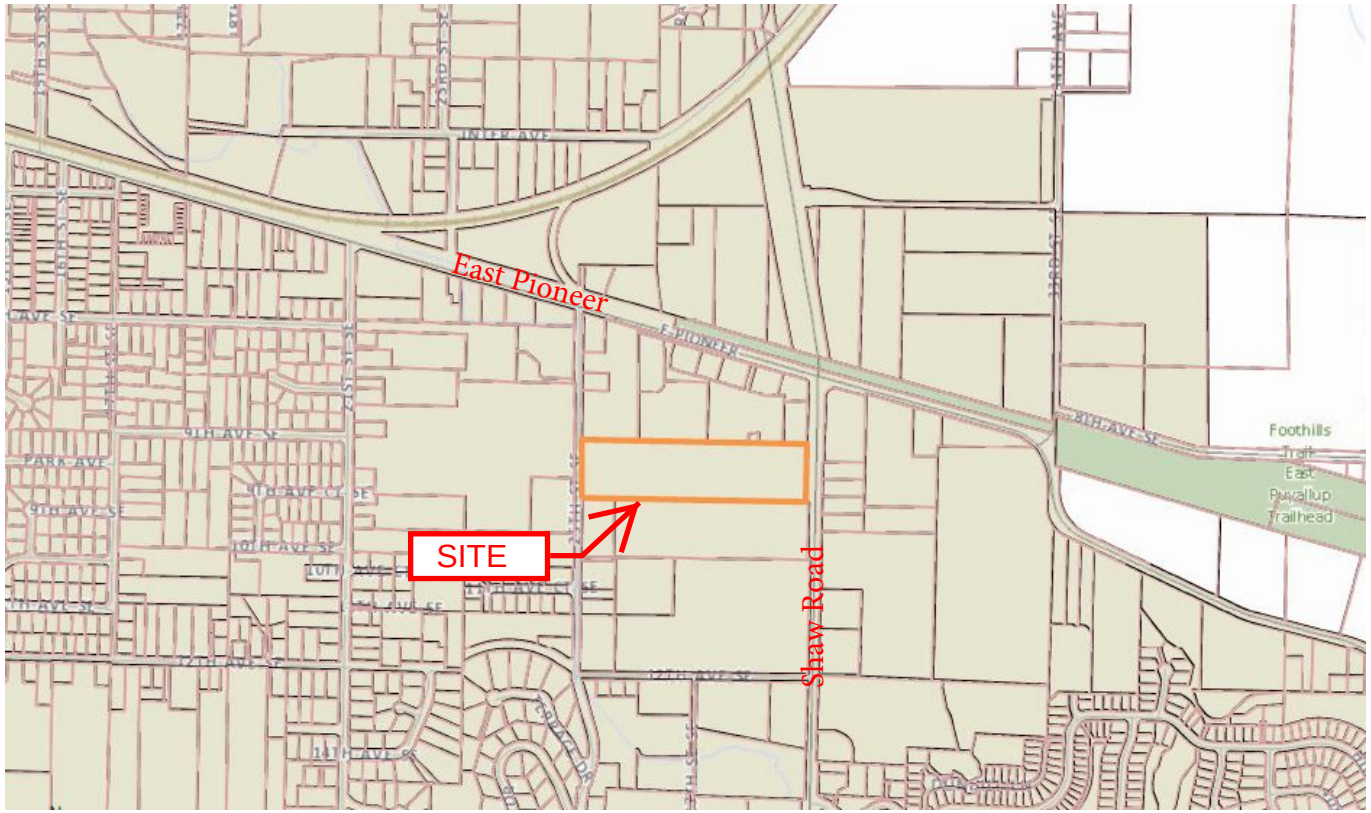

Figure 1: Vicinity Map

Reference: Pierce County Parcel Map

Krazan		
Cascade Shaw Road Development		
Date: April 2020	Project Number: 062-20004	
Drawn By: TRN	Figure: 1	Not to scale

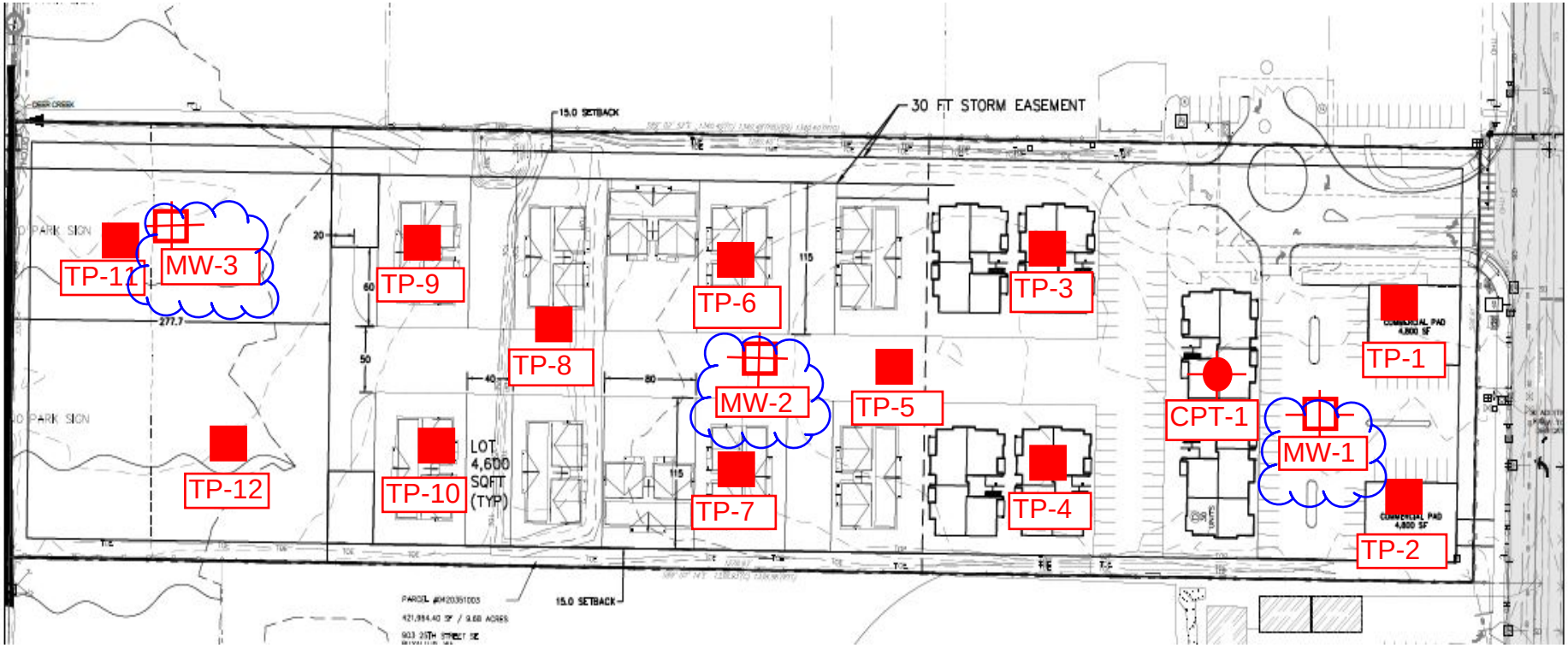

Figure 2: Site Plan

(Not to Scale)

N

Legend:

CPT-1 Cone Penetration Test Location

TP-1 Test Pit Location

MW-1 Monitoring Well Location

Reference: Cascade Christian Site Plan prepared by Abbey Road Group, dated January 6, 2020.

Krazan		
Cascade Shaw Road Development		
Date: May 2020	Project Number: 062-20004	
Drawn By: TRN	Figure: 2	Not to scale

APPENDIX A

FIELD INVESTIGATION – LABORATORY TESTING

Field Investigation

The field investigation consisted of a surface reconnaissance and a subsurface exploration program. Twelve (12) exploratory test pits, designated TP-1 through TP-12, were excavated and sampled for the subsurface investigation at this site. The test pits were conducted on March 2, 2020 utilizing a subcontracted equipment operator and CAT 308E backhoe. The test pits were advanced to depths of approximately 4 to 10.2 feet below the existing ground surface (bgs). In addition, one seismic Cone Penetration Test (SPT), designated CPT-1, was conducted at the site to a depth of approximately 29 feet bgs on March 5, 2020. The approximate exploratory test pit, CPT, and monitoring well locations are shown on the Site Plan (Figure 2). The test pit and CPT logs are presented in this Appendix. The depths shown on the attached logs are from the existing ground surface at the time of our exploration.

The soils encountered were logged in the field during the exploration and are described in accordance with the Unified Soil Classification System (USCS). Select samples were returned to our laboratory for evaluation and testing.

Three groundwater monitoring wells, designated MW-1 through MW-3, were installed at the site on April 29, 2020. The monitoring wells were installed to a depth of 20 feet bgs, using 15 feet of slotted PVC pipe and 5 feet of solid PVC pipe. The approximate monitoring well locations are shown on the Site Plan (Figure 2).

Laboratory Testing

The laboratory testing program was developed primarily to determine the index and engineering properties of the soils. Test results were used for soil classification and as criteria for determining the engineering suitability of the subsurface materials encountered.

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Project: Cascade Shaw Rd. Development	**Project Number:** 062-20004	**Client:** Abbey Road Land Dev.	**Test Pit No.:**	**TP-1**
Location: 808 Shaw Road E, Puyallup, WA			**Contractor:** Steffen Construction	
Project Manager: Therese Nunan	**Date** **Started:** 3.2.2020		**Equipment:** CAT 308E Track Backhoe	
Field Engineer: Therese Nunan	**Completed:** 3.2.2020			
Groundwater Depth: 7 feet		**Ground Elevation:**	**Total Depth of Test Pit:** 7.5 feet	

Elev. (feet)	Depth (feet)	Sample Type	Sample ID	Blow Counts	N-Value (blows/ft)	Graphic Log	Soil Classification	Notes
	0–1						Brown **Silty SAND (SM)** with Gravel, trace Cobbles, fine to coarse grained sand, very dense, moist **(FILL)**	
	2–4	BULK	S-1				Light Grey **Silty SAND (SM)** with Gravel, trace Cobbles, very dense, moist **(CEMENT MODIFIED SOIL - FILL)**	%G = 37 %Sa = 39 %Si/Cl = 24 MC = 8.3 %
	5–6	BULK	S-2				Brown **Sandy SILT (ML)**, fine grained sand, stiff, moist **(ALLUVIUM)**	
	7 ▼						Black **SAND (SP)**, trace Silt, medium dense, wet	
	8–16						**Test Pit Terminated at 7.5 Feet**	

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Project: Cascade Shaw Rd. Development	**Project Number:** 062-20004		**Client:** Abbey Road Land Dev.	**Test Pit No.:**	**TP-2**
Location: 808 Shaw Road E, Puyallup, WA				**Contractor:** Steffen Construction	
Project Manager: Therese Nunan	**Date**	**Started:** 3.2.2020		**Equipment:** CAT 308E Track Backhoe	
Field Engineer: Therese Nunan		**Completed:** 3.2.2020			
Groundwater Depth: 9.5 feet			**Ground Elevation:**	**Total Depth of Test Pit:** 10.2 feet	

Elev. (feet)	Depth (feet)	Sample Type	Sample ID	Blow Counts	N-Value (blows/ft)	Graphic Log	Soil Classification	Notes
	0						5 Inches Crushed Rock **(FILL)** over 7 Inches Dark Brown Silty SAND **(TOPSOIL)**	
	1						Tan **SAND (SP)**, trace Gravel, fine grained sand, dense, moist **(CEMENT MODIFIED SOIL - FILL)**	
	2						Dark Brown & Orangish Brown **Silty SAND (SM)**, fine grained, medium dense, moist **(ALLUVIUM)**	%Si/Cl = 36
	3	BULK	S-1					
	4	BULK	S-2				Grey **Silty SAND (SM)**, fine grained, medium dense, moist	%Si/Cl = 19
	5							
	6							
	7						- - - At 7 feet, grey with some orange mottling **(ALLUVIUM)**	
	8	BULK	S-3				Black **Poorly Graded SAND (SP)**, fine to medium grained, medium dense, moist	
	9						- - - becomes wet **(ALLUVIUM)**	
	10						**Test Pit Terminated at 10.2 Feet**	
	11							
	12							
	13							
	14							
	15							
	16							

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Project: Cascade Shaw Rd. Development	**Project Number:** 062-20004	**Client:** Abbey Road Land Dev.	**Test Pit No.:**	**TP-3**
Location: 808 Shaw Road E, Puyallup, WA			**Contractor:** Steffen Construction	
Project Manager: Therese Nunan	**Date** **Started:** 3.2.2020		**Equipment:** CAT 308E Track Backhoe	
Field Engineer: Therese Nunan	**Completed:** 3.2.2020			
Groundwater Depth: 8 feet		**Ground Elevation:**	**Total Depth of Test Pit:** 8.5 feet	

Elev. (feet)	Depth (feet)	Sample Type	Sample ID	Blow Counts	N-Value (blows/ft)	Graphic Log	Soil Classification	Notes
	0						Brown **Silty SAND (SM)** with Gravel, loose/med. dense, moist **(FILL)**	
	1						Light Grey **SAND (SP-SM)** with Gravel and Silt, trace Cobbles, very dense, moist	
	2						- - - At 2 feet, becomes brownish grey	
	3						**(CEMENT MODIFIED SOIL - FILL)**	
	4						Brown **Silty SAND (SM)**, fine to medium grained, occassional 2" to 3" thick seams of sandy silt, medium dense, moist	
	5						**(ALLUVIUM)**	
	6						Brownish Grey **Sandy SILT (ML)**, fine grained sand, stiff, moist to wet	
	7						**(ALLUVIUM)**	
	8 ▼						Black **SAND (SP)**, fine to medium grained, med. dense, wet	
	9						**Test Pit Terminated at 8.5 Feet**	
	10							
	11							
	12							
	13							
	14							
	15							
	16							

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Project: Cascade Shaw Rd. Development		**Project Number:** 062-20004	**Client:** Abbey Road Land Dev.	**Test Pit No.:**	**TP-4**
Location: 808 Shaw Road E, Puyallup, WA				**Contractor:** Steffen Construction	
Project Manager: Therese Nunan	**Date**	**Started:** 3.2.2020		**Equipment:** CAT 308E Track Backhoe	
Field Engineer: Therese Nunan		**Completed:** 3.2.2020			
Groundwater Depth: 9.3 feet			**Ground Elevation:**	**Total Depth of Test Pit:** 9.5 feet	

Elev. (feet)	Depth (feet)	Sample Type	Sample ID	Blow Counts	N-Value (blows/ft)	Graphic Log	Soil Classification	Notes
	0						Tan/Lt. Br. **Silty SAND (SM)** with Gravel, trace Cobbles, fine to coarse grained sand, dense, moist **(FILL)**	
	1							
	2						Light Grey **SAND (SP-SM)** with Gravel, Silt, and Cobbles, dense, moist **(CEMENT MODIFIED SOIL - FILL)**	
	3							
	4						Brown **SAND (SP-SM)** with Silt, fine grained, with occassional 2" to 3" thick seams brown with orange mottling very stiff sandy silt, medium dense, moist **(ALLUVIUM)**	
	5							
	6							
	7						Grey with Orange Mottling **Sandy SILT (ML)**, with layers of fine to medium sand (SP-SM), stiff, moist - - - At 7.5 feet, with seams of fine sand **(ALLUVIUM)**	
	8							
	9 ▼						Black **SAND (SP)**, trace Silt, fine to medium grained, med dense, wet	
	10						**Test Pit Terminated at 9.5 Feet**	
	11							
	12							
	13							
	14							
	15							
	16							

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Project: Cascade Shaw Rd. Development	**Project Number:** 062-20004	**Client:** Abbey Road Land Dev.	**Test Pit No.:**	**TP-5**
Location: 808 Shaw Road E, Puyallup, WA			**Contractor:** Steffen Construction	
Project Manager: Therese Nunan	**Date** **Started:** 3.2.2020		**Equipment:** CAT 308E Track Backhoe	
Field Engineer: Therese Nunan	**Completed:** 3.2.2020			
Groundwater Depth: 7.5 feet		**Ground Elevation:**	**Total Depth of Test Pit:** 8 feet	

Elev. (feet)	Depth (feet)	Sample Type	Sample ID	Blow Counts	N-Value (blows/ft)	Graphic Log	Soil Classification	Notes
	0						Brown **Silty SAND (SM)** with Gravel and Cobbles, medium dense, moist **(FILL)**	
	1							
	2							
	3						Dark Brown **Silty SAND (SM)** with Gravel and Cobbles, few pieces brick, glass, tree branches, pvc - - - At 3 ft., 8" dia. tree stump **(FILL)**	
	4						Dark Brown Silty SAND (SM) & grass with roots **(BURIED TOPSOIL)**	
	5						Grey with Orange Mottling **Silty SAND (SM)**, with seams (1" thick) and layers (6" to 8" thick) stiff Sandy SILT (ML), medium dense, moist **(ALLUVIUM)**	%Si/Cl = 46
	6	BULK	S-1					
	7							
	8						Black **SAND (SP-SM)** with Silt and orange Gravel, medium dense, wet	
	9						**Test Pit Terminated at 8 Feet**	
	10							
	11							
	12							
	13							
	14							
	15							
	16							

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Project: Cascade Shaw Rd. Development	**Project Number:** 062-20004	**Client:** Abbey Road Land Dev.	**Test Pit No.:**	**TP-6**
Location: 808 Shaw Road E, Puyallup, WA			**Contractor:** Steffen Construction	
Project Manager: Therese Nunan	**Date** **Started:** 3.2.2020		**Equipment:** CAT 308E Track Backhoe	
Field Engineer: Therese Nunan	**Completed:** 3.2.2020			
Groundwater Depth: 6 feet		**Ground Elevation:**	**Total Depth of Test Pit:** 6.5 feet	

Elev. (feet)	Depth (feet)	Sample Type	Sample ID	Blow Counts	N-Value (blows/ft)	Graphic Log	Soil Classification	Notes
	0						Dark Brown **Silty SAND (SM)** with Gravel and Cobbles, some organics, few tree branches, medium dense, moist **(FILL)**	
	1							
	2						Grey **Silty SAND (SM)** with Gravel and Cobbles, fine to medium grained sand, medium dense, moist **(FILL)**	
	3							
	4	BULK	S-1				Brownish Grey with Orange Mottling and Streaks **Sandy SILT (ML)**, with occasional seams silty sand, stiff, moist **(ALLUVIUM)**	%Si/Cl = 58
	5							
	6						Black **SAND (SP)**, trace Silt, f-m grained, medium dense, wet	
	7						**Test Pit Terminated at 6.5 Feet**	
	8							
	9							
	10							
	11							
	12							
	13							
	14							
	15							
	16							

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Project: Cascade Shaw Rd. Development	**Project Number:** 062-20004	**Client:** Abbey Road Land Dev.	**Test Pit No.:**	**TP-7**
Location: 808 Shaw Road E, Puyallup, WA			**Contractor:** Steffen Construction	
Project Manager: Therese Nunan	**Date** **Started:** 3.2.2020		**Equipment:** CAT 308E Track Backhoe	
Field Engineer: Therese Nunan	**Completed:** 3.2.2020			
Groundwater Depth: 7.5 feet		**Ground Elevation:**	**Total Depth of Test Pit:** 8 feet	

Elev. (feet)	Depth (feet)	Sample Type	Sample ID	Blow Counts	N-Value (blows/ft)	Graphic Log	Soil Classification	Notes
	0–1						Brown **Silty SAND (SM)** with Gravel and Cobbles, medium dense, moist **(FILL)**	
	2	BULK	S-1				Brown **Sandy SILT (ML)**, trace Gravel, stiff, moist **(ALLUVIUM)**	%G = 1 %Sa = 46 %Si/Cl = 53 MC = 23.5%
	4	BULK	S-2				Grey with Orange Mottling and Streaks **Sandy SILT (ML)**, with 1" thick seams grey Silty SAND, stiff, moist	%G = 0 %Sa = 29 %Si/Cl = 71
	6	BULK	S-3				- - - At 6 feet, with occasional 1" to 2" thick seams black sand **(ALLUVIUM)**	%Si/Cl = 66
	7	BULK	S-4					%Si/Cl = 72
	8	BULK	S-5				Black **SAND (SP-SM)** with Silt, f-m grained, medium dense, wet	%G = 0 %Sa = 94 %Si/Cl = 6 MC = 20.7%
	9–16						**Test Pit Terminated at 8 Feet**	

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Project: Cascade Shaw Rd. Development	**Project Number:** 062-20004	**Client:** Abbey Road Land Dev.	**Test Pit No.:**	**TP-8**
Location: 808 Shaw Road E, Puyallup, WA			**Contractor:** Steffen Construction	
Project Manager: Therese Nunan	**Date** **Started:** 3.2.2020		**Equipment:** CAT 308E Track Backhoe	
Field Engineer: Therese Nunan	**Completed:** 3.2.2020			
Groundwater Depth: Not Encountered		**Ground Elevation:**	**Total Depth of Test Pit:** 4.5 feet	

Elev. (feet)	Depth (feet)	Sample Type	Sample ID	Blow Counts	N-Value (blows/ft)	Graphic Log	Soil Classification	Notes
	0							
	1	BULK	S-1				Brown **Silty SAND (SM)** with Gravel and Cobbles (4" to 5" in size), medium dense, moist	
	2							
	3	BULK	S-2				**(FILL)**	
	4						Brown with Orange Mottling **Sandy SILT (ML)**, stiff, moist **(ALLUVIUM)**	
	5						**Test Pit Terminated at 4.5 Feet**	
	6							
	7							
	8							
	9							
	10							
	11							
	12							
	13							
	14							
	15							
	16							

Krazan & ASSOCIATES, INC.

Project: Cascade Shaw Rd. Development	**Project Number:** 062-20004	**Client:** Abbey Road Land Dev.	**Test Pit No.:**	**TP-9**
Location: 808 Shaw Road E, Puyallup, WA			**Contractor:** Steffen Construction	
Project Manager: Therese Nunan	**Date** **Started:** 3.2.2020		**Equipment:** CAT 308E Track Backhoe	
Field Engineer: Therese Nunan	**Completed:** 3.2.2020			
Groundwater Depth: 3.5 Feet		**Ground Elevation:**	**Total Depth of Test Pit:** 4 feet	

Elev. (feet)	Depth (feet)	Sample Type	Sample ID	Blow Counts	N-Value (blows/ft)	Graphic Log	Soil Classification	Notes
	0–1						Brown **Silty SAND (SM)**, fine grained, trace thin roots, medium dense, moist **(ALLUVIUM)**	
	1–2						Brown with Orange Mottling **Sandy SILT (ML)**, stiff, moist **(ALLUVIUM)**	
	2–3						Grey **SAND (SP-SM)** with Silt, f-m grained, with seams Sandy SILT (ML), medium dense, moist to wet	
	3 ▼						Black **SAND (SP)**, f-m grained, medium dense, wet	
	4–16						**Test Pit Terminated at 4 Feet**	

Krazan & ASSOCIATES, INC.

Project: Cascade Shaw Rd. Development	**Project Number:** 062-20004	**Client:** Abbey Road Land Dev.	**Test Pit No.:**	**TP-10**
Location: 808 Shaw Road E, Puyallup, WA			**Contractor:** Steffen Construction	
Project Manager: Therese Nunan	**Date** **Started:** 3.2.2020		**Equipment:** CAT 308E Track Backhoe	
Field Engineer: Therese Nunan	**Completed:** 3.2.2020			
Groundwater Depth: 3 feet		**Ground Elevation:**	**Total Depth of Test Pit:** 4 feet	

Elev. (feet)	Depth (feet)	Sample Type	Sample ID	Blow Counts	N-Value (blows/ft)	Graphic Log	Soil Classification	Notes
	0						Brown **Silty SAND/Sandy SILT (SM/ML)**, medium dense/stiff, moist **(ALLUVIUM)**	
	1						Alternating layers grey with orange mottling **Sandy SILT (ML) and Silty SAND (SM)**, stiff/medium dense, moist **(ALLUVIUM)**	
	2							
	3 ▼	BULK	S-1				Black **SAND (SP)**, trace orange Gravel, fine to medium grained, medium dense, wet **(ALLUVIUM)**	%Si/Cl = 1
	4						**Test Pit Terminated at 4 Feet**	
	5							
	6							
	7							
	8							
	9							
	10							
	11							
	12							
	13							
	14							
	15							
	16							

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Project: Cascade Shaw Rd. Development	**Project Number:** 062-20004	**Client:** Abbey Road Land Dev.	**Test Pit No.:**	**TP-11**
Location: 808 Shaw Road E, Puyallup, WA			**Contractor:** Steffen Construction	
Project Manager: Therese Nunan	**Date** **Started:** 3.2.2020		**Equipment:** CAT 308E Track Backhoe	
Field Engineer: Therese Nunan	**Completed:** 3.2.2020			
Groundwater Depth: 4 feet		**Ground Elevation:**	**Total Depth of Test Pit:** 5 feet	

Elev. (feet)	Depth (feet)	Sample Type	Sample ID	Blow Counts	N-Value (blows/ft)	Graphic Log	Soil Classification	Notes
	0						Brown **Sandy SILT (ML)**, trace thin roots, stiff, moist **(ALLUVIUM)**	
	1							
	2						Alternating seams and layers grey with orange mottling **Sandy SILT (ML)** and grey **Silty SAND (SM)**, stiff/medium dense, moist **(ALLUVIUM)**	
	3							
	4 ▼						Black **SAND (SP)**, fine to medium grained, medium dense, wet **(ALLUVIUM)**	
	5						**Test Pit Terminated at 5 Feet**	
	6							
	7							
	8							
	9							
	10							
	11							
	12							
	13							
	14							
	15							
	16							

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Project: Cascade Shaw Rd. Development	**Project Number:** 062-20004	**Client:** Abbey Road Land Dev.	**Test Pit No.:**	**TP-12**
Location: 808 Shaw Road E, Puyallup, WA			**Contractor:** Steffen Construction	
Project Manager: Therese Nunan	**Date** **Started:** 3.2.2020		**Equipment:** CAT 308E Track Backhoe	
Field Engineer: Therese Nunan	**Completed:** 3.2.2020			
Groundwater Depth: 6 feet		**Ground Elevation:**	**Total Depth of Test Pit:** 7 feet	

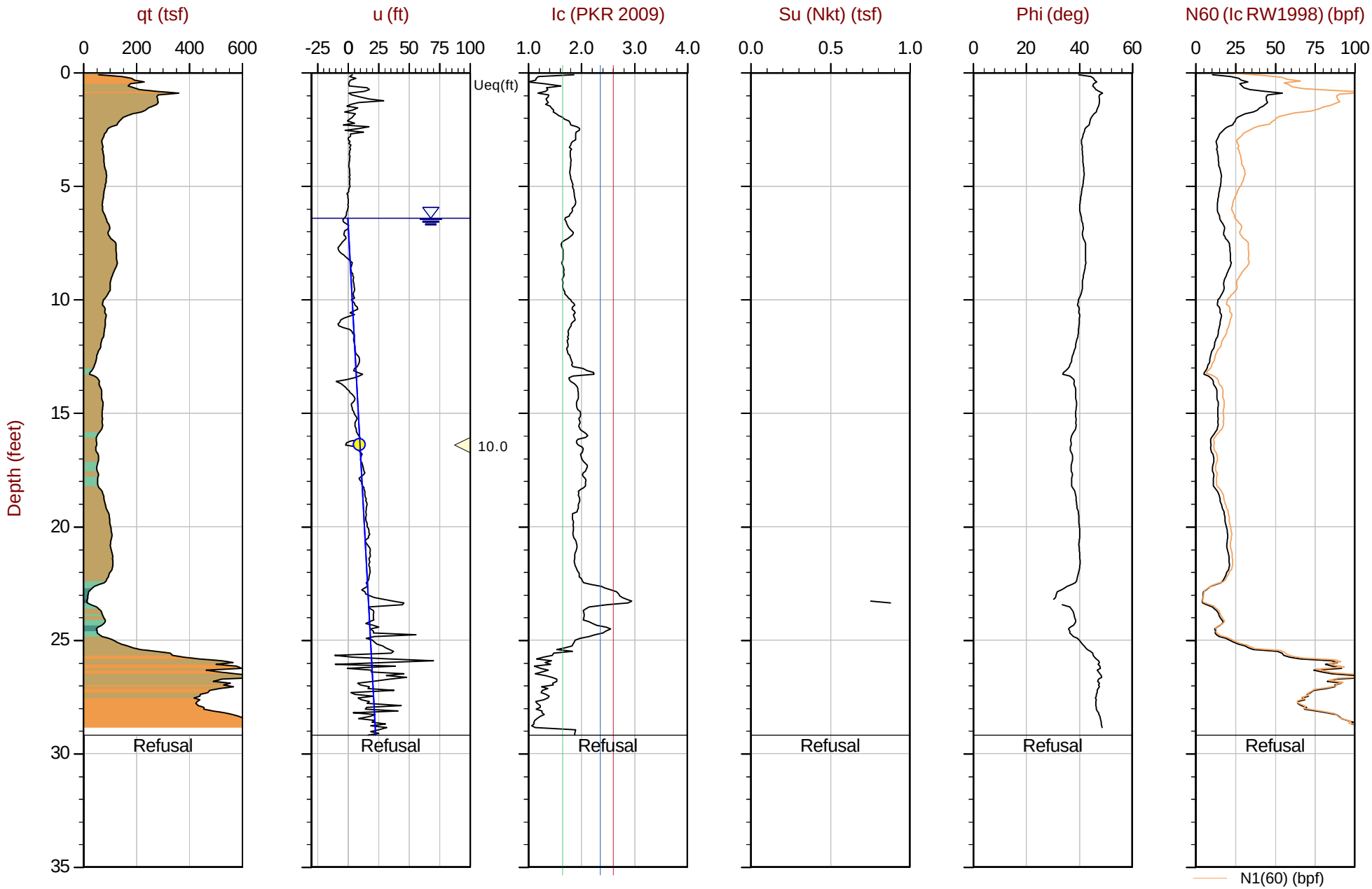
Elev. (feet)	Depth (feet)	Sample Type	Sample ID	Blow Counts	N-Value (blows/ft)	Graphic Log	Soil Classification	Notes
	0–16						Brown **Silty SAND/Sandy SILT (SM/ML)**, trace thin roots, medium dense/stiff, moist **(ALLUVIUM)**	
							Grey with orange mottling **SAND (SP)**, trace silt, fine grained, occasional 2" to 4" thick seams black sand (SP), medium dense, moist	
							- - - At 4 feet, **SAND (SP-SM)** with Silt, fine to medium grained, frequent thin seams black sand (SP) **(ALLUVIUM)**	
	6 ▼						Black **SAND (SP)**, f-m grained, medium dense, wet **(ALLUVIUM)**	
	7						**Test Pit Terminated at 7 Feet**	

CONETEC

Krazan & Associates

Job No: 20-59-20613
Date: 2020-03-05 16:02
Site: 808 Shaw Road, Puyallup WA

Sounding: CPT-01
Cone: 528:T1500F15U35



Max Depth: 8.900 m / 29.20 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 20-59-20613_SP01.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt: 15.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 47.18396 Long: -122.25742

△ Dissipation with estimated Ueq value △ Dissipation, equilibrium not achieved ○ Equilibrium Pore Pressure (Ueq) — Hydrostatic Line

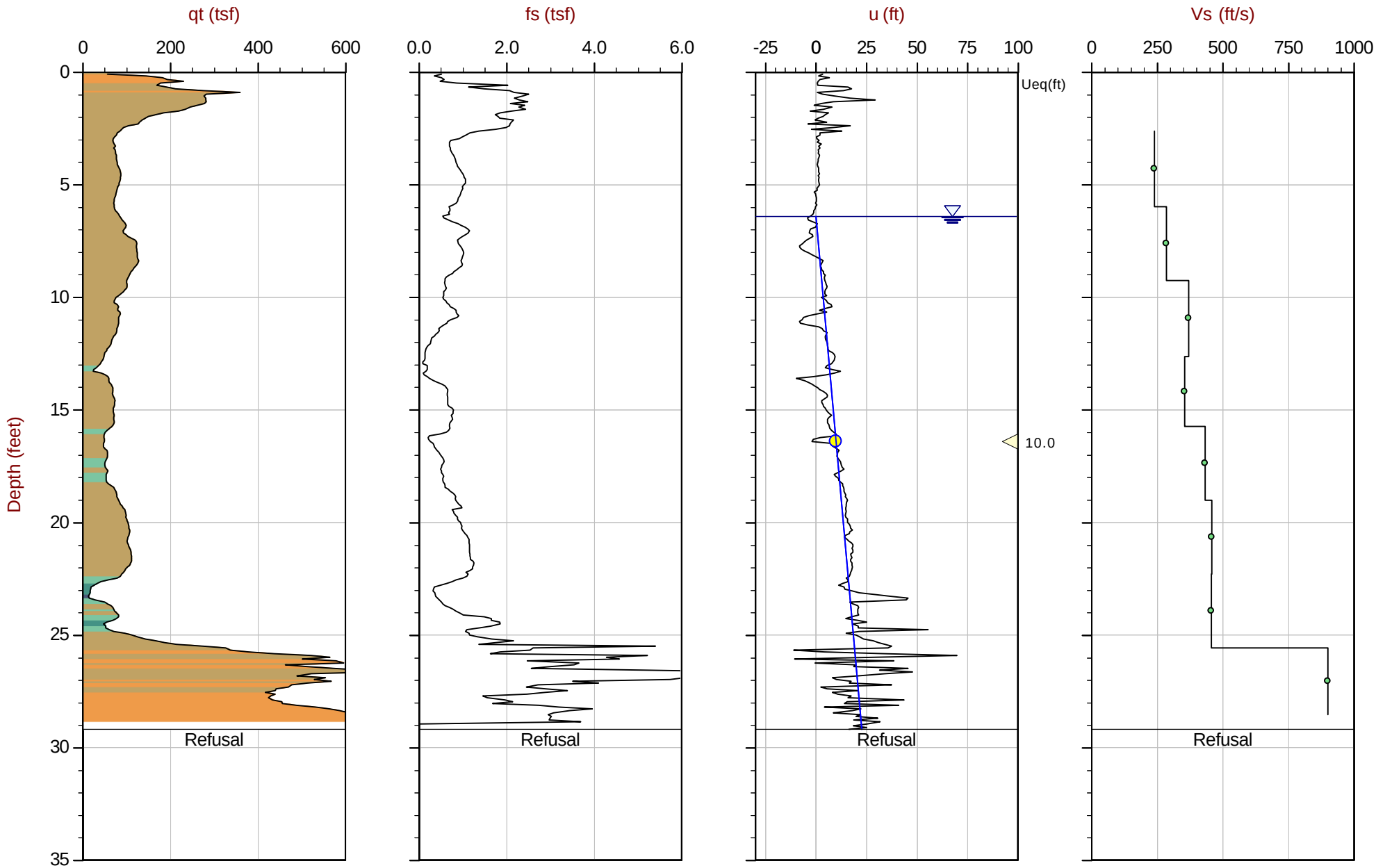
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Krazan & Associates

Job No: 20-59-20613
Date: 2020-03-05 16:02
Site: 808 Shaw Road, Puyallup WA

Sounding: CPT-01
Cone: 528:T1500F15U35



Max Depth: 8.900 m / 29.20 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 20-59-20613_SP01.COR
Unit Wt: SBTQtn (PKR2009)

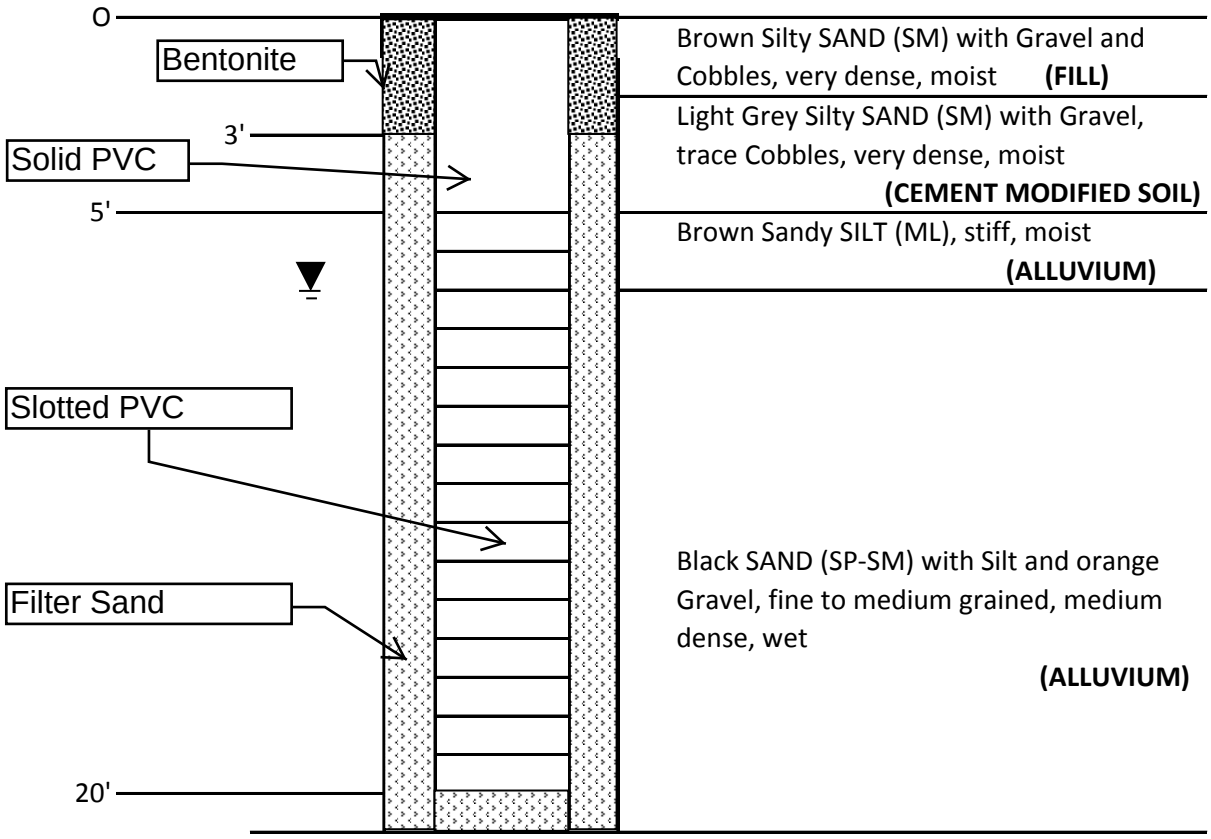
SBT: Robertson, 2009 and 2010
Coords: Lat: 47.18396 Long: -122.25742

△ Dissipation with estimated Ueq value △ Dissipation, equilibrium not achieved ○ Equilibrium Pore Pressure (Ueq) — Hydrostatic Line

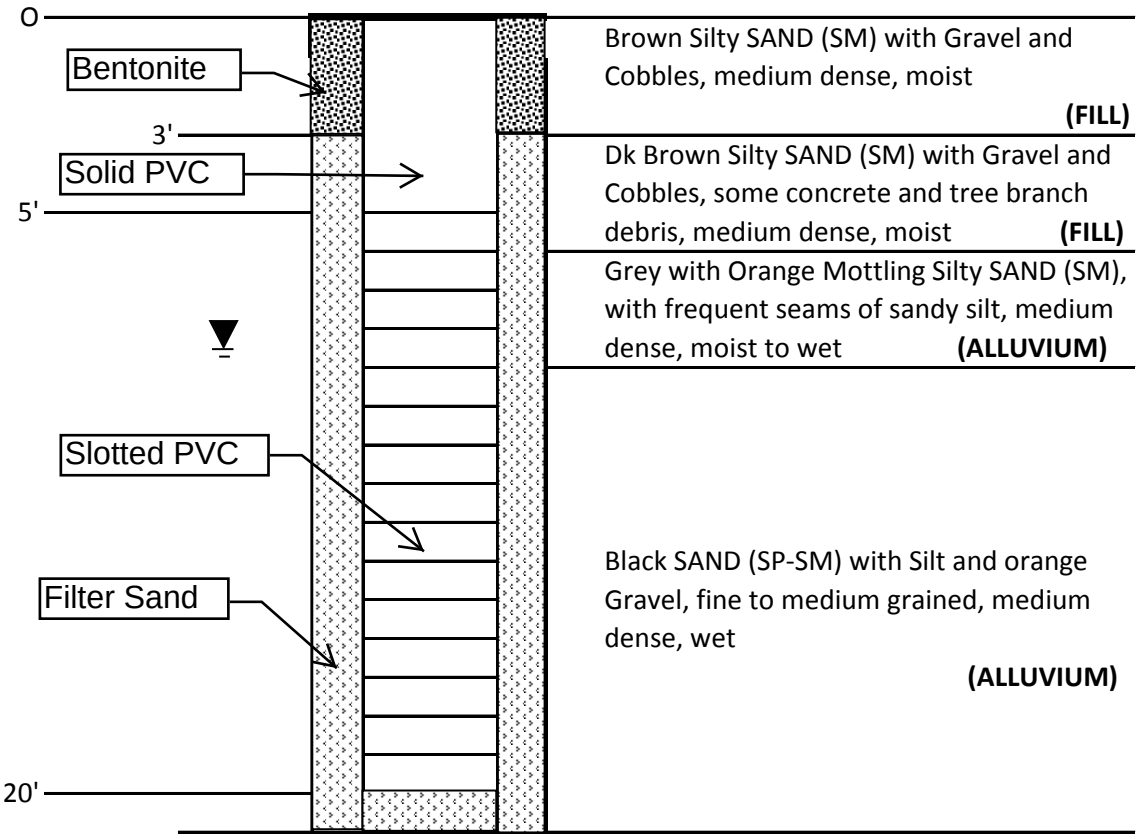
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Krazan & ASSOCIATES, INC.

Monitoring Well
MW-1

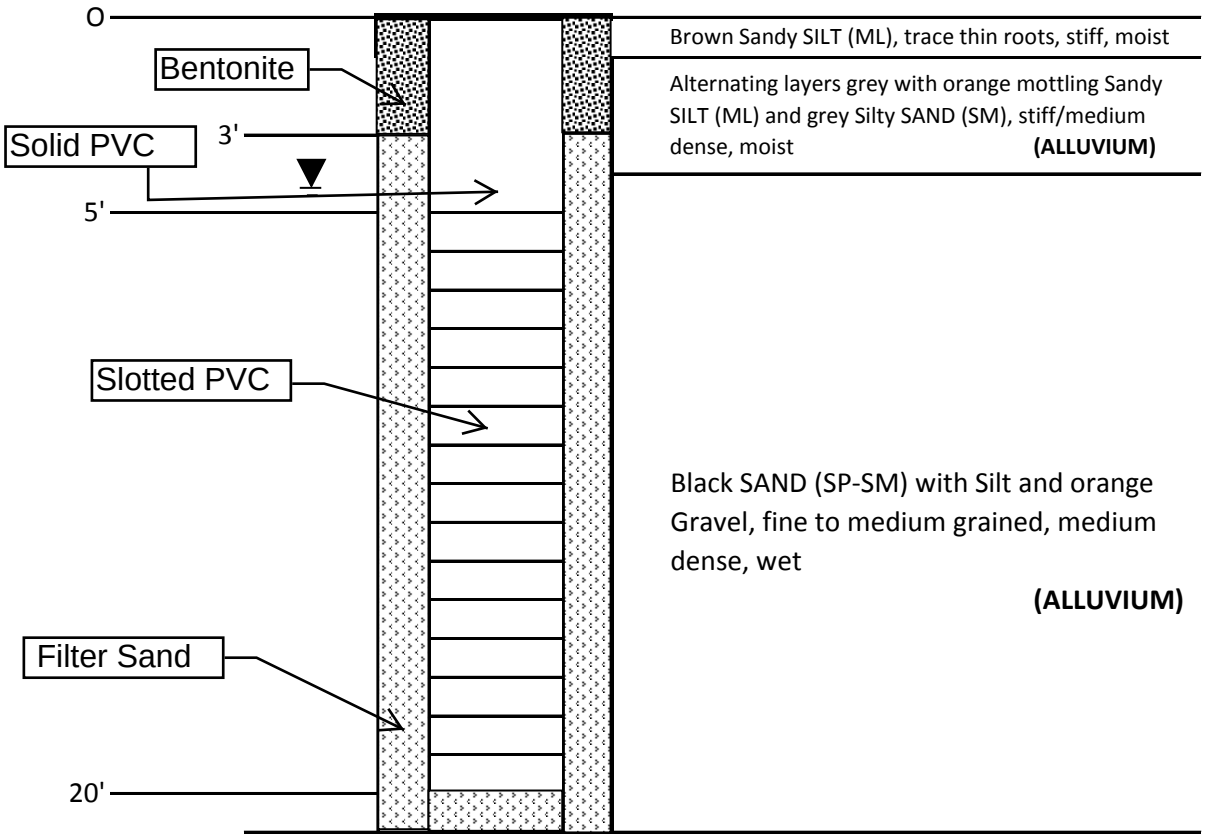


Monitoring Well
MW-2

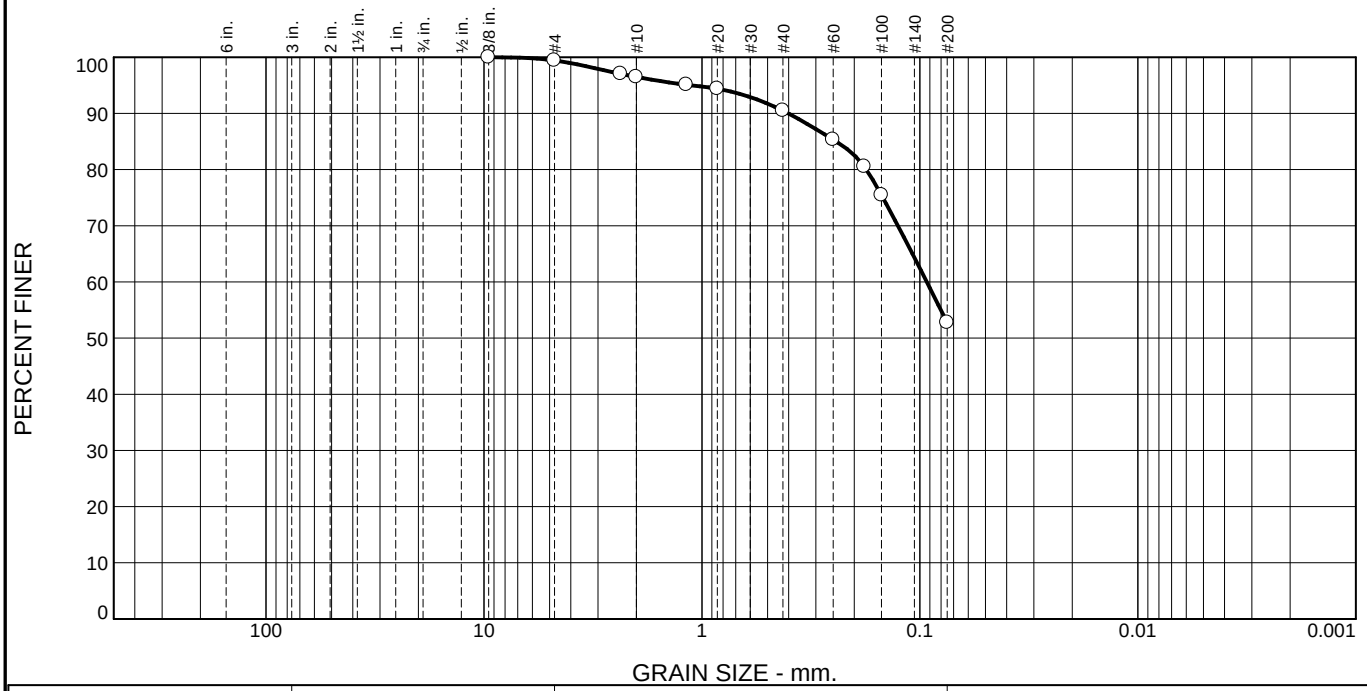


Krazan & ASSOCIATES, INC.

Monitoring Well
MW-3



Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	
0	0	1	2	7	37	53

Test Results (C-136 & C-117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.375	100		
#4	99		
#8	97		
#10	97		
#16	95		
#20	94		
#40	90		
#60	85		
#80	81		
#100	75		
#200	53		

* (no specification provided)

Material Description

Brown sandy silt.
Sampled by T.Nunan.

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}= 0.4015 D_{85}= 0.2424 D_{60}= 0.0930
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Sample ID:20L120
Moisture Content(ASTM D2216):23.5%

Date Received: 3-18-20 **Date Tested:** 3-20-20

Tested By: M.Thomas

Checked By: T.Nunan

Title: Project Manager

Location: TP-7
Sample Number: 20L120 **Depth:** 1.5' to 2.5'

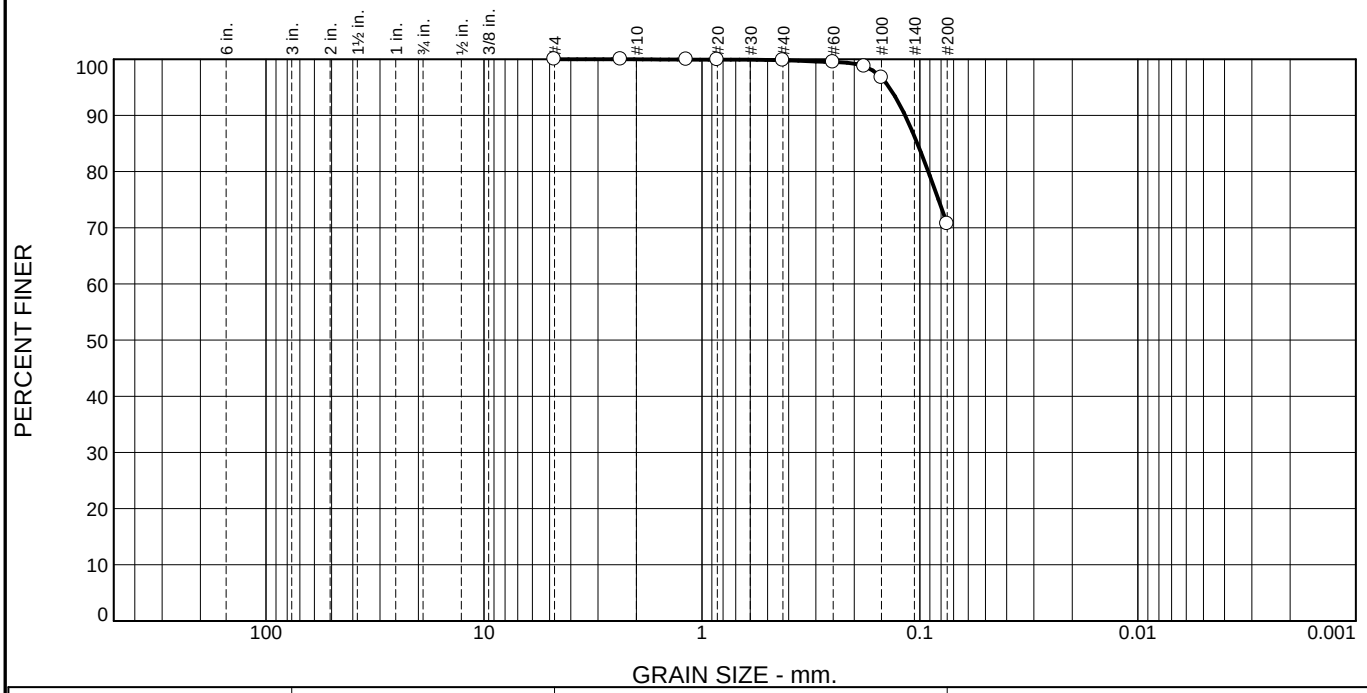
Date Sampled: 3-2-20

Krazan

Client: Abbey Road Group Land Developement Services Company, LLC.
Project: Cascade Shaw Road Developement

Project No: 062-20004 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	
0	0	0	0	0	29	71

Test Results (C-136 & C-117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100		
#8	100		
#16	100		
#20	100		
#40	100		
#60	99		
#80	99		
#100	97		
#200	71		

* (no specification provided)

Material Description

Brown silt with sand.
Sampled by T.Nunan.

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}= 0.1169 D_{85}= 0.1027 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Sample ID:20L119
Moisture Content(ASTM D2216):31.6%

Date Received: 3-18-20 **Date Tested:** 3-20-20

Tested By: M.Thomas

Checked By: T.Nunan

Title: Project Manager

Location: TP-7
Sample Number: 20L119 **Depth:** 4' to 4.5'

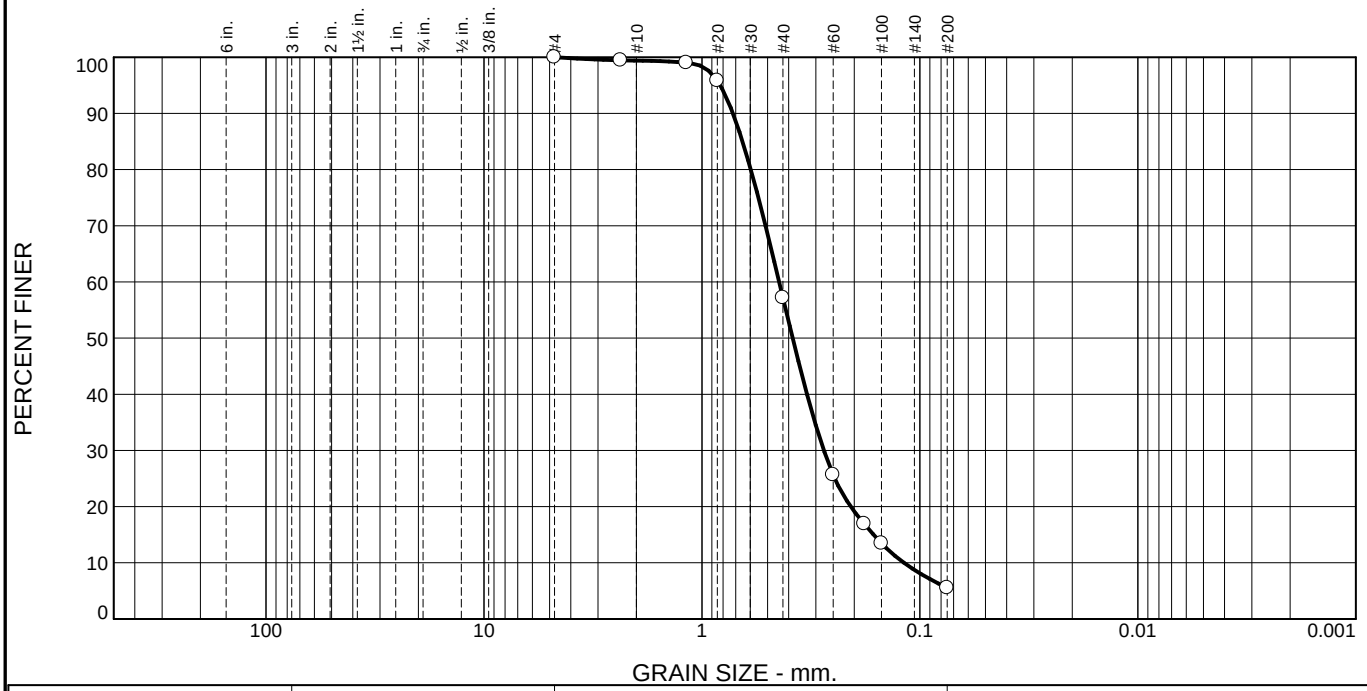
Date Sampled: 3-18-20

Krazan

Client: Abbey Road Group Land Developement Services Company, LLC.
Project: Cascade Shaw Road Developement

Project No: 062-20004 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	
0	0	0	1	42	51	6

Test Results (C-136 & C-117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100		
#8	99		
#16	99		
#20	96		
#40	57		
#60	26		
#80	17		
#100	13		
#200	5.5		

* (no specification provided)

Material Description

Black poorly graded sand with silt.
Sampled by T.Nunan.

Atterberg Limits (ASTM D 4318)

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

Classification

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

Coefficients

D_{90}= 0.7205 D_{85}= 0.6513 D_{60}= 0.4425
D_{50}= 0.3834 D_{30}= 0.2758 D_{15}= 0.1631
D_{10}= 0.1184 C_u= 3.74 C_c= 1.45

Remarks

Sample ID:20L121
Moisture Content(ASTM D2216):20.7%

Date Received: 3-18-20 **Date Tested:** 3-20-20
Tested By: M.Thomas
Checked By: T.Nunan
Title: Project Manager

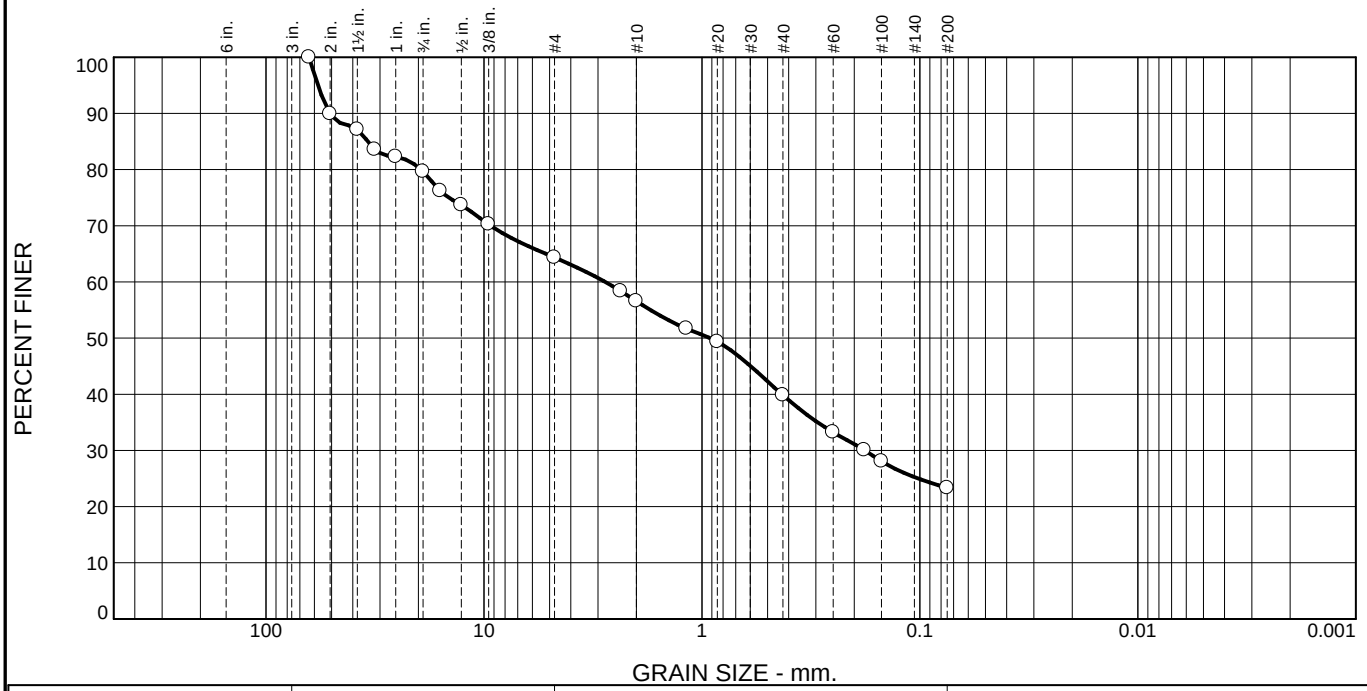
Location: TP-7
Sample Number: 20L121 **Depth:** 7.5' TO 8.0'
Date Sampled: 3-2-20

Krazan

Client: Abbey Road Group Land Developement Services Company, LLC.
Project: Cascade Shaw Road Developement

Project No: 062-20004 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	
0	20	16	7	17	17	23

Test Results (C-136 & C-117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
2.5	100		
2	90		
1.5	87		
1.25	84		
1	82		
.75	80		
.625	76		
.5	74		
.375	70		
#4	64		
#8	58		
#10	57		
#16	52		
#20	49		
#40	40		
#60	33		
#80	30		
#100	28		
#200	23		

* (no specification provided)

Material Description

Brown silty sand with gravel.
Sampled by T.Nunan.

Atterberg Limits (ASTM D 4318)

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

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 50.9268 D_{85}= 34.1561 D_{60}= 2.7809
D_{50}= 0.9178 D_{30}= 0.1788 D_{15}=
D_{10}= C_u= C_c=

Remarks

Sample ID:20L114
Sample Date:3-2-20

Date Received: 3-18-20 **Date Tested:** 3-20-20

Tested By: M.Thomas

Checked By: T.Nunan

Title: Project Manager

Location: TP-8
Sample Number: 20L114 **Depth:** 2.0' to 3.0'

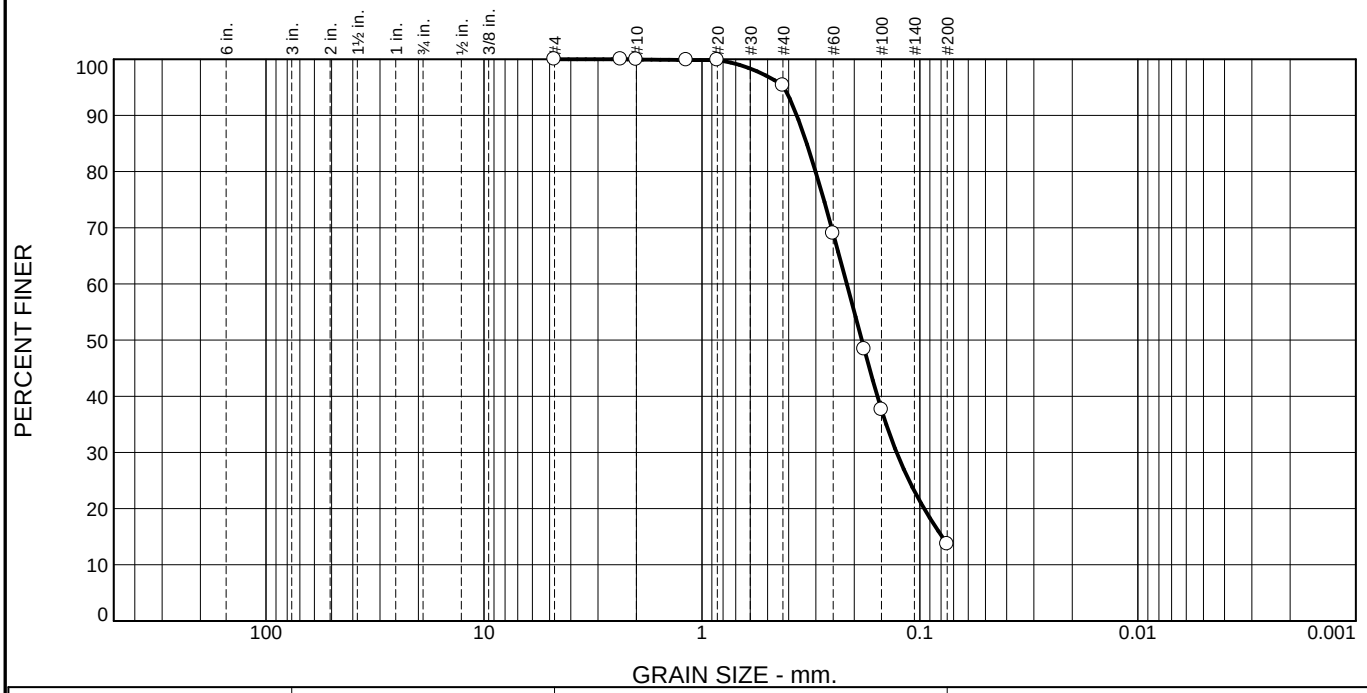
Date Sampled: 3-2-20

Krazan

Client: Abbey Road Group Land Developement Services Company, LLC.
Project: Cascade Shaw Road Developement

Project No: 062-20004 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	
0	0	0	0	5	81	14

Test Results (C-136 & C-117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100		
#8	100		
#10	100		
#16	100		
#20	100		
#40	95		
#60	69		
#80	48		
#100	38		
#200	14		

* (no specification provided)

Material Description

Black silty sand.
Sampled by T.Nunan.

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}= 0.3671 D_{85}= 0.3303 D_{60}= 0.2165
D_{50}= 0.1847 D_{30}= 0.1279 D_{15}= 0.0791
D_{10}= C_u= C_c=

Remarks

Sample ID:20L117
Sample Date:3-2-20

Date Received: 3-18-20 **Date Tested:** 3-20-20
Tested By: M.Thomas
Checked By: T.Nunan
Title: Project Manager

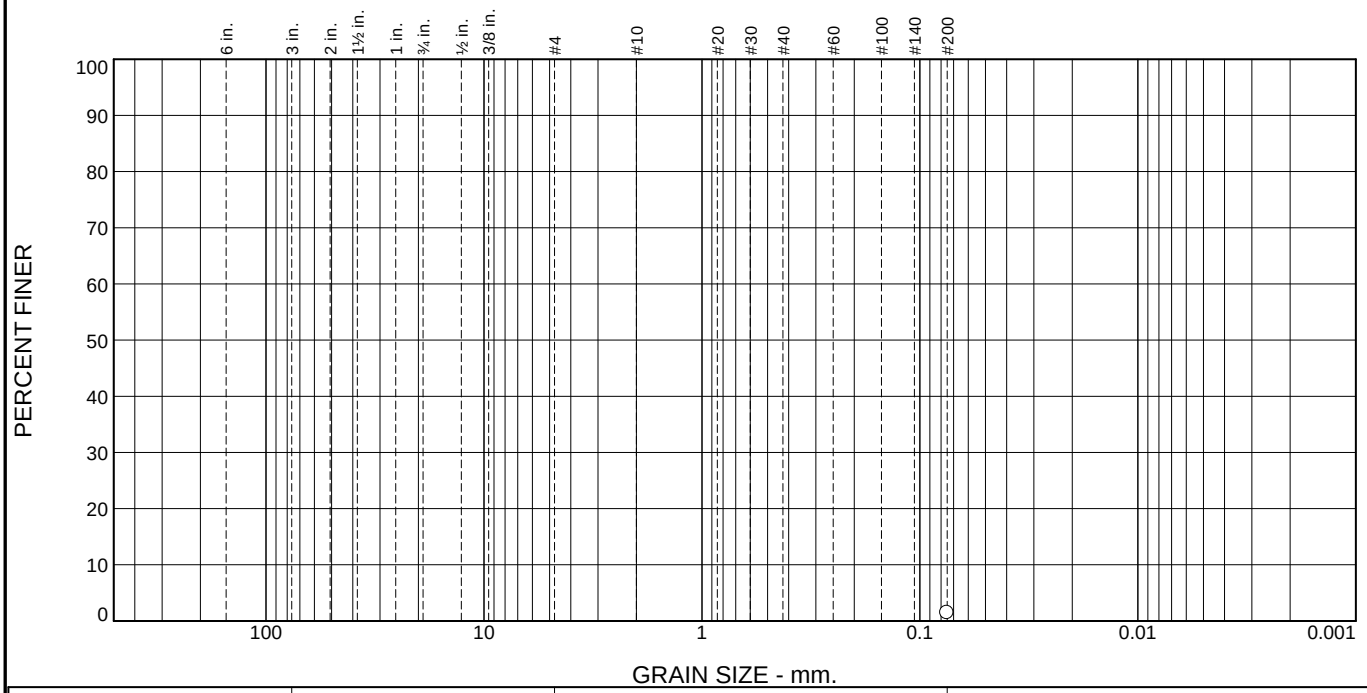
Location: TP-8
Sample Number: 20L117 **Depth:** 6.0' to 7.5'
Date Sampled: 3-2-20

Krazan

Client: Abbey Road Group Land Developement Services Company, LLC.
Project: Cascade Shaw Road Developement

Project No: 062-20004 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	
						1

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#200	1.5		

* (no specification provided)

Material Description

Black poorly graded sand.
Sampled by T.Nunan.

Atterberg Limits (ASTM D 4318)

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

Classification

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

Coefficients

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

Remarks

Sample ID:20L110
Sample Date:3-2-20

Date Received: 3-18-20 **Date Tested:** 3-20-20

Tested By: M.Thomas

Checked By: T.Nunan

Title: Project Manager

Location: TP-10
Sample Number: 20L110 **Depth:** 2.5' to 4.0'

Date Sampled: 3-2-20

Krazan

Client: Abbey Road Group Land Developement Services Company, LLC.
Project: Cascade Shaw Road Developement

Project No: 062-20004 **Figure**

APPENDIX B

EARTHWORK SPECIFICATIONS

GENERAL

When the text of the report conflicts with the general specifications in this appendix, the recommendations in the report have precedence.

SCOPE OF WORK: These specifications and applicable plans pertain to and include all earthwork associated with the site rough grading, including but not limited to the furnishing of all labor, tools, and equipment necessary for site clearing and grubbing, stripping, preparation of foundation materials for receiving fill, excavation, processing, placement and compaction of fill and backfill materials to the lines and grades shown on the project grading plans, and disposal of excess materials.

PERFORMANCE: The Contractor shall be responsible for the satisfactory completion of all earthwork in accordance with the project plans and specifications. This work shall be inspected and tested by a representative of Krazan and Associates, Inc., hereinafter known as the Geotechnical Engineer and/or Testing Agency. Attainment of design grades when achieved shall be certified to by the project Civil Engineer. Both the Geotechnical Engineer and Civil Engineer are the Owner's representatives. If the contractor should fail to meet the technical or design requirements embodied in this document and on the applicable plans, he shall make the necessary readjustments until all work is deemed satisfactory as determined by both the Geotechnical Engineer and Civil Engineer. No deviation from these specifications shall be made except upon written approval of the Geotechnical Engineer, Civil Engineer or project Architect.

No earthwork shall be performed without the physical presence or approval of the Geotechnical Engineer. The Contractor shall notify the Geotechnical Engineer at least 2 working days prior to the commencement of any aspect of the site earthwork.

The Contractor agrees that he shall assume sole and complete responsibility for job site conditions during the course of construction of this project, including safety of all persons and property; that this requirement shall apply continuously and not be limited to normal working hours; and that the Contractor shall defend, indemnify and hold the Owner and the Engineers harmless from any and all liability, real or alleged, in connection with the performance of work on this project, except for liability arising from the sole negligence of the Owner of the Engineers.

TECHNICAL REQUIREMENTS: All compacted materials shall be compacted to a density not less than 95 percent of maximum dry density as determined by ASTM Test Method D1557 as specified in the technical portion of the Geotechnical Engineering Report. The results of these tests and compliance with these specifications shall be the basis upon which satisfactory completion of work will be judged by the Geotechnical Engineer.

SOIL AND FOUNDATION CONDITIONS: The Contractor is presumed to have visited the site and to have familiarized himself with existing site conditions and the contents of the data presented in the soil report.

The Contractor shall make his own interpretation of the data contained in said report, and the Contractor shall not be relieved of liability under the contractor for any loss sustained as a result of any variance between conditions indicated by or deduced from said report and the actual conditions encountered during the progress of the work.

DUST CONTROL: The work includes dust control as required for the alleviation or prevention of any dust nuisance on or about the site or the borrow area, or off-site if caused by the Contractor's operation either during the performance of the earthwork or resulting from the conditions in which the Contractor leaves the site. The Contractor shall assume all liability, including Court costs of codefendants, for all claims related to dust or windblown materials attributable to his work.

SITE PREPARATION

Site preparation shall consist of site clearing and grubbing and preparations of foundation materials for receiving fill.

CLEARING AND GRUBBING: The Contractor shall accept the site in this present condition and shall demolish and/or remove from the area of designated project earthwork all structures, both surface and subsurface, trees, brush, roots, debris, organic matter, and all other matter determined by the Geotechnical Engineer to be deleterious. Such materials shall become the property of the Contractor and shall be removed from the site.

Tree root systems in proposed building areas should be removed to a minimum depth of 3 feet and to such an extent which would permit removal of all roots larger than 1 inch. Tree root removed in parking areas may be limited to the upper 1½ feet of the ground surface. Backfill or tree root excavation should not be permitted until all exposed surfaces have been inspected and the Geotechnical Engineer is present for the proper control of backfill placement and compaction. Burning in areas, which are to receive fill materials, shall not be permitted.

SUBGRADE PREPARATION: Subgrade should be prepared as described in our site preparation section of this report.

EXCAVATION: All excavation shall be accomplished to the tolerance normally defined by the Civil Engineer as shown on the project grading plans. All over excavation below the grades specified shall be backfilled at the Contractor's expense and shall be compacted in accordance with the applicable technical requirements.

FILL AND BACKFILL MATERIAL: No material shall be moved or compacted without the presence of the Geotechnical Engineer. Material from the required site excavation may be utilized for construction site fills provided prior approval is given by the Geotechnical Engineer. All materials utilized for constructing site fills shall be free from vegetable or other deleterious matter as determined by the Geotechnical Engineer.

PLACEMENT, SPREADING AND COMPACTION: The placement and spreading of approved fill materials and the processing and compaction of approved fill and native materials shall be the responsibility of the Contractor. However, compaction of fill materials by flooding, ponding, or jetting shall not be permitted unless specifically approved by local code, as well as the Geotechnical Engineer.

Both cut and fill shall be surface compacted to the satisfaction of the Geotechnical Engineer prior to final acceptance.

SEASONAL LIMITS: No fill material shall be placed, spread, or rolled while it is frozen or thawing or during unfavorable wet weather conditions. When the work is interrupted by heavy rains, fill operations shall not be resumed until the Geotechnical Engineer indicates that the moisture content and density of previously placed fill are as specified.

APPENDIX C

PAVEMENT SPECIFICATIONS

1. DEFINITIONS – The term "pavement" shall include asphalt concrete surfacing, untreated aggregate base, and aggregate subbase. The term "subgrade" is that portion of the area on which surfacing, base, or subbase is to be placed.

2. SCOPE OF WORK – This portion of the work shall include all labor, materials, tools and equipment necessary for and reasonable incidental to the completion of the pavement shown on the plans and as herein specified, except work specifically notes as "Work Not Included."

3. PREPARATION OF THE SUBGRADE – The Contractor shall prepare the surface of the various subgrades receiving subsequent pavement courses to the lines, grades, and dimensions given on the plans and pavement design section of this report. The upper 12 inches of the soil subgrade beneath the pavement section shall be compacted to a minimum compaction of 95% of maximum dry density as determined by test method ASTM D1557. The finished subgrades shall be tested and approved by the Geotechnical Engineer prior to the placement of additional pavement of additional pavement courses.

4. AGGREGATE BASE – The aggregate base shall be spread and compacted on the prepared subgrade in conformity with the lines, grades, and dimensions shown on the plans. The aggregate base should conform to WSDOT Standard Specification for Crushed Surfacing Base Course or Top Course (Item 9-03.9(3)). The base material shall be compacted to a minimum compaction of 95% as determined by ASTM D1557. Each layer of subbase shall be tested and approved by the Geotechnical Engineer prior to the placement of successive layers.

5. ASPHALTIC CONCRETE SURFACING – Asphaltic concrete surfacing shall consist of a mixture of mineral aggregate and paving grade asphalt, mixed at a central mixing plant and spread and compacted on a prepared base in conformity with the lines, grades, and dimensions shown on the plans. The drying, proportioning, and mixing of the materials shall conform to WSDOT Specifications.

The prime coat, spreading and compaction equipment, as well as the process of spreading and compacting the mixture, shall conform to WSDOT Specifications, with the exception that no surface course shall be placed when the atmospheric temperature is below 50 degrees F. The surfacing shall be rolled with combination steel-wheel and pneumatic rollers, as described in WSDOT Specifications. The surface course shall be placed with an approved self-propelled mechanical spreading and finishing machine.

6. TACK COAT – The tack (mixing type asphaltic emulsion) shall conform to and be applied in accordance with the requirements of WSDOT Specifications.

Appendix C – Floodplain Analysis

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT

COMMUNITY AND REVISION INFORMATION		PROJECT DESCRIPTION	BASIS OF REQUEST
COMMUNITY	City of Puyallup Pierce County Washington	NO PROJECT	BASE MAP CHANGES HYDRAULIC ANALYSIS HYDROLOGIC ANALYSIS UPDATE
	COMMUNITY NO.: 530144		
IDENTIFIER	Puyallup AO Zone	APPROXIMATE LATITUDE & LONGITUDE: 47.186, -122.262 SOURCE: USGS QUADRANGLE DATUM: NAD 83	

ANNOTATED MAPPING ENCLOSURES	ANNOTATED STUDY ENCLOSURES
TYPE: FIRM* NO.: 53053C0334E DATE: March 7, 2017 TYPE: FIRM NO.: 53053C0342E DATE: March 7, 2017	DATE OF EFFECTIVE FLOOD INSURANCE STUDY: March 07, 2017 PROFILES: 361P, 362P, 363P, AND 364P (NEW) SUMMARY OF DISCHARGES TABLE: 2

Enclosures reflect changes to flooding sources affected by this revision.
* FIRM - Flood Insurance Rate Map

FLOODING SOURCE(S) & REVISED REACH(ES) **See Page 2 for Additional Flooding Sources**

Deer Creek - From approximately 515 feet downstream of 23rd Street SE to approximately 1,070 feet upstream of 12th Avenue SE

SUMMARY OF REVISIONS

Flooding Source	Effective Flooding	Revised Flooding	Increases	Decreases
Deer Creek	Zone AO	Zone AE	NONE	YES
	Zone A	Zone X (unshaded)	NONE	YES
	No BFEs*	BFEs	YES	NONE
	Zone X (unshaded)	Zone AE	YES	YES
	Depth	BFEs	YES	NONE

* BFEs - Base Flood Elevations

DETERMINATION

This document provides the determination from the Department of Homeland Security's Federal Emergency Management Agency (FEMA) regarding a request for a Letter of Map Revision (LOMR) for the area described above. Using the information submitted, we have determined that a revision to the flood hazards depicted in the Flood Insurance Study (FIS) report and/or National Flood Insurance Program (NFIP) map is warranted. This document revises the effective NFIP map, as indicated in the attached documentation. Please use the enclosed annotated map panels revised by this LOMR for floodplain management purposes and for all flood insurance policies and renewals in your community.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Information eXchange toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Patrick “Rick” F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency
Washington, D.C. 20472

LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)

OTHER FLOODING SOURCES AFFECTED BY THIS REVISION

FLOODING SOURCE(S) & REVISED REACH(ES)

Deer Creek - From approximately 515 feet downstream of 23rd Street SE to approximately 1,070 feet upstream of 12th Avenue SE
Deer Creek - Pioneer - From just upstream of Deer Creek to approximately 1,275 feet upstream of Deer Creek
Deer Creek - 12th - From approximately 50 feet to approximately 1,060 feet upstream of the confluence with Deer Creek

SUMMARY OF REVISIONS

Flooding Source	Effective Flooding	Revised Flooding	Increases	Decreases
Deer Creek	Zone AO	Zone X (unshaded)	NONE	YES
Deer Creek - Pioneer	Zone X (unshaded)	Zone AE	NONE	YES
	No BFEs*	BFEs	YES	NONE
Deer Creek - 12th	Zone AO	Zone AE	NONE	YES
	No BFEs	BFEs	YES	NONE
	Zone AO	Zone X (unshaded)	NONE	YES

* BFEs - Base Flood Elevations

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Information eXchange toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Patrick “Rick” F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency
Washington, D.C. 20472

LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)

COMMUNITY INFORMATION

APPLICABLE NFIP REGULATIONS/COMMUNITY OBLIGATION

We have made this determination pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (P.L. 93-234) and in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, P.L. 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65. Pursuant to Section 1361 of the National Flood Insurance Act of 1968, as amended, communities participating in the NFIP are required to adopt and enforce floodplain management regulations that meet or exceed NFIP criteria. These criteria, including adoption of the FIS report and FIRM, and the modifications made by this LOMR, are the minimum requirements for continued NFIP participation and do not supersede more stringent State/Commonwealth or local requirements to which the regulations apply.

COMMUNITY REMINDERS

We based this determination on the 1-percent-annual-chance discharges computed in the submitted hydrologic model. Future development of projects upstream could cause increased discharges, which could cause increased flood hazards. A comprehensive restudy of your community's flood hazards would consider the cumulative effects of development on discharges and could, therefore, indicate that greater flood hazards exist in this area.

Your community must regulate all proposed floodplain development and ensure that permits required by Federal and/or State/Commonwealth law have been obtained. State/Commonwealth or community officials, based on knowledge of local conditions and in the interest of safety, may set higher standards for construction or may limit development in floodplain areas. If your State/Commonwealth or community has adopted more restrictive or comprehensive floodplain management criteria, those criteria take precedence over the minimum NFIP requirements.

We will not print and distribute this LOMR to primary users, such as local insurance agents or mortgage lenders; instead, the community will serve as a repository for the new data. We encourage you to disseminate the information in this LOMR by preparing a news release for publication in your community's newspaper that describes the revision and explains how your community will provide the data and help interpret the NFIP maps. In that way, interested persons, such as property owners, insurance agents, and mortgage lenders, can benefit from the information.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Information eXchange toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Patrick "Rick" F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency
Washington, D.C. 20472

LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)

We have designated a Consultation Coordination Officer (CCO) to assist your community. The CCO will be the primary liaison between your community and FEMA. For information regarding your CCO, please contact:

Mr. Mark Carey
Director, Mitigation Division
Federal Emergency Management Agency, Region X
Federal Regional Center
130 228th Street, Southwest
Bothell, WA 98021-8627
(425) 487-4682

STATUS OF THE COMMUNITY NFIP MAPS

We will not physically revise and republish the FIRM and FIS report for your community to reflect the modifications made by this LOMR at this time. When changes to the previously cited FIRM panel(s) and FIS report warrant physical revision and republication in the future, we will incorporate the modifications made by this LOMR at that time.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Information eXchange toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Patrick “Rick” F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency
Washington, D.C. 20472

LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)

PUBLIC NOTIFICATION OF REVISION

A notice of changes will be published in the *Federal Register*. This information also will be published in your local newspaper on or about the dates listed below, and through FEMA's Flood Hazard Mapping website at https://www.floodmaps.fema.gov/fhm/bfe_status/bfe_main.asp

LOCAL NEWSPAPER

Name: *The News Tribune*
Dates: November 28, 2018 and December 5, 2018

Within 90 days of the second publication in the local newspaper, any interested party may request that we reconsider this determination. Any request for reconsideration must be based on scientific or technical data. Therefore, this letter will be effective only after the 90-day appeal period has elapsed and we have resolved any appeals that we receive during this appeal period. Until this LOMR is effective, the revised flood hazard determination presented in this LOMR may be changed.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Information eXchange toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Patrick "Rick" F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

Table 2 – Summary of Discharges

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cubic feet per second) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
DEBRA JANE CREEK					
At Mouth	1.3	45	62	69	85
At Confluence with Bonney Lake Outflow	0.8	26	34	38	48
At Upstream End of Debra Jane Lake	0.1	9	12	14	17
DEER CREEK					
At the BNSF Railroad crossing near E. Pioneer Way and 23rd Street SE	2.4	N/A	N/A	220	N/A

REVISED DATA

REVISED TO
REFLECT LOMR
EFFECTIVE: April 4, 2019

REVISED REACH

ELEVATION IN FEET (NAVD)

80
75
70
65
60
55
50
45
40
35

40+72
Railroad Tracks
Railroad Tracks
44+51
23rd Street SE
49+18
52+62
East Pioneer Way
55+68
Driveway
59+73
Unnamed Road
62+75
Driveway
66+27

4082
4451
4918
5262
5568
5973
6275
6627

LEGEND
0.2% ANNUAL CHANCE FLOOD*
1% ANNUAL CHANCE FLOOD*
2% ANNUAL CHANCE FLOOD*
10% ANNUAL CHANCE FLOOD*
STREAM BED
CROSS SECTION LOCATION
* DATA NOT AVAILABLE

4,150 4,350 4,550 4,750 4,950 5,150 5,350 5,550 5,750 5,950 6,150 6,350 6,550 6,750

STREAM DISTANCE IN FEET UPSTREAM OF OUTFALL TO PUYALLUP RIVER

REVISED TO
REFLECT LOMR
EFFECTIVE: April 4, 2019

FLOOD PROFILES

DEER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
PIERCE COUNTY, WA
AND INCORPORATED AREAS

361P

REVISED REACH

ELEVATION IN FEET (NAVD)

100
95
90
85
80
75
70
65
60
55

Deer132
11th Avenue Ct SE
Driveway
Driveway
12th Avenue SE
77+60
81+15
84+34
Limit of Detailed Study

D132
7434
7760
8115
8434
8861

LEGEND
0.2% ANNUAL CHANCE FLOOD*
1% ANNUAL CHANCE FLOOD*
2% ANNUAL CHANCE FLOOD*
10% ANNUAL CHANCE FLOOD*
STREAM BED
CROSS SECTION LOCATION
* DATA NOT AVAILABLE

6,750 6,950 7,150 7,350 7,550 7,750 7,950 8,150 8,350 8,550 8,750 8,950 9,150 9,350

STREAM DISTANCE IN FEET UPSTREAM OF OUTFALL TO PUYALLUP RIVER

REVISED TO REFLECT LOMR EFFECTIVE: April 4, 2019

FLOOD PROFILES

DEER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

PIERCE COUNTY, WA

AND INCORPORATED AREAS

362P

REVISED REACH

East Pioneer Way and 25th Street SE

3+48

Private Road

A6+63

Private Road

A10+11

Limit of Detailed Study

ELEVATION IN FEET (NAVD)

76
74
72
70
68
66
64
62
60
58

0
200
400
600
800
1,000
1,200
1,400
1,600
1,800
2,000
2,200
2,400
2,600

STREAM DISTANCE IN FEET UPSTREAM OF DEER CREEK - MAIN

A028
A348
A663
A1011
A1276

LEGEND

0.2% ANNUAL CHANCE FLOOD*
1% ANNUAL CHANCE FLOOD*
2% ANNUAL CHANCE FLOOD*
10% ANNUAL CHANCE FLOOD*
STREAM BED
CROSS SECTION LOCATION
* DATA NOT AVAILABLE

REVISED TO REFLECT LOMR EFFECTIVE: April 4, 2019

FLOOD PROFILES

DEER CREEK - PIONEER

FEDERAL EMERGENCY MANAGEMENT AGENCY
PIERCE COUNTY, WA
AND INCORPORATED AREAS

363P

REVISED REACH

ELEVATION IN FEET (NAVD)

80
78
76
74
72
70
68
66
64
62

0
200
400
600
800
1,000
1,200
1,400
1,600
1,800
2,000
2,200
2,400
2,600

Deer128
Sidewalk
B3+54
B6+64
Limit of Detailed Study

D128
B354
B664
B1066

LEGEND
0.2% ANNUAL CHANCE FLOOD*
1% ANNUAL CHANCE FLOOD*
2% ANNUAL CHANCE FLOOD*
10% ANNUAL CHANCE FLOOD*
STREAM BED
CROSS SECTION LOCATION
* DATA NOT AVAILABLE

STREAM DISTANCE IN FEET UPSTREAM OF DEER CREEK - MAIN

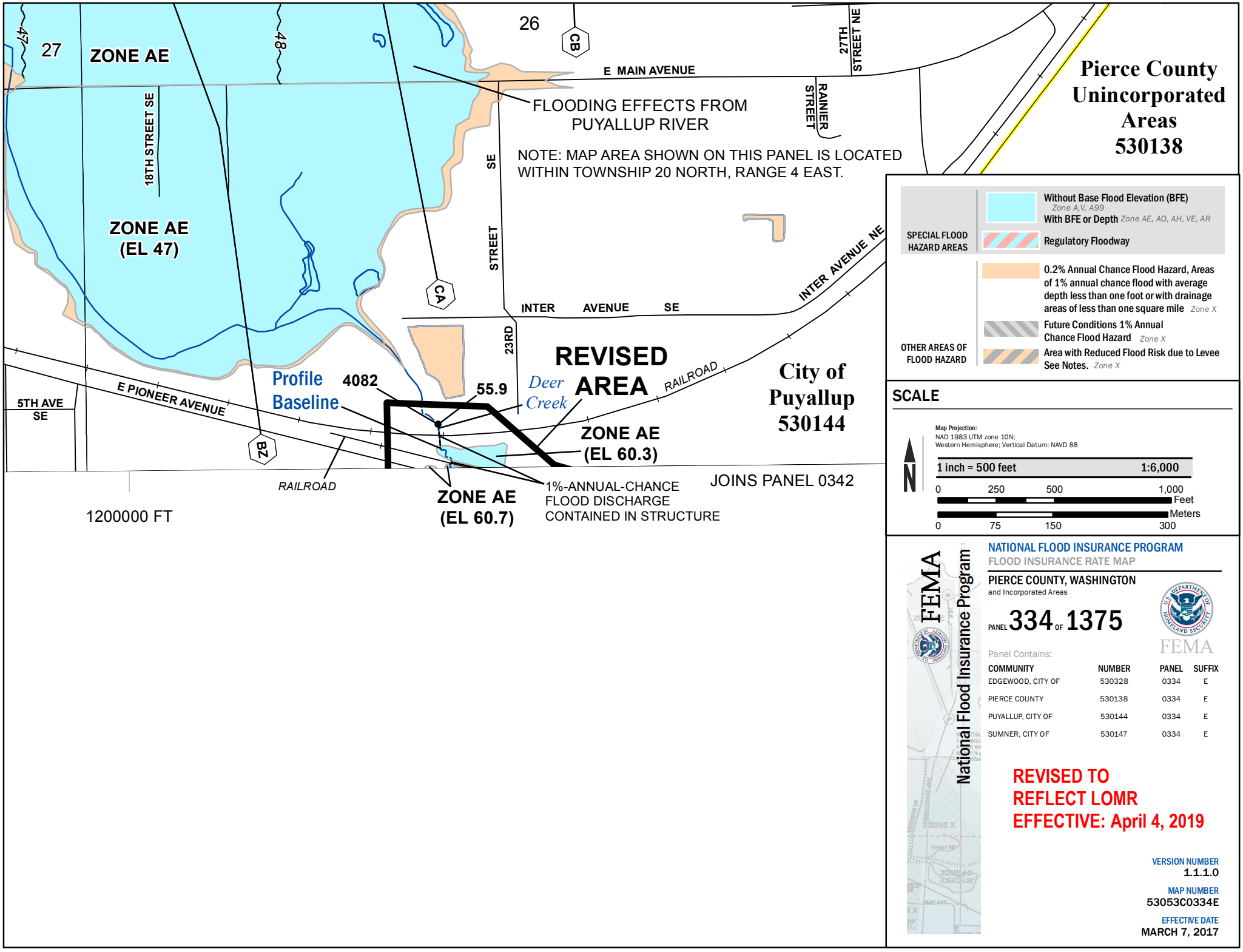
REVISED TO REFLECT LOMR EFFECTIVE: April 4, 2019

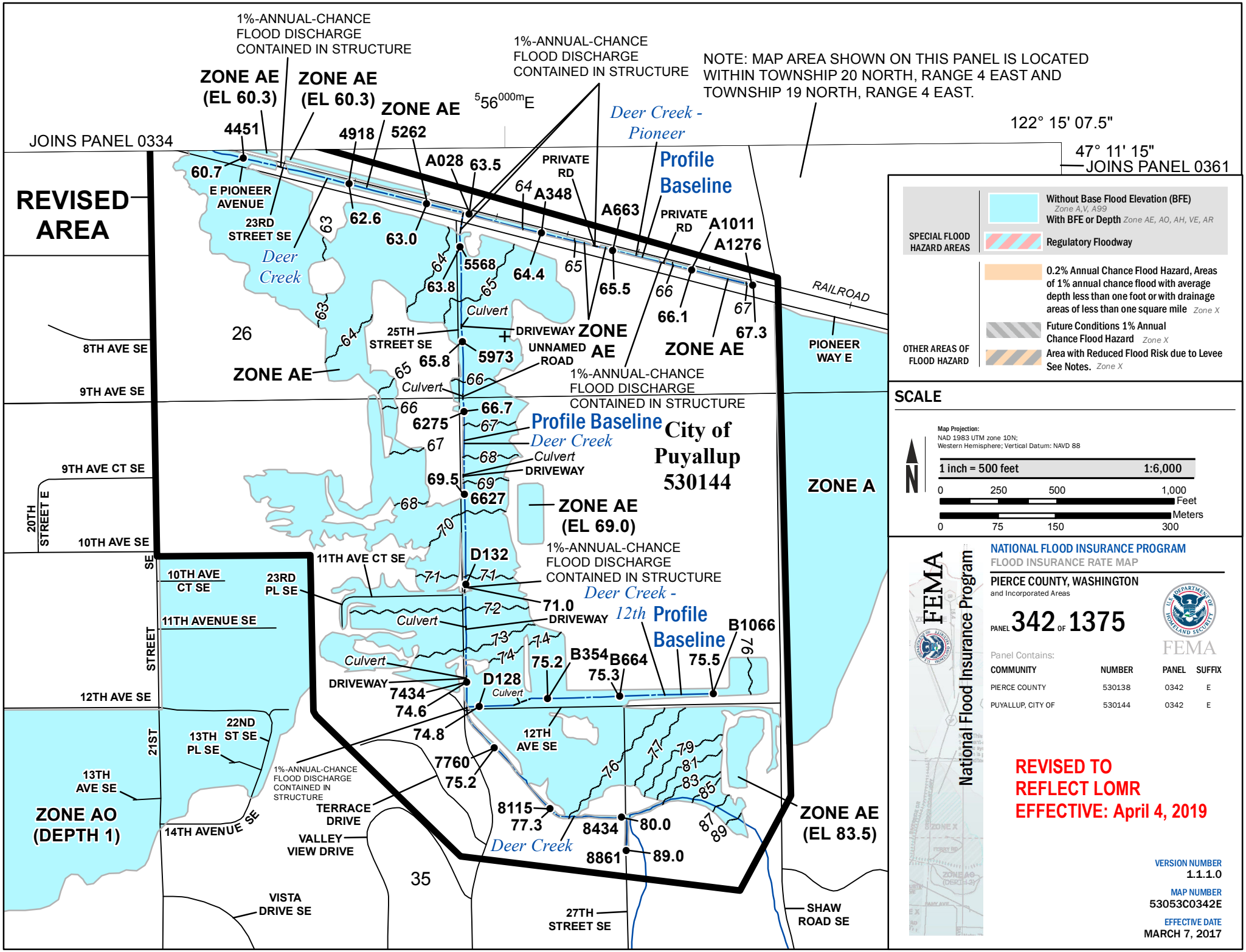
FLOOD PROFILES

DEER CREEK - 12TH

FEDERAL EMERGENCY MANAGEMENT AGENCY
PIERCE COUNTY, WA
AND INCORPORATED AREAS

364P


27
ZONE AE
47
48
26
CB
E MAIN AVENUE
27TH STREET NE
RAINIER STREET
18TH STREET SE
FLOODING EFFECTS FROM PUYALLUP RIVER
NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 20 NORTH, RANGE 4 EAST.
Pierce County Unincorporated Areas 530138
ZONE AE (EL 47)
SE STREET
CA
INTER AVENUE SE
INTER AVENUE NE
23RD
REVISED AREA
Deer Creek
RAILROAD
City of Puyallup 530144
Profile Baseline
4082
55.9
ZONE AE (EL 60.3)
5TH AVE SE
E PIONEER AVENUE
BZ
RAILROAD
ZONE AE (EL 60.7)
1%-ANNUAL-CHANCE FLOOD DISCHARGE CONTAINED IN STRUCTURE
JOINS PANEL 0342
1200000 FT
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
SCALE
N
Map Projection:
NAD 1983 UTM zone 10N;
Western Hemisphere; Vertical Datum: NAVD 88
1 inch = 500 feet 1:6,000
0 250 500 1,000 Feet
0 75 150 300 Meters
FEMA
National Flood Insurance Program
NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP
PIERCE COUNTY, WASHINGTON
and Incorporated Areas
PANEL 334 OF 1375
FEMA
Panel Contains:
COMMUNITY NUMBER PANEL SUFFIX
EDGEWOOD, CITY OF 530328 0334 E
PIERCE COUNTY 530138 0334 E
PUYALLUP, CITY OF 530144 0334 E
SUMNER, CITY OF 530147 0334 E
REVISED TO REFLECT LOMR EFFECTIVE: April 4, 2019
VERSION NUMBER
1.1.1.0
MAP NUMBER
53053C0334E
EFFECTIVE DATE
MARCH 7, 2017


1%-ANNUAL-CHANCE FLOOD DISCHARGE CONTAINED IN STRUCTURE
ZONE AE (EL 60.3)
ZONE AE (EL 60.3)
ZONE AE
4451
4918
5262
A028
63.5
PRIVATE RD
A348
A663
PRIVATE RD
A1011
A1276
5568
5973
6275
6627
7434
7760
8115
8434
8861
B1066
B354
B664
D128
D132
Deer Creek - Pioneer
Profile Baseline
Deer Creek
Deer Creek - 12th
Culvert
DRIVEWAY
UNNAMED ROAD
RAILROAD
PIONEER WAY E
E PIONEER AVENUE
23RD STREET SE
25TH STREET SE
8TH AVE SE
9TH AVE SE
9TH AVE CT SE
10TH AVE SE
11TH AVE CT SE
10TH AVE CT SE
23RD PL SE
11TH AVENUE SE
12TH AVE SE
13TH AVE SE
14TH AVENUE SE
22ND ST SE
13TH PL SE
TERRACE DRIVE
VALLEY VIEW DRIVE
VISTA DRIVE SE
27TH STREET SE
SHAW ROAD SE
20TH STREET E
21ST STREET SE
12TH AVE SE
ZONE AE
ZONE AE (EL 69.0)
ZONE AE (EL 83.5)
ZONE A
ZONE AO (DEPTH 1)
1%-ANNUAL-CHANCE FLOOD DISCHARGE CONTAINED IN STRUCTURE
City of Puyallup 530144
26
35
JOINS PANEL 0334
JOINS PANEL 0361
REVISED AREA
NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 20 NORTH, RANGE 4 EAST AND TOWNSHIP 19 NORTH, RANGE 4 EAST.
122° 15' 07.5"
47° 11' 15"
5 560000m E
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
SCALE
Map Projection:
NAD 1983 UTM zone 10N;
Western Hemisphere; Vertical Datum: NAVD 88
1 inch = 500 feet 1:6,000
0 250 500 1,000 Feet
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FEMA
National Flood Insurance Program
NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP
PIERCE COUNTY, WASHINGTON
and Incorporated Areas
PANEL 342 OF 1375
Panel Contains:
COMMUNITY NUMBER PANEL SUFFIX
PIERCE COUNTY 530138 0342 E
PUYALLUP, CITY OF 530144 0342 E
REVISED TO REFLECT LOMR EFFECTIVE: April 4, 2019
VERSION NUMBER 1.1.1.0
MAP NUMBER 53053C0342E
EFFECTIVE DATE MARCH 7, 2017

Appendix D – WWHM Calculations

WWHM2012

PROJECT REPORT

REPORT FOR SITE

Per comments under MR5 , it is a conservative assumption to provide 100% detention for the preliminary storm design, but at the time of civil application, the applicant must show MR5 compliance. If the intent is to meet the LID Performance Standard rather than the List Options, then provide the LID Duration Analysis (curves) at time of civil application.

General Model Information

Project Name:	Cascade Shaw - Copy
Site Name:	
Site Address:	
City:	
Report Date:	2/22/2023
Gage:	38 IN CENTRAL
Data Start:	10/01/1901
Data End:	09/30/2059
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2021/08/18
Version:	4.2.18

POC Thresholds

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

Landuse Basin Data

Predeveloped Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Mod	7.93
Pervious Total	7.93
Impervious Land Use	acre
Impervious Total	0
Basin Total	7.93

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Forest, Mod	2.35
Pervious Total	2.35

Impervious Land Use	acre
ROADS FLAT	3.08
ROOF TOPS FLAT	1.8
SIDEWALKS FLAT	0.7
Impervious Total	5.58
Basin Total	7.93

This is not an acceptable landuse for the post-developed condition. At time of civil application, revise accordingly.

Element Flows To:

Surface	Interflow	Groundwater
Vault 1	Vault 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

Vault 1

Width: 140.525630469832 ft.
Length: 140.525630469832 ft.
Depth: 7 ft.
Discharge Structure
Riser Height: 6 ft.
Riser Diameter: 18 in.
Notch Type: Rectangular
Notch Width: 0.010 ft.
Notch Height: 2.563 ft.
Orifice 1 Diameter: 1.295 in. Elevation:0 ft.
Element Flows To:
Outlet 1 Outlet 2

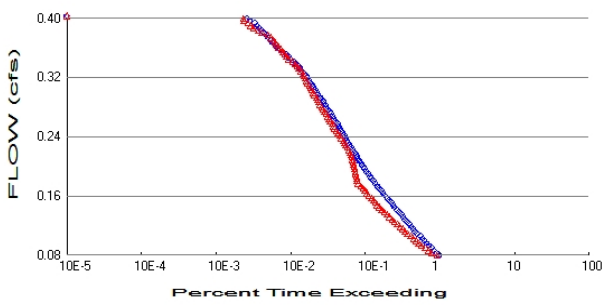
Vault Hydraulic Table

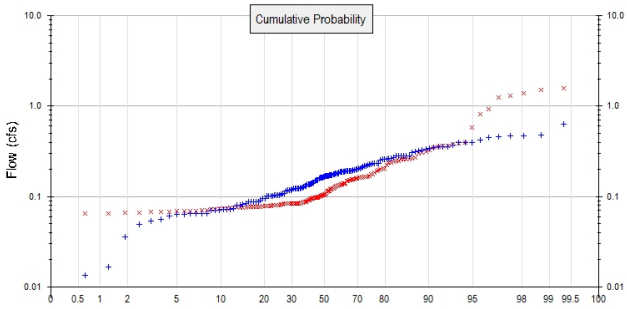
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.453	0.000	0.000	0.000
0.0778	0.453	0.035	0.012	0.000
0.1556	0.453	0.070	0.017	0.000
0.2333	0.453	0.105	0.022	0.000
0.3111	0.453	0.141	0.025	0.000
0.3889	0.453	0.176	0.028	0.000
0.4667	0.453	0.211	0.031	0.000
0.5444	0.453	0.246	0.033	0.000
0.6222	0.453	0.282	0.035	0.000
0.7000	0.453	0.317	0.038	0.000
0.7778	0.453	0.352	0.040	0.000
0.8556	0.453	0.387	0.042	0.000
0.9333	0.453	0.423	0.044	0.000
1.0111	0.453	0.458	0.045	0.000
1.0889	0.453	0.493	0.047	0.000
1.1667	0.453	0.528	0.049	0.000
1.2444	0.453	0.564	0.050	0.000
1.3222	0.453	0.599	0.052	0.000
1.4000	0.453	0.634	0.053	0.000
1.4778	0.453	0.669	0.055	0.000
1.5556	0.453	0.705	0.056	0.000
1.6333	0.453	0.740	0.058	0.000
1.7111	0.453	0.775	0.059	0.000
1.7889	0.453	0.811	0.060	0.000
1.8667	0.453	0.846	0.062	0.000
1.9444	0.453	0.881	0.063	0.000
2.0222	0.453	0.916	0.064	0.000
2.1000	0.453	0.952	0.065	0.000
2.1778	0.453	0.987	0.067	0.000
2.2556	0.453	1.022	0.068	0.000
2.3333	0.453	1.057	0.069	0.000
2.4111	0.453	1.093	0.070	0.000
2.4889	0.453	1.128	0.071	0.000
2.5667	0.453	1.163	0.072	0.000
2.6444	0.453	1.198	0.074	0.000
2.7222	0.453	1.234	0.075	0.000
2.8000	0.453	1.269	0.076	0.000

2.8778	0.453	1.304	0.077	0.000
2.9556	0.453	1.339	0.078	0.000
3.0333	0.453	1.375	0.079	0.000
3.1111	0.453	1.410	0.080	0.000
3.1889	0.453	1.445	0.081	0.000
3.2667	0.453	1.480	0.082	0.000
3.3444	0.453	1.516	0.083	0.000
3.4222	0.453	1.551	0.084	0.000
3.5000	0.453	1.586	0.085	0.000
3.5778	0.453	1.621	0.087	0.000
3.6556	0.453	1.657	0.090	0.000
3.7333	0.453	1.692	0.093	0.000
3.8111	0.453	1.727	0.095	0.000
3.8889	0.453	1.763	0.098	0.000
3.9667	0.453	1.798	0.102	0.000
4.0444	0.453	1.833	0.105	0.000
4.1222	0.453	1.868	0.108	0.000
4.2000	0.453	1.904	0.112	0.000
4.2778	0.453	1.939	0.115	0.000
4.3556	0.453	1.974	0.118	0.000
4.4333	0.453	2.009	0.122	0.000
4.5111	0.453	2.045	0.126	0.000
4.5889	0.453	2.080	0.130	0.000
4.6667	0.453	2.115	0.134	0.000
4.7444	0.453	2.150	0.138	0.000
4.8222	0.453	2.186	0.143	0.000
4.9000	0.453	2.221	0.163	0.000
4.9778	0.453	2.256	0.168	0.000
5.0556	0.453	2.291	0.174	0.000
5.1333	0.453	2.327	0.180	0.000
5.2111	0.453	2.362	0.187	0.000
5.2889	0.453	2.397	0.193	0.000
5.3667	0.453	2.432	0.199	0.000
5.4444	0.453	2.468	0.206	0.000
5.5222	0.453	2.503	0.212	0.000
5.6000	0.453	2.538	0.219	0.000
5.6778	0.453	2.574	0.226	0.000
5.7556	0.453	2.609	0.233	0.000
5.8333	0.453	2.644	0.240	0.000
5.9111	0.453	2.679	0.247	0.000
5.9889	0.453	2.715	0.254	0.000
6.0667	0.453	2.750	0.530	0.000
6.1444	0.453	2.785	1.126	0.000
6.2222	0.453	2.820	1.894	0.000
6.3000	0.453	2.856	2.759	0.000
6.3778	0.453	2.891	3.645	0.000
6.4556	0.453	2.926	4.476	0.000
6.5333	0.453	2.961	5.184	0.000
6.6111	0.453	2.997	5.729	0.000
6.6889	0.453	3.032	6.110	0.000
6.7667	0.453	3.067	6.467	0.000
6.8444	0.453	3.102	6.775	0.000
6.9222	0.453	3.138	7.069	0.000
7.0000	0.453	3.173	7.351	0.000
7.0778	0.453	3.208	7.622	0.000
7.1556	0.000	0.000	7.884	0.000

Analysis Results

POC 1





\+ Predeveloped x Mitigated

If the intent is to meet the LID Performance Standard rather than the List Options, then provide the LID Duration Analysis (curves) at time of civil application.

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 7.93
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 2.35
Total Impervious Area: 5.58

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.168742
5 year	0.263938
10 year	0.315852
25 year	0.368797
50 year	0.400311
100 year	0.426247

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.119135
5 year	0.224757
10 year	0.335803
25 year	0.544735
50 year	0.768382
100 year	1.069852

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1902	0.123	0.138
1903	0.102	0.076
1904	0.196	0.084
1905	0.080	0.137
1906	0.036	0.069
1907	0.256	0.159
1908	0.190	0.078
1909	0.188	0.091
1910	0.259	0.203
1911	0.169	0.098

1912	0.637	0.131
1913	0.266	0.238
1914	0.065	0.067
1915	0.107	0.154
1916	0.167	0.087
1917	0.056	0.081
1918	0.179	0.194
1919	0.132	0.116
1920	0.170	0.096
1921	0.190	0.163
1922	0.190	0.165
1923	0.153	0.169
1924	0.070	0.077
1925	0.087	0.075
1926	0.166	0.077
1927	0.105	0.109
1928	0.129	0.089
1929	0.271	0.147
1930	0.170	0.085
1931	0.158	0.084
1932	0.123	0.122
1933	0.119	0.119
1934	0.350	0.328
1935	0.162	0.222
1936	0.141	0.098
1937	0.234	0.087
1938	0.137	0.103
1939	0.009	0.079
1940	0.152	0.164
1941	0.072	0.067
1942	0.229	0.351
1943	0.118	0.106
1944	0.230	0.378
1945	0.191	0.096
1946	0.116	0.069
1947	0.065	0.081
1948	0.359	0.185
1949	0.308	0.579
1950	0.087	0.082
1951	0.107	0.080
1952	0.474	1.293
1953	0.423	0.396
1954	0.152	0.138
1955	0.125	0.071
1956	0.061	0.067
1957	0.216	0.162
1958	0.452	0.934
1959	0.280	0.363
1960	0.074	0.074
1961	0.281	0.386
1962	0.151	0.084
1963	0.072	0.069
1964	0.080	0.078
1965	0.315	0.300
1966	0.088	0.125
1967	0.139	0.077
1968	0.138	0.134
1969	0.138	0.096

1970	0.215	0.158
1971	0.339	0.304
1972	0.220	0.140
1973	0.280	0.273
1974	0.163	0.137
1975	0.355	0.819
1976	0.189	0.102
1977	0.063	0.064
1978	0.317	0.249
1979	0.087	0.078
1980	0.179	0.091
1981	0.172	0.134
1982	0.070	0.069
1983	0.281	0.257
1984	0.114	0.099
1985	0.186	0.116
1986	0.167	0.122
1987	0.324	0.361
1988	0.202	0.175
1989	0.182	0.083
1990	0.206	0.104
1991	0.161	0.087
1992	0.230	0.200
1993	0.223	0.098
1994	0.335	0.193
1995	0.064	0.106
1996	0.375	0.359
1997	0.141	0.074
1998	0.167	0.095
1999	0.013	0.075
2000	0.127	0.133
2001	0.065	0.065
2002	0.263	0.097
2003	0.203	0.167
2004	0.189	0.127
2005	0.400	0.086
2006	0.104	0.080
2007	0.104	0.085
2008	0.177	0.103
2009	0.122	0.084
2010	0.104	0.163
2011	0.084	0.079
2012	0.121	0.084
2013	0.095	0.068
2014	0.071	0.071
2015	0.135	0.080
2016	0.054	0.083
2017	0.257	0.314
2018	0.474	1.384
2019	0.457	1.573
2020	0.142	0.075
2021	0.232	0.236
2022	0.096	0.074
2023	0.195	0.130
2024	0.468	0.084
2025	0.172	0.120
2026	0.281	0.261
2027	0.101	0.083

2028	0.088	0.070
2029	0.190	0.150
2030	0.353	0.244
2031	0.117	0.077
2032	0.064	0.073
2033	0.102	0.074
2034	0.101	0.084
2035	0.398	1.525
2036	0.210	0.150
2037	0.049	0.076
2038	0.177	0.205
2039	0.017	0.065
2040	0.092	0.084
2041	0.124	0.074
2042	0.392	1.242
2043	0.187	0.263
2044	0.253	0.154
2045	0.172	0.154
2046	0.201	0.247
2047	0.148	0.112
2048	0.192	0.093
2049	0.172	0.149
2050	0.123	0.082
2051	0.179	0.175
2052	0.103	0.095
2053	0.184	0.260
2054	0.234	0.260
2055	0.073	0.068
2056	0.081	0.078
2057	0.126	0.102
2058	0.160	0.114
2059	0.282	0.167

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.6370	1.5730
2	0.4745	1.5246
3	0.4739	1.3841
4	0.4680	1.2927
5	0.4567	1.2424
6	0.4518	0.9339
7	0.4234	0.8193
8	0.3995	0.5786
9	0.3984	0.3965
10	0.3923	0.3864
11	0.3746	0.3783
12	0.3593	0.3632
13	0.3553	0.3606
14	0.3533	0.3595
15	0.3500	0.3512
16	0.3390	0.3285
17	0.3354	0.3144
18	0.3243	0.3036
19	0.3167	0.3005
20	0.3145	0.2729
21	0.3078	0.2626
22	0.2824	0.2609

23	0.2811	0.2599
24	0.2810	0.2596
25	0.2809	0.2566
26	0.2802	0.2493
27	0.2795	0.2473
28	0.2710	0.2436
29	0.2664	0.2383
30	0.2628	0.2361
31	0.2587	0.2218
32	0.2573	0.2054
33	0.2563	0.2029
34	0.2526	0.2001
35	0.2343	0.1941
36	0.2340	0.1934
37	0.2318	0.1846
38	0.2303	0.1751
39	0.2296	0.1745
40	0.2291	0.1686
41	0.2234	0.1666
42	0.2198	0.1666
43	0.2165	0.1652
44	0.2154	0.1636
45	0.2100	0.1635
46	0.2058	0.1627
47	0.2027	0.1617
48	0.2021	0.1590
49	0.2015	0.1585
50	0.1960	0.1541
51	0.1950	0.1538
52	0.1920	0.1538
53	0.1910	0.1504
54	0.1904	0.1503
55	0.1904	0.1488
56	0.1900	0.1472
57	0.1899	0.1401
58	0.1895	0.1382
59	0.1885	0.1380
60	0.1877	0.1375
61	0.1872	0.1367
62	0.1864	0.1343
63	0.1841	0.1338
64	0.1818	0.1331
65	0.1795	0.1306
66	0.1789	0.1295
67	0.1785	0.1273
68	0.1774	0.1246
69	0.1769	0.1220
70	0.1721	0.1220
71	0.1720	0.1197
72	0.1719	0.1195
73	0.1716	0.1163
74	0.1705	0.1162
75	0.1698	0.1142
76	0.1686	0.1118
77	0.1674	0.1086
78	0.1672	0.1064
79	0.1668	0.1064
80	0.1656	0.1044

81	0.1634	0.1033
82	0.1623	0.1031
83	0.1611	0.1024
84	0.1601	0.1021
85	0.1577	0.0988
86	0.1532	0.0982
87	0.1525	0.0978
88	0.1521	0.0975
89	0.1509	0.0975
90	0.1483	0.0965
91	0.1422	0.0961
92	0.1412	0.0960
93	0.1408	0.0949
94	0.1385	0.0948
95	0.1379	0.0928
96	0.1375	0.0913
97	0.1373	0.0909
98	0.1354	0.0893
99	0.1320	0.0873
100	0.1295	0.0871
101	0.1274	0.0868
102	0.1264	0.0863
103	0.1247	0.0849
104	0.1237	0.0845
105	0.1234	0.0845
106	0.1232	0.0840
107	0.1225	0.0839
108	0.1218	0.0839
109	0.1214	0.0839
110	0.1191	0.0838
111	0.1179	0.0837
112	0.1167	0.0836
113	0.1164	0.0835
114	0.1145	0.0832
115	0.1074	0.0829
116	0.1074	0.0822
117	0.1049	0.0817
118	0.1042	0.0810
119	0.1038	0.0805
120	0.1036	0.0801
121	0.1029	0.0798
122	0.1022	0.0796
123	0.1019	0.0789
124	0.1010	0.0785
125	0.1005	0.0779
126	0.0960	0.0778
127	0.0948	0.0778
128	0.0917	0.0776
129	0.0882	0.0773
130	0.0875	0.0772
131	0.0873	0.0766
132	0.0870	0.0766
133	0.0869	0.0761
134	0.0837	0.0756
135	0.0813	0.0754
136	0.0802	0.0753
137	0.0796	0.0747
138	0.0744	0.0745

139	0.0725	0.0744
140	0.0725	0.0738
141	0.0723	0.0737
142	0.0707	0.0736
143	0.0702	0.0727
144	0.0700	0.0714
145	0.0652	0.0708
146	0.0652	0.0705
147	0.0651	0.0695
148	0.0643	0.0690
149	0.0635	0.0689
150	0.0635	0.0687
151	0.0611	0.0679
152	0.0556	0.0677
153	0.0539	0.0671
154	0.0495	0.0669
155	0.0359	0.0667
156	0.0166	0.0655
157	0.0135	0.0653
158	0.0086	0.0641

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0844	53650	50481	94	Pass
0.0876	49777	42598	85	Pass
0.0908	46326	38564	83	Pass
0.0939	43240	35285	81	Pass
0.0971	39357	31279	79	Pass
0.1003	36753	28747	78	Pass
0.1035	34332	26482	77	Pass
0.1067	32116	24432	76	Pass
0.1099	29988	22515	75	Pass
0.1131	27423	20332	74	Pass
0.1163	25723	18842	73	Pass
0.1195	24227	17473	72	Pass
0.1227	22836	16127	70	Pass
0.1259	21551	14953	69	Pass
0.1290	19928	13623	68	Pass
0.1322	18797	12637	67	Pass
0.1354	17745	11701	65	Pass
0.1386	16737	10781	64	Pass
0.1418	15701	10011	63	Pass
0.1450	14526	9152	63	Pass
0.1482	13695	8548	62	Pass
0.1514	12975	8016	61	Pass
0.1546	12232	7557	61	Pass
0.1578	11557	7125	61	Pass
0.1610	10875	6681	61	Pass
0.1642	10083	6166	61	Pass
0.1673	9529	5784	60	Pass
0.1705	8997	5462	60	Pass
0.1737	8482	5150	60	Pass
0.1769	8028	4838	60	Pass
0.1801	7490	4435	59	Pass
0.1833	7080	4324	61	Pass
0.1865	6665	4256	63	Pass
0.1897	6332	4198	66	Pass
0.1929	6044	4129	68	Pass
0.1961	5701	4038	70	Pass
0.1993	5432	3977	73	Pass
0.2024	5209	3913	75	Pass
0.2056	4958	3850	77	Pass
0.2088	4726	3801	80	Pass
0.2120	4478	3742	83	Pass
0.2152	4310	3676	85	Pass
0.2184	4135	3579	86	Pass
0.2216	3942	3451	87	Pass
0.2248	3753	3314	88	Pass
0.2280	3581	3186	88	Pass
0.2312	3371	3039	90	Pass
0.2344	3227	2922	90	Pass
0.2376	3115	2803	89	Pass
0.2407	3020	2654	87	Pass
0.2439	2915	2531	86	Pass
0.2471	2760	2367	85	Pass
0.2503	2623	2247	85	Pass

0.2535	2514	2155	85	Pass
0.2567	2419	2079	85	Pass
0.2599	2328	2000	85	Pass
0.2631	2197	1887	85	Pass
0.2663	2084	1811	86	Pass
0.2695	2010	1735	86	Pass
0.2727	1913	1662	86	Pass
0.2758	1830	1585	86	Pass
0.2790	1718	1491	86	Pass
0.2822	1640	1433	87	Pass
0.2854	1592	1363	85	Pass
0.2886	1519	1310	86	Pass
0.2918	1450	1263	87	Pass
0.2950	1379	1220	88	Pass
0.2982	1287	1149	89	Pass
0.3014	1235	1105	89	Pass
0.3046	1181	1058	89	Pass
0.3078	1123	1019	90	Pass
0.3110	1079	982	91	Pass
0.3141	1019	932	91	Pass
0.3173	978	900	92	Pass
0.3205	935	869	92	Pass
0.3237	892	842	94	Pass
0.3269	829	806	97	Pass
0.3301	780	754	96	Pass
0.3333	737	710	96	Pass
0.3365	697	674	96	Pass
0.3397	640	632	98	Pass
0.3429	606	584	96	Pass
0.3461	553	517	93	Pass
0.3492	511	490	95	Pass
0.3524	475	461	97	Pass
0.3556	433	440	101	Pass
0.3588	397	417	105	Pass
0.3620	361	378	104	Pass
0.3652	337	356	105	Pass
0.3684	313	340	108	Pass
0.3716	298	325	109	Pass
0.3748	278	301	108	Pass
0.3780	257	273	106	Pass
0.3812	240	228	95	Pass
0.3844	223	203	91	Pass
0.3875	210	175	83	Pass
0.3907	197	162	82	Pass
0.3939	183	147	80	Pass
0.3971	156	130	83	Pass
0.4003	142	129	90	Pass

Water Quality

Water Quality BMP Flow and Volume for POC #1

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.

LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
Vault 1 POC	☐	2045.86			☐	0.00			
Total Volume Infiltrated		2045.86	0.00	0.00		0.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

If the intent is to meet the LID performance standard rather than the List Options, then provide the LID Duration Analysis (curves) at time of civil application.

Model Default Modifications

Total of 0 changes have been made.

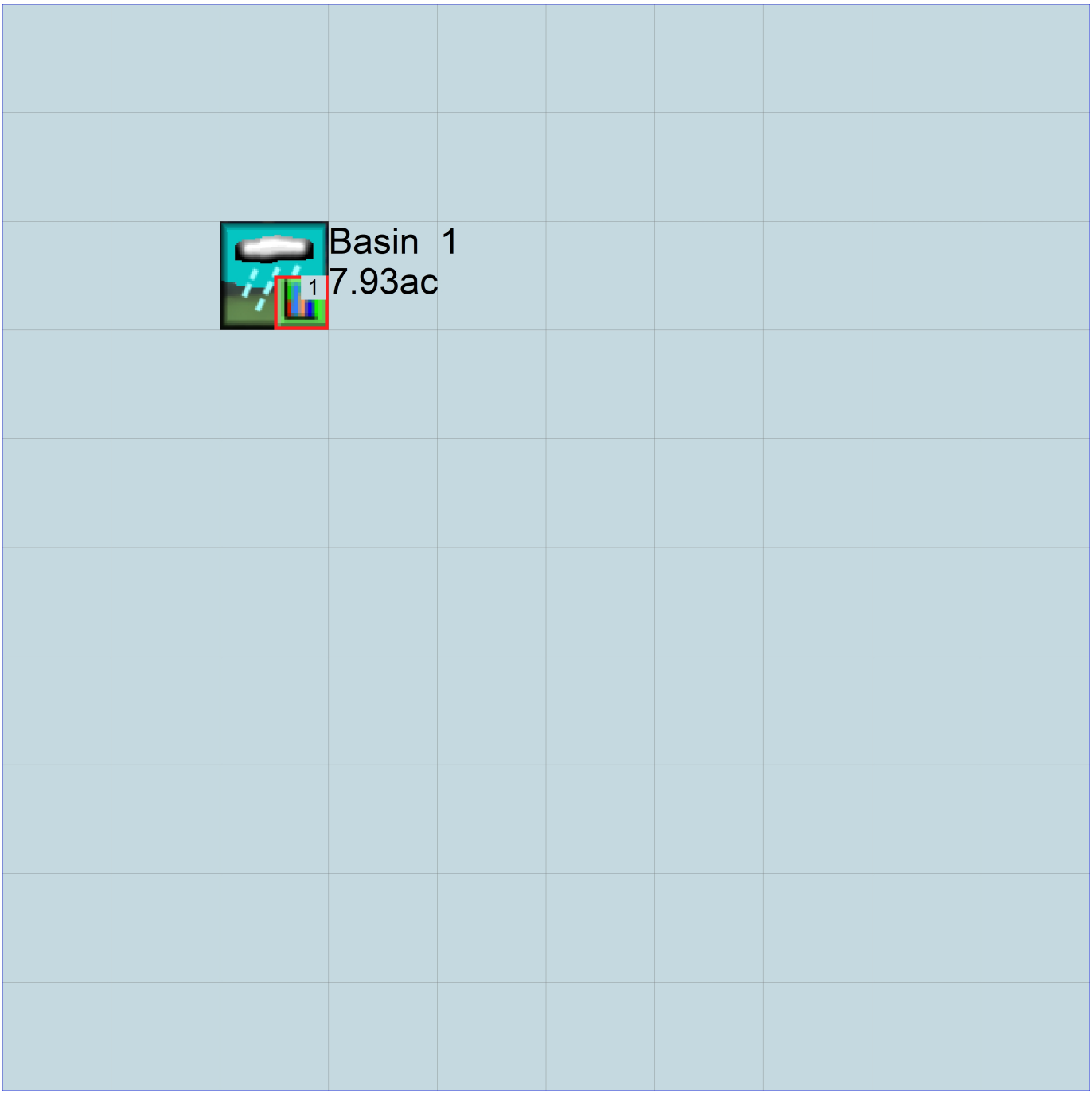
PERLND Changes

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       1901 10 01        END    2059 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   Cascade Shaw - Copy.wdm
MESSU       25   PreCascade Shaw - Copy.MES
            27   PreCascade Shaw - Copy.L61
            28   PreCascade Shaw - Copy.L62
            30   POCCascade Shaw - Copy1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      11
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title---------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  1                   MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                      in  out           ***
   11     C, Forest, Mod          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 ***
   11         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  *********
   11         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 ***
   11         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
   11              0       4.5      0.08       400       0.1       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   11              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   11            0.2       0.5      0.35         6       0.5       0.7
  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
   11              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           ***
  END GEN-INFO
  *** Section IWATER***

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

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

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

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

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

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

```
END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  11                        7.93     COPY   501     12
PERLND  11                        7.93     COPY   501     13

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

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



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

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

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

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

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

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

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

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

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

END EXT SOURCES

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

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

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


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1901 10 01        END    2059 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   Cascade Shaw - Copy.wdm
MESSU       25   MitCascade Shaw - Copy.MES
            27   MitCascade Shaw - Copy.L61
            28   MitCascade Shaw - Copy.L62
            30   POCCascade Shaw - Copy1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND       8
      IMPLND       1
      IMPLND       4
      IMPLND       8
      RCHRES       1
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Vault  1                   MAX                     1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                        in  out           ***
    8     A/B, Lawn, Mod          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 ***
    8         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  *********
    8         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 ***
    8         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
    8              0         5       0.8       400       0.1       0.3     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
    8              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                                 ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
    8          0.1       0.5      0.25         0       0.7      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
    8              0         0         0         0         3         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
    8      SIDEWALKS/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
    8         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    0    1    9
    4         0    0    4    0    0    0    1    9
    8         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
    8         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
    8            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
    8              0         0
  END IWAT-PARM3

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

END IMPLND

SCHEMATIC
<-Source->                 <--Area-->     <-Target->   MBLK   ***
<Name>   #                 <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND   8                       2.35     RCHRES   1      2
PERLND   8                       2.35     RCHRES   1      3
IMPLND   1                       3.08     RCHRES   1      5
IMPLND   4                        1.8     RCHRES   1      5
IMPLND   8                        0.7     RCHRES   1      5

******Routing******
PERLND   8                       2.35     COPY     1     12
IMPLND   1                       3.08     COPY     1     15
IMPLND   4                        1.8     COPY     1     15
IMPLND   8                        0.7     COPY     1     15
PERLND   8                       2.35     COPY     1     13
RCHRES   1                          1     COPY   501     16
END SCHEMATIC

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



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

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

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

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                    ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
           FG FG FG FG  possible  exit  *** possible  exit      possible  exit
            *  *  *  *    *  *  *  *  *       *  *  *  *  *        ***
    1        0  1  0  0    4  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      0.02       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  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      1
   92    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.302124  0.000000  0.000000
  0.077778  0.302124  0.023499  0.012751
  0.155556  0.302124  0.046997  0.018032
  0.233333  0.302124  0.070496  0.022085
  0.311111  0.302124  0.093994  0.025502
  0.388889  0.302124  0.117493  0.028512
  0.466667  0.302124  0.140991  0.031233
  0.544444  0.302124  0.164490  0.033735
  0.622222  0.302124  0.187988  0.036065
  0.700000  0.302124  0.211487  0.038252
  0.777778  0.302124  0.234986  0.040321
  0.855556  0.302124  0.258484  0.042289
  0.933333  0.302124  0.281983  0.044170
  1.011111  0.302124  0.305481  0.045973
  1.088889  0.302124  0.328980  0.047709
  1.166667  0.302124  0.352478  0.049383
  1.244444  0.302124  0.375977  0.051003
  1.322222  0.302124  0.399475  0.052573
  1.400000  0.302124  0.422974  0.054097
  1.477778  0.302124  0.446473  0.055579
  1.555556  0.302124  0.469971  0.057023
  1.633333  0.302124  0.493470  0.058431
  1.711111  0.302124  0.516968  0.059806
  1.788889  0.302124  0.540467  0.061150
  1.866667  0.302124  0.563965  0.062466
  1.944444  0.302124  0.587464  0.063754
  2.022222  0.302124  0.610962  0.065016
  2.100000  0.302124  0.634461  0.066255
  2.177778  0.302124  0.657960  0.067471
  2.255556  0.302124  0.681458  0.068665
  2.333333  0.302124  0.704957  0.069839
  2.411111  0.302124  0.728455  0.070993
```

```
  2.488889  0.302124  0.751954  0.072129
  2.566667  0.302124  0.775452  0.073248
  2.644444  0.302124  0.798951  0.074349
  2.722222  0.302124  0.822449  0.075434
  2.800000  0.302124  0.845948  0.076505
  2.877778  0.302124  0.869447  0.077560
  2.955556  0.302124  0.892945  0.078601
  3.033333  0.302124  0.916444  0.079628
  3.111111  0.302124  0.939942  0.080643
  3.188889  0.302124  0.963441  0.081645
  3.266667  0.302124  0.986939  0.082634
  3.344444  0.302124  1.010438  0.083612
  3.422222  0.302124  1.033937  0.084793
  3.500000  0.302124  1.057435  0.087546
  3.577778  0.302124  1.080934  0.091171
  3.655556  0.302124  1.104432  0.095370
  3.733333  0.302124  1.127931  0.099996
  3.811111  0.302124  1.151429  0.104954
  3.888889  0.302124  1.174928  0.110175
  3.966667  0.302124  1.198426  0.115603
  4.044444  0.302124  1.221925  0.121192
  4.122222  0.302124  1.245424  0.126903
  4.200000  0.302124  1.268922  0.132702
  4.277778  0.302124  1.292421  0.138560
  4.355556  0.302124  1.315919  0.144448
  4.433333  0.302124  1.339418  0.150797
  4.511111  0.302124  1.362916  0.157909
  4.588889  0.302124  1.386415  0.165237
  4.666667  0.302124  1.409913  0.172775
  4.744444  0.302124  1.433412  0.180514
  4.822222  0.302124  1.456911  0.216647
  4.900000  0.302124  1.480409  0.227119
  4.977778  0.302124  1.503908  0.237838
  5.055556  0.302124  1.527406  0.248799
  5.133333  0.302124  1.550905  0.259995
  5.211111  0.302124  1.574403  0.271421
  5.288889  0.302124  1.597902  0.283073
  5.366667  0.302124  1.621400  0.294945
  5.444444  0.302124  1.644899  0.307034
  5.522222  0.302124  1.668398  0.319334
  5.600000  0.302124  1.691896  0.331843
  5.677778  0.302124  1.715395  0.344556
  5.755556  0.302124  1.738893  0.357470
  5.833333  0.302124  1.762392  0.370582
  5.911111  0.302124  1.785890  0.383888
  5.988889  0.302124  1.809389  0.397386
  6.066667  0.302124  1.832887  0.673645
  6.144444  0.302124  1.856386  1.269660
  6.222222  0.302124  1.879885  2.038330
  6.300000  0.302124  1.903383  2.903357
  6.377778  0.302124  1.926882  3.789085
  6.455556  0.302124  1.950380  4.619595
  6.533333  0.302124  1.973879  5.328398
  6.611111  0.302124  1.997377  5.873236
  6.688889  0.302124  2.020876  6.254378
  6.766667  0.302124  2.044374  6.611320
  6.844444  0.302124  2.067873  6.919149
  6.922222  0.302124  2.091372  7.213126
  7.000000  0.302124  2.114870  7.494970
  7.077778  0.302124  2.138369  7.766073
  END FTABLE  1
END FTABLES

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

```
END EXT SOURCES

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

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

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

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

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

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

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

  MASS-LINK       16
RCHRES     ROFLOW                          COPY           INPUT  MEAN
  END MASS-LINK   16


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

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WWHM2012

PROJECT REPORT

REPORT FOR FRONTAGE

It is not acceptable to mix public runoff with private runoff. If the disturbed PGHS in the ROW is less than 2,000sf, then no need for a public WQ facility. In addition, there is an existing storm system within Shaw Road that conveys ROW runoff to a different basin. Any disturbed areas within the ROW shall be evaluated at time of civil application, but likely will necessitate the private onsite flow control system be oversized to account for bypass of public runoff. To be resolved at time of civil application.

General Model Information

Project Name:	Cascade Shaw Frontage
Site Name:	
Site Address:	
City:	
Report Date:	2/22/2023
Gage:	38 IN CENTRAL
Data Start:	10/01/1901
Data End:	09/30/2059
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2021/08/18
Version:	4.2.18

POC Thresholds

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

Landuse Basin Data

Predeveloped Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Mod	0.43
Pervious Total	0.43
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.43

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
A B, Lawn, Flat	0.11
Pervious Total	0.11

Impervious Land Use	acre
ROADS MOD	0.26
SIDEWALKS FLAT	0.06
Impervious Total	0.32
Basin Total	0.43

Element Flows To:

Surface	Interflow	Groundwater
Vault 1	Vault 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

Vault 1

Width: 33.6632249423425 ft.
Length: 33.6632249423425 ft.
Depth: 7 ft.
Discharge Structure
Riser Height: 6 ft.
Riser Diameter: 18 in.
Notch Type: Rectangular
Notch Width: 0.010 ft.
Notch Height: 0.500 ft.
Orifice 1 Diameter: 0.268 in. Elevation:0 ft.
Element Flows To:
Outlet 1 Outlet 2

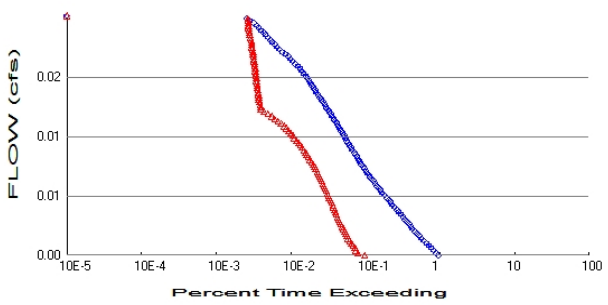
Vault Hydraulic Table

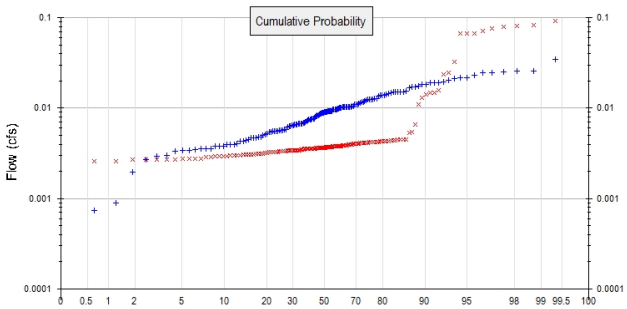
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.026	0.000	0.000	0.000
0.0778	0.026	0.002	0.000	0.000
0.1556	0.026	0.004	0.000	0.000
0.2333	0.026	0.006	0.000	0.000
0.3111	0.026	0.008	0.001	0.000
0.3889	0.026	0.010	0.001	0.000
0.4667	0.026	0.012	0.001	0.000
0.5444	0.026	0.014	0.001	0.000
0.6222	0.026	0.016	0.001	0.000
0.7000	0.026	0.018	0.001	0.000
0.7778	0.026	0.020	0.001	0.000
0.8556	0.026	0.022	0.001	0.000
0.9333	0.026	0.024	0.001	0.000
1.0111	0.026	0.026	0.002	0.000
1.0889	0.026	0.028	0.002	0.000
1.1667	0.026	0.030	0.002	0.000
1.2444	0.026	0.032	0.002	0.000
1.3222	0.026	0.034	0.002	0.000
1.4000	0.026	0.036	0.002	0.000
1.4778	0.026	0.038	0.002	0.000
1.5556	0.026	0.040	0.002	0.000
1.6333	0.026	0.042	0.002	0.000
1.7111	0.026	0.044	0.002	0.000
1.7889	0.026	0.046	0.002	0.000
1.8667	0.026	0.048	0.002	0.000
1.9444	0.026	0.050	0.002	0.000
2.0222	0.026	0.052	0.002	0.000
2.1000	0.026	0.054	0.002	0.000
2.1778	0.026	0.056	0.002	0.000
2.2556	0.026	0.058	0.002	0.000
2.3333	0.026	0.060	0.003	0.000
2.4111	0.026	0.062	0.003	0.000
2.4889	0.026	0.064	0.003	0.000
2.5667	0.026	0.066	0.003	0.000
2.6444	0.026	0.068	0.003	0.000
2.7222	0.026	0.070	0.003	0.000
2.8000	0.026	0.072	0.003	0.000

2.8778	0.026	0.074	0.003	0.000
2.9556	0.026	0.076	0.003	0.000
3.0333	0.026	0.078	0.003	0.000
3.1111	0.026	0.080	0.003	0.000
3.1889	0.026	0.083	0.003	0.000
3.2667	0.026	0.085	0.003	0.000
3.3444	0.026	0.087	0.003	0.000
3.4222	0.026	0.089	0.003	0.000
3.5000	0.026	0.091	0.003	0.000
3.5778	0.026	0.093	0.003	0.000
3.6556	0.026	0.095	0.003	0.000
3.7333	0.026	0.097	0.003	0.000
3.8111	0.026	0.099	0.003	0.000
3.8889	0.026	0.101	0.003	0.000
3.9667	0.026	0.103	0.003	0.000
4.0444	0.026	0.105	0.003	0.000
4.1222	0.026	0.107	0.004	0.000
4.2000	0.026	0.109	0.004	0.000
4.2778	0.026	0.111	0.004	0.000
4.3556	0.026	0.113	0.004	0.000
4.4333	0.026	0.115	0.004	0.000
4.5111	0.026	0.117	0.004	0.000
4.5889	0.026	0.119	0.004	0.000
4.6667	0.026	0.121	0.004	0.000
4.7444	0.026	0.123	0.004	0.000
4.8222	0.026	0.125	0.004	0.000
4.9000	0.026	0.127	0.004	0.000
4.9778	0.026	0.129	0.004	0.000
5.0556	0.026	0.131	0.004	0.000
5.1333	0.026	0.133	0.004	0.000
5.2111	0.026	0.135	0.004	0.000
5.2889	0.026	0.137	0.004	0.000
5.3667	0.026	0.139	0.004	0.000
5.4444	0.026	0.141	0.004	0.000
5.5222	0.026	0.143	0.004	0.000
5.6000	0.026	0.145	0.005	0.000
5.6778	0.026	0.147	0.007	0.000
5.7556	0.026	0.149	0.008	0.000
5.8333	0.026	0.151	0.010	0.000
5.9111	0.026	0.153	0.012	0.000
5.9889	0.026	0.155	0.015	0.000
6.0667	0.026	0.157	0.289	0.000
6.1444	0.026	0.159	0.884	0.000
6.2222	0.026	0.161	1.652	0.000
6.3000	0.026	0.163	2.516	0.000
6.3778	0.026	0.165	3.401	0.000
6.4556	0.026	0.167	4.231	0.000
6.5333	0.026	0.170	4.939	0.000
6.6111	0.026	0.172	5.483	0.000
6.6889	0.026	0.174	5.864	0.000
6.7667	0.026	0.176	6.220	0.000
6.8444	0.026	0.178	6.527	0.000
6.9222	0.026	0.180	6.821	0.000
7.0000	0.026	0.182	7.102	0.000
7.0778	0.026	0.184	7.372	0.000
7.1556	0.000	0.000	7.633	0.000

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.43
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.11
Total Impervious Area: 0.32

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.00915
5 year	0.014312
10 year	0.017127
25 year	0.019998
50 year	0.021707
100 year	0.023113

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.004028
5 year	0.008412
10 year	0.013515
25 year	0.024064
50 year	0.036375
100 year	0.054234

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1902	0.007	0.004
1903	0.006	0.003
1904	0.011	0.003
1905	0.004	0.004
1906	0.002	0.003
1907	0.014	0.004
1908	0.010	0.003
1909	0.010	0.004
1910	0.014	0.004
1911	0.009	0.004

1912	0.035	0.004
1913	0.014	0.004
1914	0.004	0.003
1915	0.006	0.004
1916	0.009	0.003
1917	0.003	0.003
1918	0.010	0.005
1919	0.007	0.003
1920	0.009	0.004
1921	0.010	0.004
1922	0.010	0.004
1923	0.008	0.004
1924	0.004	0.003
1925	0.005	0.003
1926	0.009	0.003
1927	0.006	0.004
1928	0.007	0.004
1929	0.015	0.004
1930	0.009	0.004
1931	0.009	0.004
1932	0.007	0.004
1933	0.006	0.004
1934	0.019	0.076
1935	0.009	0.005
1936	0.008	0.004
1937	0.013	0.003
1938	0.007	0.004
1939	0.000	0.003
1940	0.008	0.004
1941	0.004	0.003
1942	0.012	0.033
1943	0.006	0.004
1944	0.012	0.004
1945	0.010	0.004
1946	0.006	0.003
1947	0.004	0.003
1948	0.019	0.004
1949	0.017	0.004
1950	0.005	0.003
1951	0.006	0.003
1952	0.026	0.004
1953	0.023	0.024
1954	0.008	0.004
1955	0.007	0.003
1956	0.003	0.003
1957	0.012	0.004
1958	0.024	0.079
1959	0.015	0.067
1960	0.004	0.003
1961	0.015	0.024
1962	0.008	0.004
1963	0.004	0.003
1964	0.004	0.003
1965	0.017	0.071
1966	0.005	0.004
1967	0.008	0.003
1968	0.007	0.004
1969	0.007	0.004

1970	0.012	0.004
1971	0.018	0.007
1972	0.012	0.004
1973	0.015	0.004
1974	0.009	0.004
1975	0.019	0.083
1976	0.010	0.004
1977	0.003	0.003
1978	0.017	0.015
1979	0.005	0.003
1980	0.010	0.004
1981	0.009	0.004
1982	0.004	0.003
1983	0.015	0.004
1984	0.006	0.003
1985	0.010	0.003
1986	0.009	0.004
1987	0.018	0.011
1988	0.011	0.004
1989	0.010	0.003
1990	0.011	0.004
1991	0.009	0.004
1992	0.012	0.013
1993	0.012	0.004
1994	0.018	0.004
1995	0.003	0.004
1996	0.020	0.016
1997	0.008	0.003
1998	0.009	0.004
1999	0.001	0.003
2000	0.007	0.004
2001	0.004	0.003
2002	0.014	0.004
2003	0.011	0.004
2004	0.010	0.004
2005	0.022	0.004
2006	0.006	0.003
2007	0.006	0.004
2008	0.010	0.004
2009	0.007	0.003
2010	0.006	0.004
2011	0.005	0.003
2012	0.007	0.003
2013	0.005	0.003
2014	0.004	0.003
2015	0.007	0.003
2016	0.003	0.003
2017	0.014	0.004
2018	0.026	0.092
2019	0.025	0.066
2020	0.008	0.003
2021	0.013	0.005
2022	0.005	0.003
2023	0.011	0.004
2024	0.025	0.004
2025	0.009	0.004
2026	0.015	0.004
2027	0.005	0.003

2028	0.005	0.003
2029	0.010	0.004
2030	0.019	0.004
2031	0.006	0.003
2032	0.003	0.003
2033	0.006	0.003
2034	0.005	0.003
2035	0.022	0.082
2036	0.011	0.004
2037	0.003	0.003
2038	0.010	0.004
2039	0.001	0.002
2040	0.005	0.003
2041	0.007	0.003
2042	0.021	0.014
2043	0.010	0.004
2044	0.014	0.004
2045	0.009	0.004
2046	0.011	0.067
2047	0.008	0.004
2048	0.010	0.004
2049	0.009	0.004
2050	0.007	0.004
2051	0.010	0.004
2052	0.006	0.004
2053	0.010	0.015
2054	0.013	0.004
2055	0.004	0.003
2056	0.004	0.003
2057	0.007	0.004
2058	0.009	0.004
2059	0.015	0.004

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.0345	0.0919
2	0.0257	0.0829
3	0.0257	0.0818
4	0.0254	0.0791
5	0.0248	0.0755
6	0.0245	0.0707
7	0.0230	0.0675
8	0.0217	0.0667
9	0.0216	0.0664
10	0.0213	0.0328
11	0.0203	0.0244
12	0.0195	0.0237
13	0.0193	0.0158
14	0.0192	0.0148
15	0.0190	0.0147
16	0.0184	0.0141
17	0.0182	0.0130
18	0.0176	0.0109
19	0.0172	0.0066
20	0.0171	0.0054
21	0.0167	0.0054
22	0.0153	0.0045

23	0.0152	0.0045
24	0.0152	0.0045
25	0.0152	0.0045
26	0.0152	0.0044
27	0.0152	0.0044
28	0.0147	0.0044
29	0.0144	0.0043
30	0.0143	0.0043
31	0.0140	0.0043
32	0.0140	0.0043
33	0.0139	0.0043
34	0.0137	0.0042
35	0.0127	0.0042
36	0.0127	0.0042
37	0.0126	0.0042
38	0.0125	0.0042
39	0.0125	0.0042
40	0.0124	0.0042
41	0.0121	0.0042
42	0.0119	0.0042
43	0.0117	0.0042
44	0.0117	0.0041
45	0.0114	0.0041
46	0.0112	0.0041
47	0.0110	0.0041
48	0.0110	0.0041
49	0.0109	0.0040
50	0.0106	0.0040
51	0.0106	0.0040
52	0.0104	0.0040
53	0.0104	0.0040
54	0.0103	0.0039
55	0.0103	0.0039
56	0.0103	0.0039
57	0.0103	0.0039
58	0.0103	0.0039
59	0.0102	0.0038
60	0.0102	0.0038
61	0.0102	0.0038
62	0.0101	0.0038
63	0.0100	0.0038
64	0.0099	0.0038
65	0.0097	0.0038
66	0.0097	0.0038
67	0.0097	0.0038
68	0.0096	0.0038
69	0.0096	0.0038
70	0.0093	0.0037
71	0.0093	0.0037
72	0.0093	0.0037
73	0.0093	0.0037
74	0.0092	0.0037
75	0.0092	0.0037
76	0.0091	0.0037
77	0.0091	0.0037
78	0.0091	0.0037
79	0.0090	0.0037
80	0.0090	0.0037

81	0.0089	0.0036
82	0.0088	0.0036
83	0.0087	0.0036
84	0.0087	0.0036
85	0.0086	0.0036
86	0.0083	0.0036
87	0.0083	0.0036
88	0.0083	0.0036
89	0.0082	0.0036
90	0.0080	0.0036
91	0.0077	0.0036
92	0.0077	0.0036
93	0.0076	0.0036
94	0.0075	0.0036
95	0.0075	0.0035
96	0.0075	0.0035
97	0.0074	0.0035
98	0.0073	0.0035
99	0.0072	0.0035
100	0.0070	0.0035
101	0.0069	0.0035
102	0.0069	0.0035
103	0.0068	0.0035
104	0.0067	0.0035
105	0.0067	0.0034
106	0.0067	0.0034
107	0.0066	0.0034
108	0.0066	0.0034
109	0.0066	0.0034
110	0.0065	0.0034
111	0.0064	0.0034
112	0.0063	0.0034
113	0.0063	0.0034
114	0.0062	0.0034
115	0.0058	0.0034
116	0.0058	0.0034
117	0.0057	0.0034
118	0.0056	0.0033
119	0.0056	0.0033
120	0.0056	0.0033
121	0.0056	0.0033
122	0.0055	0.0033
123	0.0055	0.0033
124	0.0055	0.0033
125	0.0055	0.0032
126	0.0052	0.0032
127	0.0051	0.0032
128	0.0050	0.0032
129	0.0048	0.0031
130	0.0047	0.0031
131	0.0047	0.0031
132	0.0047	0.0031
133	0.0047	0.0031
134	0.0045	0.0031
135	0.0044	0.0031
136	0.0043	0.0031
137	0.0043	0.0030
138	0.0040	0.0030

139	0.0039	0.0030
140	0.0039	0.0030
141	0.0039	0.0030
142	0.0038	0.0029
143	0.0038	0.0029
144	0.0038	0.0029
145	0.0035	0.0029
146	0.0035	0.0029
147	0.0035	0.0028
148	0.0035	0.0028
149	0.0034	0.0027
150	0.0034	0.0027
151	0.0033	0.0027
152	0.0030	0.0027
153	0.0029	0.0027
154	0.0027	0.0027
155	0.0019	0.0027
156	0.0009	0.0026
157	0.0007	0.0026
158	0.0005	0.0024

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0046	53124	5390	10	Pass
0.0047	49079	4382	8	Pass
0.0049	45478	4176	9	Pass
0.0051	42260	3997	9	Pass
0.0053	39246	3802	9	Pass
0.0054	36470	3611	9	Pass
0.0056	33961	3428	10	Pass
0.0058	31601	3269	10	Pass
0.0060	29384	3160	10	Pass
0.0061	27368	3045	11	Pass
0.0063	25595	2931	11	Pass
0.0065	24005	2815	11	Pass
0.0067	22554	2695	11	Pass
0.0068	21191	2593	12	Pass
0.0070	19905	2505	12	Pass
0.0072	18709	2420	12	Pass
0.0073	17623	2340	13	Pass
0.0075	16537	2266	13	Pass
0.0077	15451	2193	14	Pass
0.0079	14532	2133	14	Pass
0.0080	13656	2075	15	Pass
0.0082	12881	2025	15	Pass
0.0084	12088	1963	16	Pass
0.0086	11385	1894	16	Pass
0.0087	10687	1819	17	Pass
0.0089	10061	1770	17	Pass
0.0091	9451	1714	18	Pass
0.0092	8903	1658	18	Pass
0.0094	8371	1601	19	Pass
0.0096	7884	1545	19	Pass
0.0098	7474	1498	20	Pass
0.0099	7041	1447	20	Pass
0.0101	6615	1388	20	Pass
0.0103	6277	1343	21	Pass
0.0105	5978	1300	21	Pass
0.0106	5695	1248	21	Pass
0.0108	5417	1204	22	Pass
0.0110	5181	1158	22	Pass
0.0112	4900	1104	22	Pass
0.0113	4674	1054	22	Pass
0.0115	4483	1002	22	Pass
0.0117	4302	955	22	Pass
0.0118	4119	912	22	Pass
0.0120	3916	874	22	Pass
0.0122	3723	830	22	Pass
0.0124	3528	787	22	Pass
0.0125	3371	744	22	Pass
0.0127	3218	706	21	Pass
0.0129	3094	659	21	Pass
0.0131	2989	622	20	Pass
0.0132	2882	592	20	Pass
0.0134	2748	555	20	Pass
0.0136	2615	520	19	Pass

0.0137	2503	488	19	Pass
0.0139	2400	451	18	Pass
0.0141	2303	410	17	Pass
0.0143	2198	376	17	Pass
0.0144	2078	339	16	Pass
0.0146	1994	309	15	Pass
0.0148	1897	276	14	Pass
0.0150	1812	241	13	Pass
0.0151	1717	220	12	Pass
0.0153	1639	219	13	Pass
0.0155	1586	215	13	Pass
0.0157	1502	210	13	Pass
0.0158	1430	207	14	Pass
0.0160	1360	207	15	Pass
0.0162	1287	205	15	Pass
0.0163	1229	204	16	Pass
0.0165	1175	201	17	Pass
0.0167	1115	197	17	Pass
0.0169	1066	197	18	Pass
0.0170	1017	195	19	Pass
0.0172	975	193	19	Pass
0.0174	929	191	20	Pass
0.0176	877	188	21	Pass
0.0177	820	188	22	Pass
0.0179	781	185	23	Pass
0.0181	736	185	25	Pass
0.0182	691	182	26	Pass
0.0184	636	182	28	Pass
0.0186	596	179	30	Pass
0.0188	553	178	32	Pass
0.0189	511	175	34	Pass
0.0191	470	174	37	Pass
0.0193	424	173	40	Pass
0.0195	392	169	43	Pass
0.0196	361	167	46	Pass
0.0198	337	166	49	Pass
0.0200	312	165	52	Pass
0.0201	297	163	54	Pass
0.0203	274	160	58	Pass
0.0205	254	156	61	Pass
0.0207	240	154	64	Pass
0.0208	221	153	69	Pass
0.0210	207	150	72	Pass
0.0212	194	150	77	Pass
0.0214	176	149	84	Pass
0.0215	156	147	94	Pass
0.0217	142	147	103	Pass

Water Quality

Water Quality BMP Flow and Volume for POC #1

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.

LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
Vault 1 POC	☐	119.13			☐	0.00			
Total Volume Infiltrated		119.13	0.00	0.00		0.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

Model Default Modifications

Total of 0 changes have been made.

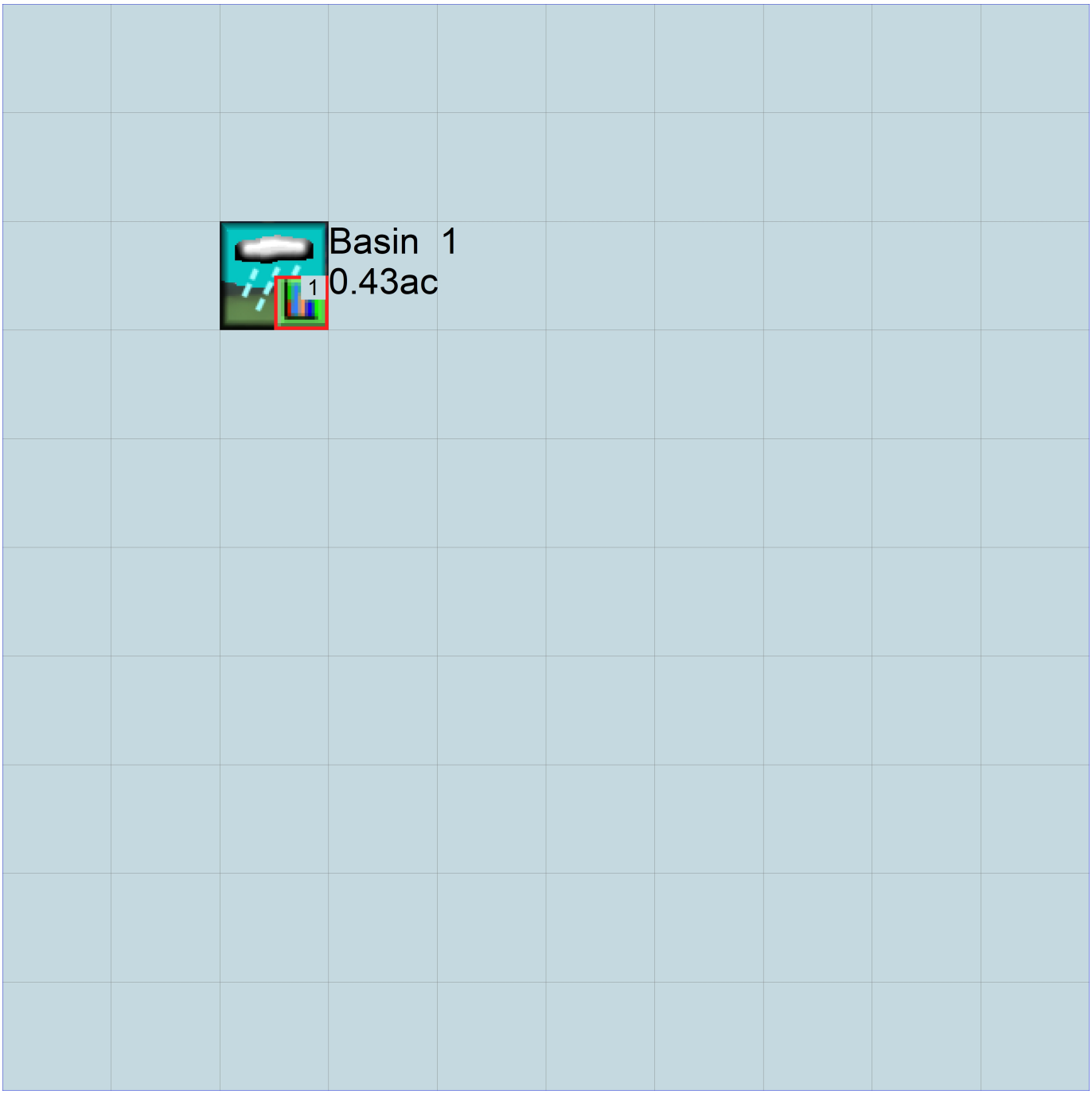
PERLND Changes

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       1901 10 01        END    2059 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   Cascade Shaw Frontage.wdm
MESSU       25   PreCascade Shaw Frontage.MES
            27   PreCascade Shaw Frontage.L61
            28   PreCascade Shaw Frontage.L62
            30   POCCascade Shaw Frontage1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      11
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  1                   MAX                     1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                         User  t-series Engl Metr ***
                                      in  out           ***
   11     C, Forest, Mod          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 ***
   11         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  *********
   11         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 ***
   11         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
   11              0       4.5      0.08       400       0.1       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   11              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   11            0.2       0.5      0.35         6       0.5       0.7
  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
   11              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           ***
  END GEN-INFO
  *** Section IWATER***

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

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

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

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

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

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

```
END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  11                       0.43     COPY   501     12
PERLND  11                       0.43     COPY   501     13

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

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



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

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

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

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

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

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

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

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

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

END EXT SOURCES

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

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

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


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1901 10 01        END    2059 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   Cascade Shaw Frontage.wdm
MESSU       25   MitCascade Shaw Frontage.MES
            27   MitCascade Shaw Frontage.L61
            28   MitCascade Shaw Frontage.L62
            30   POCCascade Shaw Frontage1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND       7
      IMPLND       2
      IMPLND       8
      RCHRES       1
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Vault  1                   MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
    7     A/B, 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 ***
    7         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  *********
    7         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 ***
    7         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
    7             0         5       0.8       400      0.05       0.3     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
    7             0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
    7          0.1       0.5      0.25         0       0.7      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
    7             0         0         0         0         3         1         0
  END PWAT-STATE1

END PERLND

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

  ACTIVITY
    <PLS > ************* Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    2         0    0    1    0    0    0
    8         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    2         0    0    4    0    0    0    1    9
    8         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    2         0    0    0    0    0
    8         0    0    0    0    0
  END IWAT-PARM1

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

```
    2            400      0.05       0.1      0.08
    8            400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    2              0         0
    8              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    2              0         0
    8              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND   7                        0.11     RCHRES   1      2
PERLND   7                        0.11     RCHRES   1      3
IMPLND   2                        0.26     RCHRES   1      5
IMPLND   8                        0.06     RCHRES   1      5

******Routing******
PERLND   7                        0.11     COPY     1     12
IMPLND   2                        0.26     COPY     1     15
IMPLND   8                        0.06     COPY     1     15
PERLND   7                        0.11     COPY     1     13
RCHRES   1                           1     COPY   501     16
END SCHEMATIC

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



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

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

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

  HYDR-PARM1
```

```
    RCHRES  Flags for each HYDR Section                                    ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
           FG FG FG FG  possible  exit  *** possible  exit      possible  exit
            *  *  *  *    *  *  *  *  *      *  *  *  *  *         ***
    1       0  1  0  0    4  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      0.01       0.0       0.0       0.5       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                       ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
         *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1           0         4.0  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      1
   92    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.026015  0.000000  0.000000
  0.077778  0.026015  0.002023  0.000544
  0.155556  0.026015  0.004047  0.000769
  0.233333  0.026015  0.006070  0.000941
  0.311111  0.026015  0.008094  0.001087
  0.388889  0.026015  0.010117  0.001215
  0.466667  0.026015  0.012140  0.001331
  0.544444  0.026015  0.014164  0.001438
  0.622222  0.026015  0.016187  0.001537
  0.700000  0.026015  0.018210  0.001631
  0.777778  0.026015  0.020234  0.001719
  0.855556  0.026015  0.022257  0.001803
  0.933333  0.026015  0.024281  0.001883
  1.011111  0.026015  0.026304  0.001960
  1.088889  0.026015  0.028327  0.002034
  1.166667  0.026015  0.030351  0.002105
  1.244444  0.026015  0.032374  0.002174
  1.322222  0.026015  0.034398  0.002241
  1.400000  0.026015  0.036421  0.002306
  1.477778  0.026015  0.038444  0.002369
  1.555556  0.026015  0.040468  0.002431
  1.633333  0.026015  0.042491  0.002491
  1.711111  0.026015  0.044515  0.002550
  1.788889  0.026015  0.046538  0.002607
  1.866667  0.026015  0.048561  0.002663
  1.944444  0.026015  0.050585  0.002718
  2.022222  0.026015  0.052608  0.002772
  2.100000  0.026015  0.054631  0.002824
  2.177778  0.026015  0.056655  0.002876
  2.255556  0.026015  0.058678  0.002927
  2.333333  0.026015  0.060702  0.002977
  2.411111  0.026015  0.062725  0.003026
  2.488889  0.026015  0.064748  0.003075
  2.566667  0.026015  0.066772  0.003123
  2.644444  0.026015  0.068795  0.003170
  2.722222  0.026015  0.070819  0.003216
  2.800000  0.026015  0.072842  0.003261
  2.877778  0.026015  0.074865  0.003306
  2.955556  0.026015  0.076889  0.003351
  3.033333  0.026015  0.078912  0.003395
  3.111111  0.026015  0.080936  0.003438
  3.188889  0.026015  0.082959  0.003481
```

```
  3.266667  0.026015  0.084982  0.003523
  3.344444  0.026015  0.087006  0.003564
  3.422222  0.026015  0.089029  0.003606
  3.500000  0.026015  0.091052  0.003646
  3.577778  0.026015  0.093076  0.003687
  3.655556  0.026015  0.095099  0.003727
  3.733333  0.026015  0.097123  0.003766
  3.811111  0.026015  0.099146  0.003805
  3.888889  0.026015  0.101169  0.003844
  3.966667  0.026015  0.103193  0.003882
  4.044444  0.026015  0.105216  0.003920
  4.122222  0.026015  0.107240  0.003957
  4.200000  0.026015  0.109263  0.003994
  4.277778  0.026015  0.111286  0.004031
  4.355556  0.026015  0.113310  0.004068
  4.433333  0.026015  0.115333  0.004104
  4.511111  0.026015  0.117356  0.004140
  4.588889  0.026015  0.119380  0.004175
  4.666667  0.026015  0.121403  0.004210
  4.744444  0.026015  0.123427  0.004245
  4.822222  0.026015  0.125450  0.004280
  4.900000  0.026015  0.127473  0.004314
  4.977778  0.026015  0.129497  0.004349
  5.055556  0.026015  0.131520  0.004382
  5.133333  0.026015  0.133544  0.004416
  5.211111  0.026015  0.135567  0.004449
  5.288889  0.026015  0.137590  0.004482
  5.366667  0.026015  0.139614  0.004515
  5.444444  0.026015  0.141637  0.004548
  5.522222  0.026015  0.143661  0.004690
  5.600000  0.026015  0.145684  0.005644
  5.677778  0.026015  0.147707  0.007052
  5.755556  0.026015  0.149731  0.008758
  5.833333  0.026015  0.151754  0.010689
  5.911111  0.026015  0.153777  0.012795
  5.988889  0.026015  0.155801  0.015040
  6.066667  0.026015  0.157824  0.289092
  6.144444  0.026015  0.159848  0.884418
  6.222222  0.026015  0.161871  1.652403
  6.300000  0.026015  0.163894  2.516750
  6.377778  0.026015  0.165918  3.401802
  6.455556  0.026015  0.167941  4.231639
  6.533333  0.026015  0.169965  4.939775
  6.611111  0.026015  0.171988  5.483949
  6.688889  0.026015  0.174011  5.864431
  6.766667  0.026015  0.176035  6.220717
  6.844444  0.026015  0.178058  6.527893
  6.922222  0.026015  0.180082  6.821221
  7.000000  0.026015  0.182105  7.102420
  7.077778  0.026015  0.184128  7.372882
  END FTABLE  1
END FTABLES

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

END EXT SOURCES

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

```
END EXT TARGETS

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

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

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

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

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

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

  MASS-LINK       16
RCHRES     ROFLOW                          COPY           INPUT  MEAN
  END MASS-LINK   16


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Too many errors.

```
ERROR/WARNING ID:   238   1

The continuity error reported below is greater than 1 part in 1000 and is
therefore considered high.

Did you specify any "special actions"?  If so, they could account for it.

Relevant data are:
DATE/TIME: 1923/ 8/31 24: 0

RCHRES :    1

RELERR       STORS        STOR       MATIN      MATDIF
-1.173E-03     0.00000  0.0000E+00     0.00000  -1.221E-07

Where:

RELERR is the relative error (ERROR/REFVAL).
ERROR  is (STOR-STORS) - MATDIF.
REFVAL is the reference value (STORS+MATIN).
STOR   is the storage of material in the processing unit (land-segment or
reach/reservior) at the end of the present interval.
STORS  is the storage of material in the pu at the start of the present
printout reporting period.
MATIN  is the total inflow of material to the pu during the present printout
reporting period.
MATDIF is the net inflow (inflow-outflow) of material to the pu during the
present printout reporting period.
```

```
ERROR/WARNING ID:   238   1

The continuity error reported below is greater than 1 part in 1000 and is
therefore considered high.

Did you specify any "special actions"?  If so, they could account for it.

Relevant data are:
DATE/TIME: 1929/ 8/31 24: 0

RCHRES :    1

RELERR       STORS        STOR       MATIN      MATDIF
-3.386E-01     0.00000  0.0000E+00     0.00000  -2.297E-10

Where:

RELERR is the relative error (ERROR/REFVAL).
ERROR  is (STOR-STORS) - MATDIF.
REFVAL is the reference value (STORS+MATIN).
STOR   is the storage of material in the processing unit (land-segment or
reach/reservior) at the end of the present interval.
STORS  is the storage of material in the pu at the start of the present
printout reporting period.
MATIN  is the total inflow of material to the pu during the present printout
reporting period.
MATDIF is the net inflow (inflow-outflow) of material to the pu during the
present printout reporting period.
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ERROR/WARNING ID:   238   1

The continuity error reported below is greater than 1 part in 1000 and is
therefore considered high.

Did you specify any "special actions"?  If so, they could account for it.

Relevant data are:
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DATE/TIME: 1955/ 9/30 24: 0

RCHRES :   1

RELERR	STORS	STOR	MATIN	MATDIF
-3.124E-01	0.00000	0.0000E+00	0.00000	-2.301E-10

Where:

RELERR is the relative error (ERROR/REFVAL).
ERROR is (STOR-STORS) - MATDIF.
REFVAL is the reference value (STORS+MATIN).
STOR   is the storage of material in the processing unit (land-segment or reach/reservior) at the end of the present interval.
STORS is the storage of material in the pu at the start of the present printout reporting period.
MATIN is the total inflow of material to the pu during the present printout reporting period.
MATDIF is the net inflow (inflow-outflow) of material to the pu during the present printout reporting period.

ERROR/WARNING ID: 238   1

The continuity error reported below is greater than 1 part in 1000 and is therefore considered high.

Did you specify any "special actions"? If so, they could account for it.

Relevant data are:
DATE/TIME: 1960/ 8/31 24: 0

RCHRES :   1

RELERR	STORS	STOR	MATIN	MATDIF
-2.012E-02	0.00000	0.0000E+00	0.00000	-6.904E-09

Where:

RELERR is the relative error (ERROR/REFVAL).
ERROR is (STOR-STORS) - MATDIF.
REFVAL is the reference value (STORS+MATIN).
STOR   is the storage of material in the processing unit (land-segment or reach/reservior) at the end of the present interval.
STORS is the storage of material in the pu at the start of the present printout reporting period.
MATIN is the total inflow of material to the pu during the present printout reporting period.
MATDIF is the net inflow (inflow-outflow) of material to the pu during the present printout reporting period.

ERROR/WARNING ID: 238   1

The continuity error reported below is greater than 1 part in 1000 and is therefore considered high.

Did you specify any "special actions"? If so, they could account for it.

Relevant data are:
DATE/TIME: 1974/ 8/31 24: 0

RCHRES :   1

RELERR	STORS	STOR	MATIN	MATDIF
-8.264E-03	0.00000	0.0000E+00	0.00000	-1.714E-08

Where:

RELERR is the relative error (ERROR/REFVAL).
ERROR is (STOR-STORS) - MATDIF.

REFVAL is the reference value (STORS+MATIN).
STOR is the storage of material in the processing unit (land-segment or reach/reservior) at the end of the present interval.
STORS is the storage of material in the pu at the start of the present printout reporting period.
MATIN is the total inflow of material to the pu during the present printout reporting period.
MATDIF is the net inflow (inflow-outflow) of material to the pu during the present printout reporting period.

The count for the WARNING printed above has reached its maximum.

If the condition is encountered again the message will not be repeated.

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Appendix E – Wetland Analysis

HABITAT TECHNOLOGIES

CRITICAL AREAS ASSESSMENT

WESTERN PORTION OF PARCEL 0420351003
CASCADE SHAW DEVELOPMENT, LLC
City of Puyallup, Pierce County, Washington

This document has been revised to incorporate comments provided by City of Puyallup review

prepared for

Abbey Road Group
Land Development Services Company, LLC
Abbey Road Project Number B-19-1107

prepared by

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June 1, 2020
REVISED
JUNE 6, 2022

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A VETERAN OWNED SMALL BUSINESS COOPERATIVE

Table of Contents

1.0 INTRODUCTION

This document presents the culmination of activities and onsite evaluations undertaken to complete a *Critical Areas Assessment* of specific critical areas (wetlands, surface water drainage corridors, fish and wildlife critical habitats) within and immediately adjacent to the western portion of **Parcel 0420351003 (project site).** The eastern and central portions of Parcel 0420351003 had been developed pursuant to a City of Puyallup approved permit associated with the adjacent Cascade Christian Schools. The project site was located along 25th Street SE, to the south of East Pioneer Way within the eastern portion of the City of Puyallup, Pierce County, Washington (part of Section 35, Township 20 North, Range 04 East, W.M.) (Figure 1). The evaluation and characterization of onsite and adjacent critical areas is a vital element in land use planning. The goal of this approach is to ensure that present and future proposed planned site development does not result in adverse environmental impacts to identified wetland or other critical areas, their associated buffer, or local water quality.

The onsite assessment and characterization of specific critical areas was completed followed the methods and procedures defined in the *Corps of Engineers Wetland Delineation Manual* (1987 Manual) with the 2010 *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region* (2010 Supplement); the *Washington State Wetlands Rating System* (WDOE 2014 version); the State of Washington Department of Natural Resources (WDNR) Forest Practice Rules (WAC 222-16-030); and the City of Puyallup *Critical Areas Ordinance*. The overall intent of this onsite assessment focuses on the identification of potential specific critical areas within and immediately adjacent to the proposed site development. This document incorporates modifications identified within the "third-party review" letter of January 28, 2022, and is designed to accommodate site planning and potential regulatory actions and has been prepared for submittal to City of Puyallup and potentially other resource permitting agencies for critical areas verification and permitting actions.

1.1 PROJECT SITE DESCRIPTION

The project site was generally flat and had been managed for the production of annual agricultural corps for several decades. The project site was located within an area of existing and increasing urban development and bound on the south by an existing single-family homesite and the Cascade Christian School facility, on the east by remainder of Parcel 0420351003 which had been developed pursuant to a City of Puyallup permit, on the north by similarly managed agricultural production, and on the west by 25th Street SE. A ditch within the eastern portion of the right of way for 25th Street SE contained a drainage corridor (Deer Creek) that forms a tributary to the Lower Puyallup River well offsite to the northwest.

Directions to Project Site: From the City of Puyallup continue easterly on East Pioneer Way to 25th Street SE. Turn south onto 25th Street SE and continue to the project site.

2.0 BACKGROUND INFORMATION

2.1 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 surface water drainages within or immediately adjacent to the project site.

2.2 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 or priority species within or immediately adjacent to the project site.

2.3 STATE OF WASHINGTON DEPARTMENT OF FISH AND WILDLIFE

The State of Washington Department of Fish and Wildlife (WDFW) *SalmonScale Mapping* was reviewed as a part of this assessment (Figure 4). This mapping resource identified a drainage corridor (Deer Creek) along the southwestern corner of the project site. Deer Creek adjacent to the project site is noted as providing the documented presence of coho salmon (*Oncorhynchus kisutch*) and as providing gradient accessible habitats for Chinook salmon (*Oncorhynchus tshawytscha*), pink salmon (*Oncorhynchus gorbuscha*), steelhead/rainbow trout (*Oncorhynchus mykiss*), and cutthroat trout (*Oncorhynchus clarkii*).

2.4 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 identified a drainage corridor along the southwestern corner of the project site. This drainage corridor was identified ”unknown.”

2.5 CITY OF PUYALLUP MAPPING

The City of Puyallup *Inventory Mapping* was reviewed as a part of this assessment (Figure 6). This mapping resource identified three "field-verified" wetlands to the east of the project site and a stream along the western boundary of the project site – adjacent to 25th Street SE.

2.6 SOILS MAPPING

The *Soil Mapping Inventory* completed the Natural Resource Conservation Service was reviewed as a part of this assessment (Figure 7). This mapping resource identified the soil throughout the project site as Briscot loam (6A). The Briscot soil series is defined as somewhat poorly drained, as formed in alluvium, and as listed as "hydric."

3.0 ONSITE ANALYSIS

3.1 CRITERIA AREAS IDENTIFICATION

The City of Puyallup defines "Critical Areas" to include those areas established as volcanic hazard areas, wetlands, flood hazard areas, fish and wildlife habitat areas, seismic hazard areas, landslide hazard areas, erosion hazard areas, and aquifer recharge areas. For the purpose of the assessment the critical areas reviewed included potential wetlands, surface water drainage corridors (streams), and fish and wildlife habitats which may be located within or immediately adjacent to the project site. This assessment did not include an assessment of potential seismic hazard areas, landslide hazard areas, volcanic hazard areas, erosion hazard areas, or aquifer recharge areas.

Wetlands: Within the City of Puyallup "wetlands" are defined to mean those areas that are inundated or saturated by surface 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. Wetlands shall be rated according to the Washington State Department of Ecology wetland rating system (Washington State Wetland Rating System for Western Washington (revised), Department of Ecology Document No. 04-06-025) or as further revised by Ecology.

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: A “stream” is generally defined to include areas where surface water has produced a defined channel or bed and includes: bedrock, gravel beds, and sand or silt beds. “Streams” may also include swales which lack a channel of bed if such areas are connected to a fish and wildlife habitat conservation area. A channel need not contain water year-round to be considered a natural water. “Streams” include man-made drainage channels that result from the modification of a natural watercourse or wetland and excludes only artificial channels.

Fish and Wildlife Habitat Areas: The City of Puyallup defines “critical habitat” as those habitat areas with which endangered, threatened, sensitive or monitored plant or wildlife species have a primary association (e.g., feeding, breeding, rearing of young, migrating). Such areas are identified herein with reference to lists, categories, and definitions promulgated by the Washington Department of Fish and Wildlife as identified in WAC 232-12-011 or 232-12-014; in the Priority Habitat and Species (PHS) program of the Department of Fish and Wildlife; or by rules and regulations adopted by the U.S. Fish and Wildlife Service, National Marine Fisheries Service, or other agency with jurisdiction for such designations.

“Fish and Wildlife Habitat Conservation Areas” are areas that serve a critical role in sustaining needed habitats and species for the functional integrity of the ecosystem, and which, if altered, may reduce the likelihood that the species will persist over the long term.

(a) These areas may include, but are not limited to, rare or vulnerable ecological systems, communities, and habitat or habitat elements including seasonal ranges, breeding habitat, winter range, and movement corridors; and areas with high relative population density or species richness. These areas also include locally important habitats and species as determined by the city.

(b) “Habitats of local importance” designated as fish and wildlife habitat conservation areas include those areas found to be locally important by the city.

(c) These areas do not include such artificial features or constructs as irrigation delivery systems, irrigation infrastructure, irrigation canals, or drainage ditches that lie within the boundaries of and are maintained by a port district or an irrigation district, unless these features are documented as being used by salmonids for habitat.

3.2 STUDY METHODS

Habitat Technologies completed a series of onsite assessments between November 2019 and the end of April 2020. In addition, Habitat Technologies has completed similar assessments for parcels within the area of the project site.

The project site was generally flat and had been managed for several decades for the production of annual agricultural corps. The project site had been manipulated through regular tilling, plowing, planting, harvesting, and ditch maintenance. The project site had also been manipulated by the development of adjacent properties and public roadways/utilities. As such, onsite assessment focused on early spring growing season hydrology patterns throughout the project site to best define those areas meeting the specific wetland criteria. Boundaries between wetland and non-wetland areas were established by examining the transitional gradient between wetland criteria. Onsite activities were completed in accordance with criteria and procedures established in the *Corps of Engineers Wetland Delineation Manual* (1987 Manual) with the 2010 *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region* (2010 Supplement); the *Washington State Wetlands Rating System* (WDOE 2014 version); the State of Washington Department of Natural Resources (WDNR) Forest Practice Rules (WAC 222-16-030); and the City of Puyallup Critical Areas Ordinance.

3.3 FIELD OBSERVATION

The project site was accessed from 25th Street SE – a paved public roadway forming the western boundary. The project site was generally flat and had been managed for the production of annual agricultural corps for several decades. A ditch within the eastern portion of the right of way for 25th Street SE contained a drainage corridor (Deer Creek) that forms a tributary to the Puyallup River. Field data are provided in Appendix A.

3.3.1 Soils

As documented at representative sample plots the soil profile throughout the project site had been modified by prior and ongoing land use actions generally associated with regular plowing, tilling, planting, and crop harvesting. The soil throughout the project site was generally a mixture of sandy loam and sandy silty loam that appeared to drain somewhat poorly to somewhat moderately well following seasonal storm events. The majority of the soil throughout the project site did not exhibit prominent redoximorphic features.

A few test plots (SP8, SP12, SP15) generally within the shallow depressions in the northwesterly and southwesterly portions of the project site exhibited few to faint redoximorphic features and a soil matrix color meeting the hydric soils criteria. These shallow depressions appeared best defined as formed by fall agricultural activities generally associated with tractor compaction within the corner turning areas. A viewed during prior years these shallow depressions were also routinely different in shape and location.

3.3.2 Hydrology

The presence and timing of seasonal surface water and shallow ground water hydrology patterns within and adjacent to the project site had been greatly modified by a mixture of both public and private urbanization actions. These actions included the prior channelization of the Deer Creek Corridor, the placement of fill within adjacent parcels for site developments, the development of regional stormwater control actions and facilities, and onsite field ditching.

The assessment of early spring 2020 growing season hydrology patterns was completed at fifteen (15) representative test plot locations (Appendix B). Field data were collected from the end of February through the fourth week of April. Data collection at each plot location was completed through the hand-excavation of a test

hole to a depth of 24 inches. Each test hole was allowed to stabilize for approximately 30 minutes and then the level of soil saturation and the free water (if present) within each test plot was documented.

Three test plots were identified to exhibit field indicators of wetland hydrology patterns during the early spring of 2020. These test plots (SP8, SP12, SP15) were generally located within the shallow depressions in the northwesterly and southwesterly portions of the project**.** The two areas associated with these test plots were identified to exhibit temporary, very shallow ponding (less than one inch of depth) during the winter rainy period (December 2019 through mid-February 2020) and then to exhibit soil saturation at or near the surface for a period of more than fourteen (14) consecutive days during the early growing season (mid-February through April 2020). However, these three test plots – as with all the other test plots – were identified as "dry" to a depth of twenty four (24) inches following the second week of April.

Deer Creek was located within a created ditch offsite to the west of the western boundary of the project site. This creek was identified to exhibit perennial flow patterns and had been modified by prior ditching, roadway and utility development, property development, and stormwater management/diversion actions.

3.3.3 Vegetation

The plant community throughout the project site had been modified by prior and ongoing land management use actions generally associated with annual agricultural production and harvest. Following fall harvest it appeared that a cover crop of blue grass had been seeded but had proven of limited establishment. While also very limited, additional grass and herbs species within the project site included buttercup (*Ranunculus repens*), aster (*Aster occidentalis*), cats ear (*Hypochaeris lanatus*), mustard (*Brassica campestris*), plantain (*Plantago major*), Queen Annes lace (*Daucus carota*), Canadian thistle (*Cirsium arvensis*), dandelion (*Taraxacum officinale*), Colonial bent grass (*Agrostis tenuis*), velvet grass (*Holcus lanatus*), and toad rush (*Juncus bufonius*).

The plant community along the area immediately to the west of the project site – along Deer Creek – had been regularly managed as a part of ongoing ditch management actions. The plant community along this ditched drainage in included seedling red alder (*Alnus rubra*), starts of Sitka willow (Salix sitchensis), Himalayan blackberry (*Rubus armeniacus*), evergreen blackberry (*Rubus laciniatus*), Scots broom (*Cytisus scoparius*), rose (Rosa spp.), knotweed (*Polygonum cuspidatum*), morning glory (*Impomaea purpurea*), bracken fern (*Pteridium aquilium*), and reed canarygrass (Pha*laris arundinacea*).

The plant community along the southern boundary of the project site was generally dominated by reed canarygrass and blackberries.

3.3.4 Fish and Wildlife Observations

Wildlife species observed directly and indirectly within the project site during the early spring 2020 assessment; along with those species observed during prior assessments and those species that would reasonably be expected to use the habitats provided within and immediately adjacent to the project site included red tailed hawk (*Buteo jamaicensis*), American crow (*Corvus brachynchos*), American robin (*Turdus migratorius*), dark eyed junco (*Junco hyemalis*), common mallard, Canada goose (*Branta canadensis*), black capped chickadee (*Parus atricapillus*), purple finch (*Carpodacus purpureus*), song sparrow (*Melospiza melodia*), killdeer (*Charadrius vociferus*),eastern cottontail (*Sylvilagus floridanus*), striped skunk (*Mephitis mephitis*), opossum (*Didelphis virginianus*), deer mouse (*Peromyscus maniculatus*), shrew (*Sorex* spp.), mole (*Scapanus spp.*), bats (*Myotis* spp.), Norway rat (*Rattus norvegicus*), and common garter snake (*Thamnophis sirtalis*).

During prior assessments Deer Creek had been documented to provide habitats for coho salmon, steelhead/rainbow trout, cutthroat trout, three-spinned stickleback, and sculpin.

Wildlife Movement Corridors: The project site was within an area of adjacent high intensity land uses. As identified by a few onsite wildlife trails, small and medium sized mammals appeared to be moving along the western and southern boundaries of the project site. The project site was also within the general area of the migratory movement of waterfowl, raptors, and passerine birds.

3.3.4.a State Priority Species

A few species identified by the State of Washington as “Priority Species” were observed onsite or potentially may utilize the habitats provided within or immediately adjacent to 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 mourning dove, common mallard, Canada goose, coho salmon, steelhead/rainbow trout, and cutthroat trout.

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 to use the habitats provided within the project site as a part of this assessment.

State Sensitive: State Sensitive species are native to Washington and is vulnerable to declining and is 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 to use the habitats provided within the project site as a part of this assessment.

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.

3.3.4.b Federally Listed Species

No federally listed endangered or sensitive species were observed or have been documented to utilize the habitats provided within the project site. Two, federally listed "species of concern" – bald eagle and coho salmon – has been documented to utilize the habitats generally associated with aquatic areas (to include Deer Creek) within the lower Puyallup River Valley.

Puget Sound Steelhead trout – a federally listed threatened species has been documented within Deer Creek offsite to the west of the project site.

4.0 CRITICAL AREAS DETERMINATION

4.1 ONSITE CRITICAL AREAS

Current code, PMC 21.06.910(4), indicates that Category IV wetlands are regulated, but the project is vested to prior code. However, stormwater regulations do regulate Category IV wetlands. See Ecology Manual MR8 requirements. [Storm Report; Pg 175 of 272]

As documented within this assessment the project site was identified contain two shallow depressional wetlands. In addition, Deer Creek was identified directly to the west of the project site and was associated with 25th Street SE (Figure 8). Of Special Note the three wetlands identified onsite within the City of Puyallup *Inventory Mapping* were not present onsite. The areas of these wetlands had been developed pursuant to a City of Puyallup approved permit associated with the adjacent Cascade Christian Schools.

WETLAND	CLASSIFICATION (USFWS)	SURVEYED SIZE	CITY OF PUYALLUP CATEGORY	WDOE RATING SCORE	WDOE HABITAT SCORE	STANDARD CITY BUFFER WIDTH
A	**PEMAdf**	**4,684sqft**	**IV**	**15**	**IV**	**Non-regulated**
B	**PEMAdf**	**9,603sqft**	**IV**	**15**	**IV**	**Non-regulated**

Wetland A: Wetland A was identified as a shallow depression within the southwestern corner of the project site. This wetland was actively managed for the production of annual agricultural crops and appeared generally formed in an area where fall harvest and plowing actions concentrated in a turn. This shallow depression was identified to exhibit temporary pond less than a few inches in depth following heavy rainfall events. The wetland was identified to remain saturated at or near the surface into early April 2020. This wetland receives seasonal stormwater runoff from onsite and from the developed areas to the east and southeast. Fall management actions had created a shallow ditch that allowed surface water from this wetland to continue to the west and enter Deer Creek.

Wetland A was noted as generally void of vegetation, regularly managed for annual agricultural production, and to meet the USFWS criteria for classification of palustrine, emergent, temporarily flooded, farmed, ditched (PEMAdf). Wetland A was also identified to meet the criteria for designation as a City of Puyallup Category IV Wetland. Wetland A achieved a total functions score of 15 points (4 habitat points) utilizing the WDOE Wetland Rating Form for Western Washington 2014 Version (Appendix C).

Wetland B: Wetland B was identified as a shallow depression within the northwestern corner of the project site. This wetland was actively managed for the production of annual agricultural crops and appeared generally formed in an area where fall harvest and plowing actions concentrated in a turn. This shallow depression was identified to

exhibit temporary pond less than a few inches in depth following heavy rainfall events. The wetland was identified to remain saturated at or near the surface into early April 2020. This wetland receives seasonal stormwater runoff from onsite and from the developed areas to the east and southeast. Fall management actions had created a shallow ditch that allowed surface water from this wetland to continue to the west and enter Deer Creek.

Wetland B was noted as generally void of vegetation, regularly managed for annual agricultural production, and to meet the USFWS criteria for classification of palustrine, emergent, temporarily flooded, farmed, ditched (PEMAdf). Wetland B was also identified to meet the criteria for designation as a City of Puyallup Category IV Wetland. Wetland B achieved a total functions score of 15 points (4 habitat points) utilizing the WDOE Wetland Rating Form for Western Washington 2014 Version (Appendix C).

Deer Creek: Deer Creek was identified immediately within an excavated roadside ditch between the western boundary of the project site and 25th Street SE. The vegetation along this creek was regularly managed through mowing and appeared also somewhat excavated to retain capacity. Deer Creek has been documented to provide existing or accessible habitats for a variety of salmonid fish species.

Deer Creek would appear best defined as a City of Puyallup Type II Stream (fish bearing). The standard buffer for a City of Puyallup Type II Stream is 100 feet in width as measured perpendicular from the ordinary high water mark.

4.2 ONSITE CRITICAL AREAS VERIFICATION

The identified onsite wetlands documented within the *CRITICAL AREAS ASSESSMENT, WESTERN PORTION OF PARCEL 0420351003* dated June 1, 2020, were verified by the City of Puyallup following an onsite “third-party review” on January 7, 2022.

4.3 OFFSITE CRITICAL AREAS

As documented within this assessment and additional onsite assessments during the spring of 2022 two (2) “potential” wetlands were identified offsite to the north and one (1) “potential wetland was identified offsite to the south of the project site. The wording of “potential” is used since no specific onsite data were collected for these areas as a result of denied access (Figure 8). In addition, Deer Creek was identified to extend to the north and south along 25th Street SE.

POTENTIAL OFFSITE WETLANDS	CLASSIFICATION (USFWS)	APPROXIMATE SIZE	CITY OF PUYALLUP CATEGORY	WDOE RATING SCORE	WDOE HABITAT SCORE	STANDARD CITY BUFFER WIDTH
OFFSITE X	**PEMAdf**	**4,000sqft**	**IV**	**15**	**IV**	**Non-regulated**
OFFSITE Y	**PEMAdf**	**10,000sqft**	**IV**	**15**	**IV**	**Potentially Non-regulated**
OFFSITE Z	**PEME**	**500sqft**	**III**	**16**	**III**	**Non-regulated**

Potential Offsite Wetland X: This potential wetland was identified as a shallow depression within the southwestern corner of the parcel located directly to the north of the project site – north of onsite Wetland B. As with onsite Wetlands A and B, this wetland was actively managed for the production of annual agricultural crops and appeared generally formed in an area where fall harvest and plowing actions concentrated in a turn. This shallow depression was identified to exhibit temporary ponding less than a few inches in depth following heavy rainfall events. The wetland was observed to remain saturated at or near the surface into early April 2020 and into early May 2022. This wetland receives seasonal stormwater runoff from the local agricultural area.

In the spring of 2020 and 2022 this offsite wetland was noted as generally void of vegetation, regularly managed for annual agricultural production, and to meet the USFWS criteria for classification of palustrine, emergent, temporarily flooded, farmed, ditched (PEMAdf). Offsite Wetland X was identified as very similar to Wetland B and as meeting the criteria for designation as a City of Puyallup Category IV Wetland. As with Wetland B, offsite Wetland X would achieve a total functions score of 15 points (4 habitat points) utilizing the WDOE Wetland Rating Form for Western Washington 2014 Version.

Wetland B and Offsite Wetland X are separated by an existing internal roadway and do not exhibit a hydrologic, soils, or plant community connection. Both wetlands independently drain via a small ditch into Deer Creek to the west.

Potential Offsite Wetland Y: This potential wetland was identified as a shallow depression within the central/northern portion of the parcel located directly to the north of the project site. As with onsite Wetlands A and B and Offsite Wetland X, this wetland was actively managed for the production of annual agricultural crops and appeared generally formed in an area where fall harvest and plowing actions concentrated in a turn. This shallow depression was identified to exhibit temporary pond less than a few inches in depth following heavy rainfall events. The wetland was observed to remain saturated at or near the surface into early April 2020 and early April 2022. This wetland receives seasonal stormwater runoff from the local agricultural area.

In the spring of 2020 and 2022 this offsite wetland was noted as generally void of vegetation, regularly managed for annual agricultural production, and to meet the USFWS criteria for classification of palustrine, emergent, temporarily flooded, farmed, ditched (PEMAdf). Offsite Wetland Y was identified as very similar to Wetland B and as meeting the criteria for designation as a City of Puyallup Category IV Wetland. As with Wetland B, Offsite Wetland Y achieved a total functions score of 15 points (4 habitat points) utilizing the WDOE Wetland Rating Form for Western Washington 2014 Version. This wetland appeared to be approximately 10,000 square feet in total size and potentially non-regulated by the City of Puyallup.

Potential Offsite Wetland Z: This potential wetland was identified as a shallow swale within the managed lawn area associated with the existing single-family homesite directly to the south of the project site. This shallow swale was dominated by seeded lawn grasses and appeared to remain saturated to the surface into the first part of the growing season. In the spring of 2020 and 2022 this offsite wetland was noted to meet the USFWS criteria for classification of palustrine, emergent, seasonally saturated (PEME). Offsite Wetland Z was identified as separated from the project site by an existing single-family homesite and as meeting the criteria for designation as a City of Puyallup Category III Wetland. Offsite Wetland Z achieved a total functions score of 16 points (4 habitat points) utilizing the WDOE Wetland Rating Form for Western Washington 2014 Version.

Verify-4.4? [Storm Report; Pg 178 of 272]

Current code regulates Category IV wetlands. Add commentary that the project is vested to prior regulations. In addition, it should be clarified that Category IV wetlands are regulated per the City's stormwater regulations. [Storm Report; Pg 178 of 272]

4.3 CITY OF PUYALLUP REGULATORY CONSIDERATIONS

Wetlands: The City of Puyallup has identified that all wetlands shall be regulated and subject to the provisions of Chapter 21.06 regardless of size, **except** for Category III wetlands less than 2,500 square feet if the wetland is not associated with a riparian corridor or part of a wetland mosaic **and Category IV wetlands less than 10,000 square feet.** Since both onsite Wetland A, onsite Wetland B, and immediately offsite Wetland Z are defined as Category IV Wetland less than 10,000 square feet in total size it appears that these wetlands would not be regulated by the City of Puyallup (21.06.910(4)).

Streams: Deer Creek was identified along the western boundary of the project site within the managed right of way of 25th Street SE. Deer Creek is defined by the City of Puyallup as a Type II Stream with an associated buffer of 100 feet in width as measured perpendicular from the ordinary high water mark. Stream buffers shall be established landward of the ordinary high water mark adjacent to streams to protect the integrity, functions, and values of the resource. Buffers shall consist of an undisturbed area of native vegetation and shall reflect the sensitivity of the stream and the type and intensity of the adjacent human use or activity (21.06.1050).

5.0 SELECTED DEVELOPMENT ACTION

The *Selected Development Action* for this project site has focused on the future creation of a high-intensity residential community consistent with the City of Puyallup Comprehensive Plan and local zoning, along with the City of Puyallup stormwater, traffic, and critical areas regulations. Primary access into this residential community would be provided by a direct connection to Shaw Road at the northeastern corner of the project site. As a part of this residential community a critical areas tract would be created and enhanced along the western boundary of the project site – adjacent to Deer Creek within the 25th Street East right-of-way (Figure 9).

5.1 PRELIMINARY STORMWATER PROGRAM

As presently outlined, stormwater management facilities would be established as a part of the proposed residential community to ensure protection of local water quality and to ensure meeting the City of Puyallup stormwater regulations. Stormwater collection and treatment features would collect stormwater and direct the stormwater generally into a buried treatment and detention system along the northern boundary of the project site. Overflow from the treatment and detention system would be conveyed via a buried pipeline along an existing roadway to outlet into Deer Creek at the northwestern corner of the project site. The proposed outlet structure and proposed discharge volumes following seasonal storm events would be consistent with applicable standards and ensure protection of local water quality and ensure protection of the structure and integrity of the receiving stream channel.

5.2 CRITICAL AREAS IMPACT ANALYSIS

As presently designed, the overall development of this residential community is designed to meet the growing need for workforce housing within the City of Puyallup and surrounding communities. The need for affordable workforce housing is identified within the City of Puyallup *Comprehensive Plan* and associated City of Puyallup long-term planning documents. In addition, this residential community is located along the Shaw Road Corridor and within an area well served by local and regional transit, along with being located within an area well supported by public and private health services (fire, police, emergency care, local and regional healthcare), public roadways, local shopping, and local religious facilities.

As noted above, the majority of the project site has been previously filled and leveled to allow for future development pursuant to a previously authorized City of Puyallup permit. This previous action has created a suitable development pad and an associated temporary stormwater collection and detention system. The very western portion of the

project site was not included within the prior City development permit and had been retained and utilized for agricultural production through 2021. Onsite assessment and City verification completed between the spring of 2020 and the winter of 2022 identified two City of Puyallup Category IV Non-regulated Wetlands within the very northwestern and southwestern corners of the project site. A City of Puyallup Type II Stream was also located within the public roadway right-of-way along the western boundary of the project site.

As a part of the development of the presently proposed site development action the project team reviewed a variety of alternative site development actions. These actions reviewed potential commercial/retail development scenarios along with a reduced density of residential development. The no-action alternative was also reviewed. However, the presently proposed residential development action was identified as the best alternative to meet the present goals of the *Comprehensive Plan*, a best meeting the need for affordable workforce housing, as meeting the character of the neighborhood and adjacent development actions, and as meeting the objectives of the *Critical Areas Ordinance*.

Per the Ecology Stormwater Manual, Category IV wetlands are regulated. Revise accordingly. [Storm Report; Pg 180 of 272]

5.2.1 Critical Areas Impact Avoidance and Minimization

As verified by the City of Puyallup review, there were no onsite wetlands regulated by the City of Puyallup within or immediately adjacent to the project site. The two Category IV Wetlands identified within the project site, along with a Category IV Wetland located directly to the north of the northwestern corner of the project site, were identified as non-regulated by the City of Puyallup because of their size and habitat score. A City of Puyallup Type II Stream was located directly to the west of the western boundary of the project site. The standard City of Puyallup buffer for this stream is 100 feet in width as measured from the ordinary high water mark.

The proposed site development actions would establish a minimum 100-foot stream corridor restoration area along the western boundary of the project site. This 100-foot restoration area would provide avoid any adverse impact to Wetland A through the retention the entire wetland and minimize adverse impacts to Wetland B through the retention of approximately 90% of Wetland B. The establishment on this 100-foot stream corridor restoration area would also avoid adverse impacts to the Deer Creek Corridor through the establishment and restoration of a viable buffer consistent with the provision of the City of Puyallup *Critical Areas Ordinance*. In addition, overall site development would implement stormwater quality and quantity protections for the short-term (construction related) development phase and the long-term (project) residential phase of this project.

5.2.2 Stream Corridor Restoration Program

As noted above, proposed site development actions would establish a protective stream corridor buffer with a minimum width of 100 feet within the western portion of the project

site. This protective stream corridor buffer area has been managed and manipulated by prior land use actions generally associated with agricultural management and is presently dominated by a variety of grasses and herbs that have recently established. To ensure the long-term protection and viability of this stream corridor buffer area the entire buffer would be planted with a variety of desirable native trees, shrubs, and emergent common to the local area and selected to provide wildlife habitat opportunities, to match soil characteristics and hydrology patterns, and to provide enhance soil stability. The restored stream buffer area would also provide detrital inputs to Deer Creek along with enhanced thermal protections and terrestrial habitats. However, Deer Creek is located within the right-of-way for 25th Street East and the management to the plant community along the stream banks is at the direction of the City of Puyallup which incorporates a somewhat regular mowing program that maintain a grass and generally invasive shrubs shoreline plant community.

The *Stream Corridor Restoration Program* discussed above is presented in concept. Upon the approval of the City of Puyallup to move forward with program development a final project would be prepared that incorporates a detailed planting plan, an implementation schedule and detailed plan, a project monitoring schedule and standards of success, a vegetation management plan, project continencies, and a reporting program consistent with the City of Puyallup *Critical Areas Ordinance*. The overall intent is to establish a viable native plant community that does not require routine maintenance and provided restored physical and biological functions for the Deer Creek Corridor.

6.0 STANDARD OF CARE

This document has been completed by Habitat Technologies for use by **Abbey Road Group Land Development Services Company LLC.** Prior to extensive site planning the defined critical habitats should be reviewed and verified by the City of Puyallup personnel and potentially other resource and permitting agencies. 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
Senior Wetland Biologist

Thomas D. Deming, SPWS
Habitat Technologies

7.0 FIGURES

Figure 1 Site Vicinity

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P.O.Box 1088
Puyallup, WA 98371
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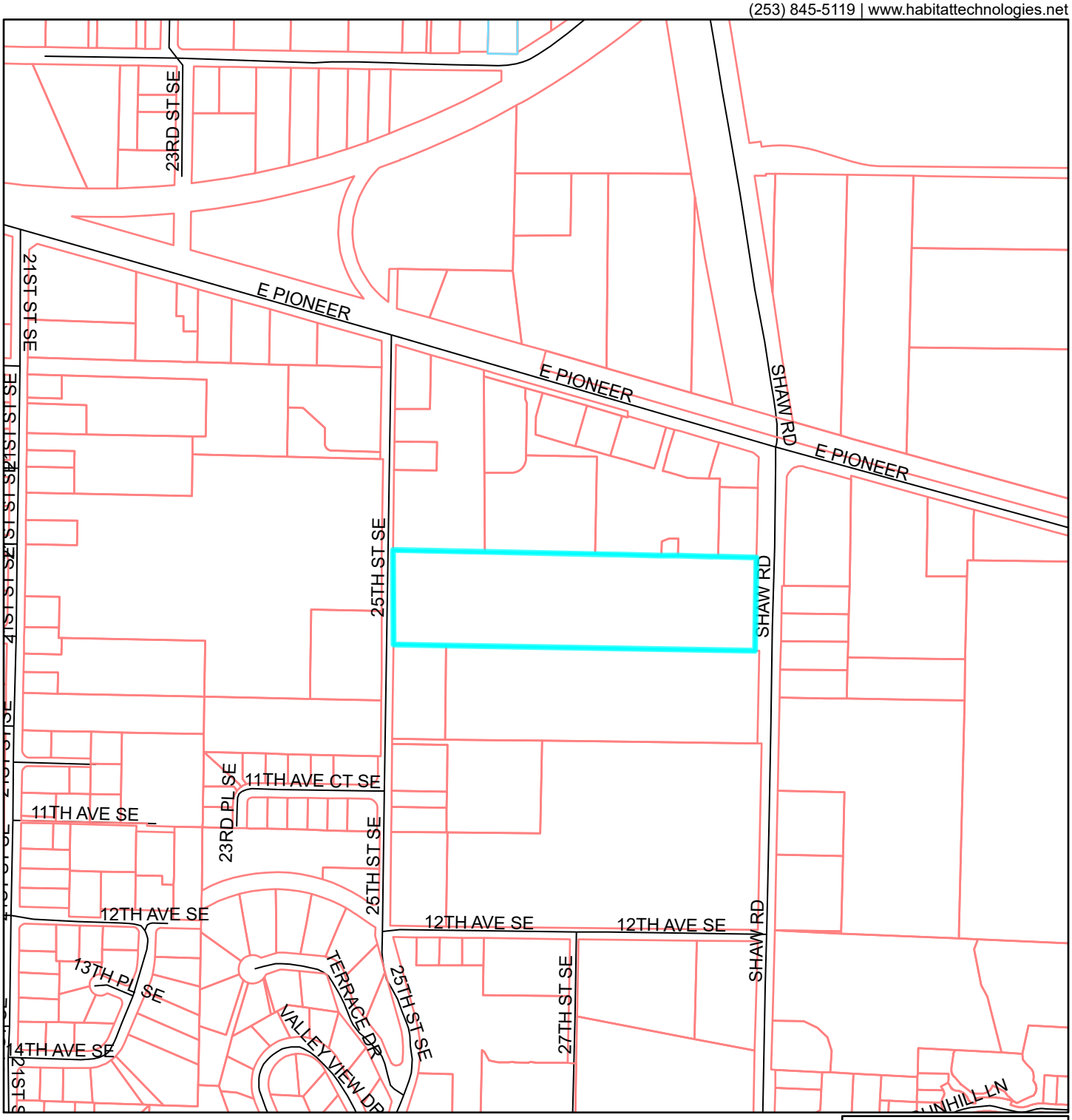

Legend

Tax Parcels
- Base Parcel
- Condominium
- Other
- Roads

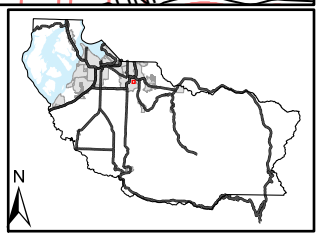

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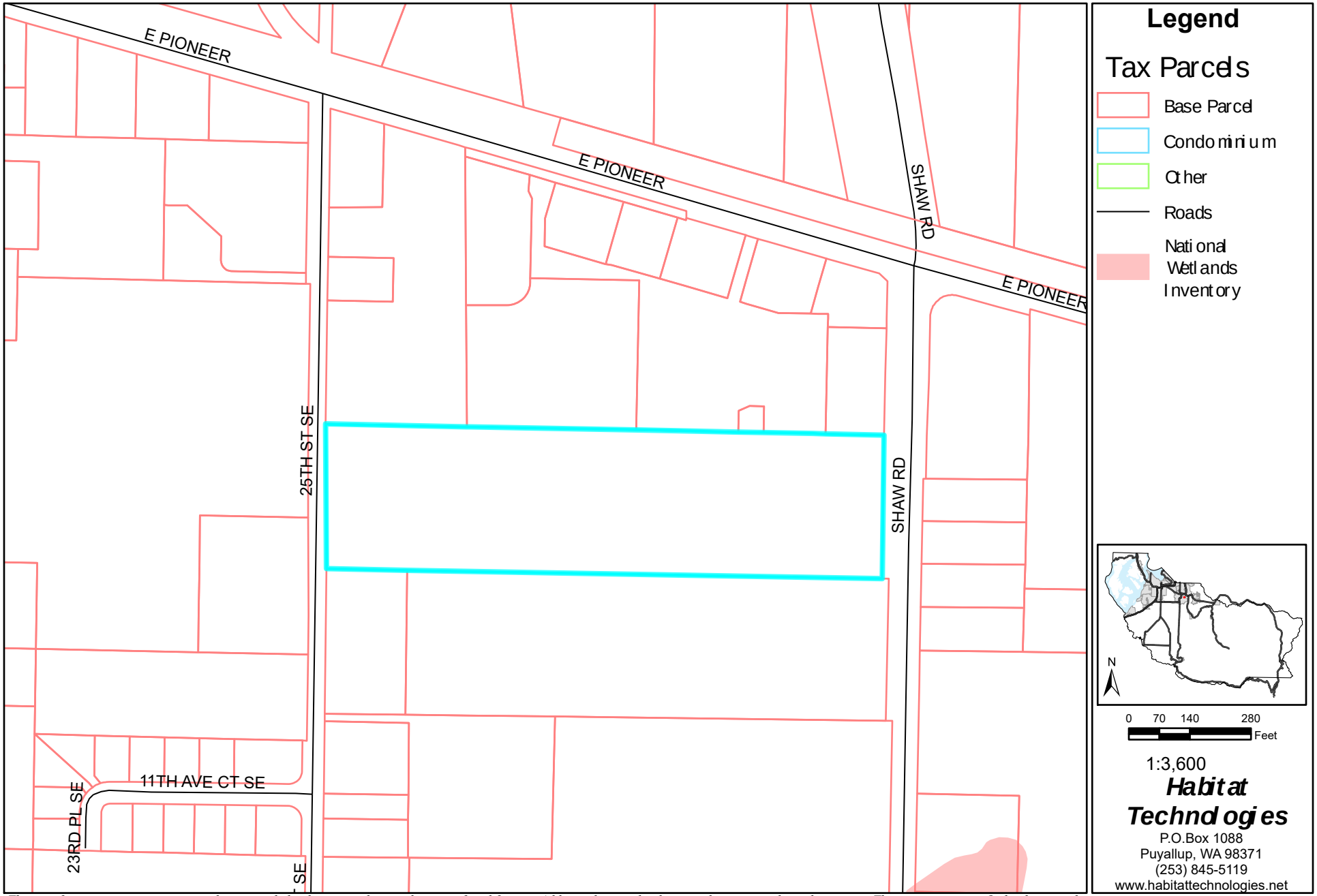
Figure 2 NWI Mapping



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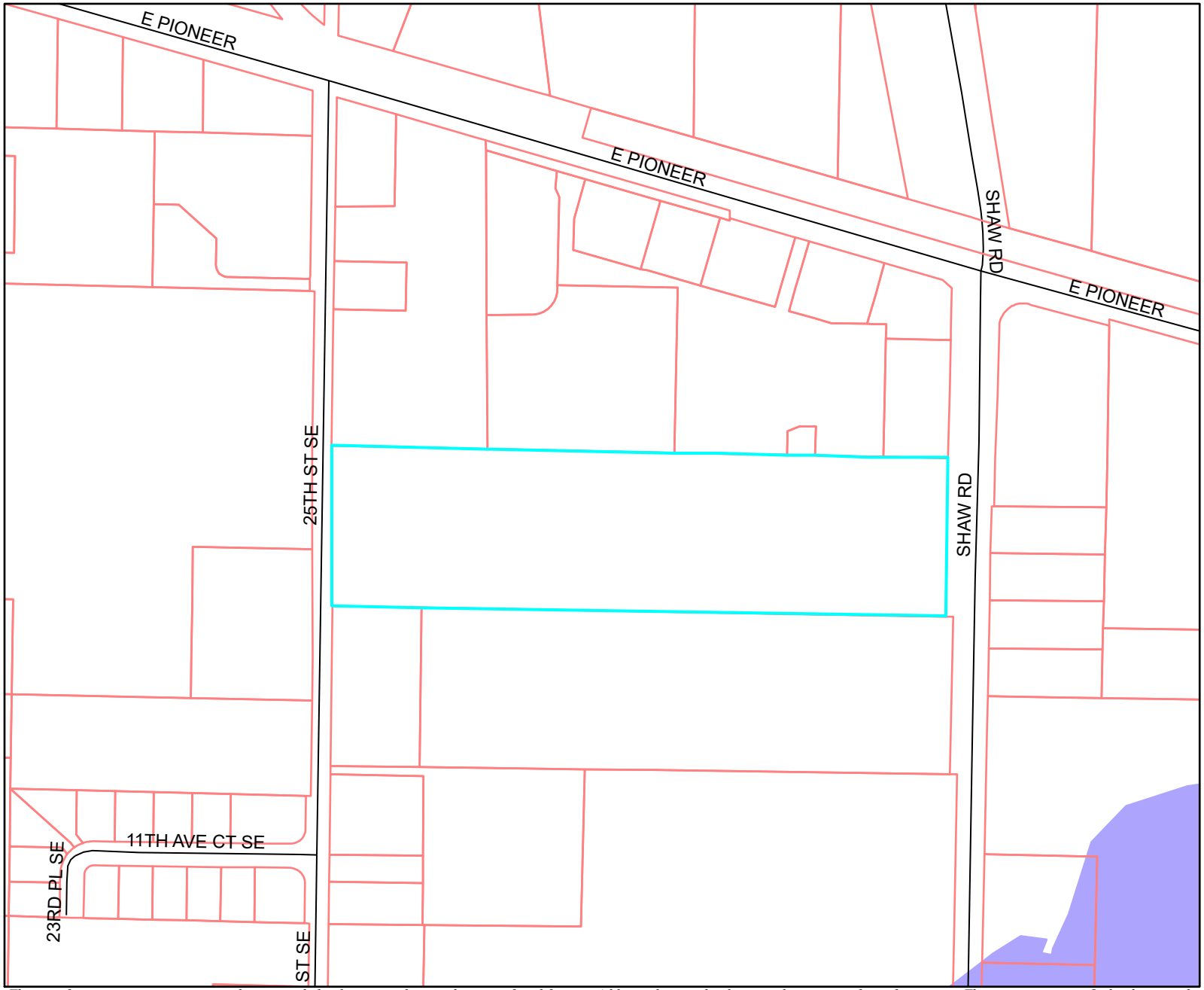
Date: 5/13/2020 03:23 PM

Figure 3 PHS Mapping



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Tax Parcels

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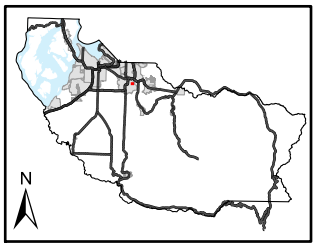
- Condominium
- Other
- Roads
- Priority Habitat and Species



0 70 140 280

Feet

1:3,600

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Date: 5/13/2020 04:22 PM

Figure 4 WDFW Salmonscape Mapping

May 13, 2020

1:9,028

All SalmonScape Species

0 0.05 0.1 0.2 mi

0 0.07 0.15 0.3 km

USGS/NHD, Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community, Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Figure 5 Forest Practices Water Type Map

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

S36 T20.0N R04.0E, S40 T20.0N R04.0E
S51 T20.0N R04.0E, S45 T20.0N R04.0E
S44 T20.0N R04.0E, S43 T20.0N R04.0E
S25 T20.0N R04.0E, S35 T20.0N R04.0E
S26 T20.0N R04.0E, S34 T20.0N R04.0E
S27 T20.0N R04.0E

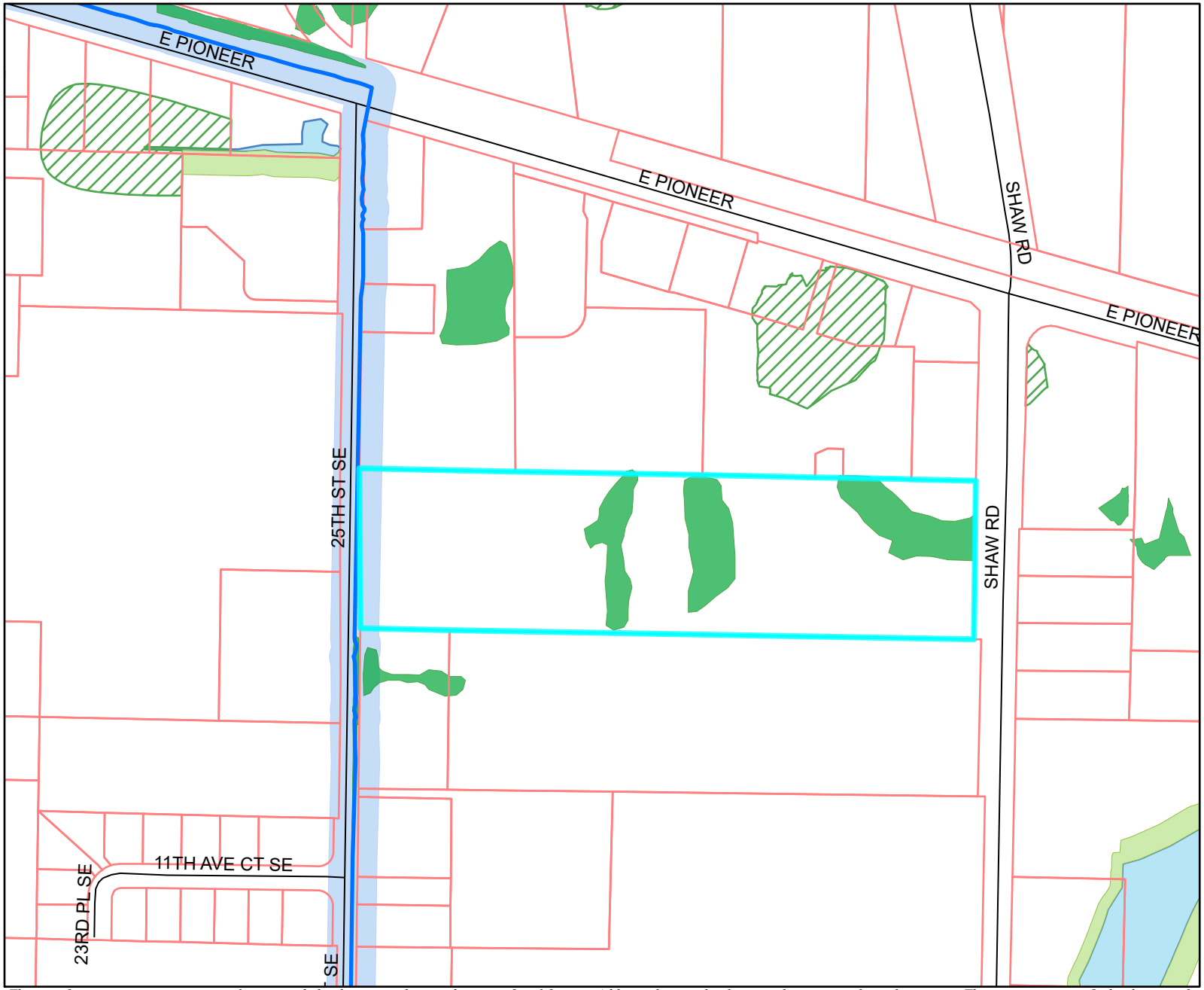
WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES

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.

0 0.25 Miles

Date: 5/13/2020 Time: 3:32:29 PM

Figure 6 City of Puyallup Mapping



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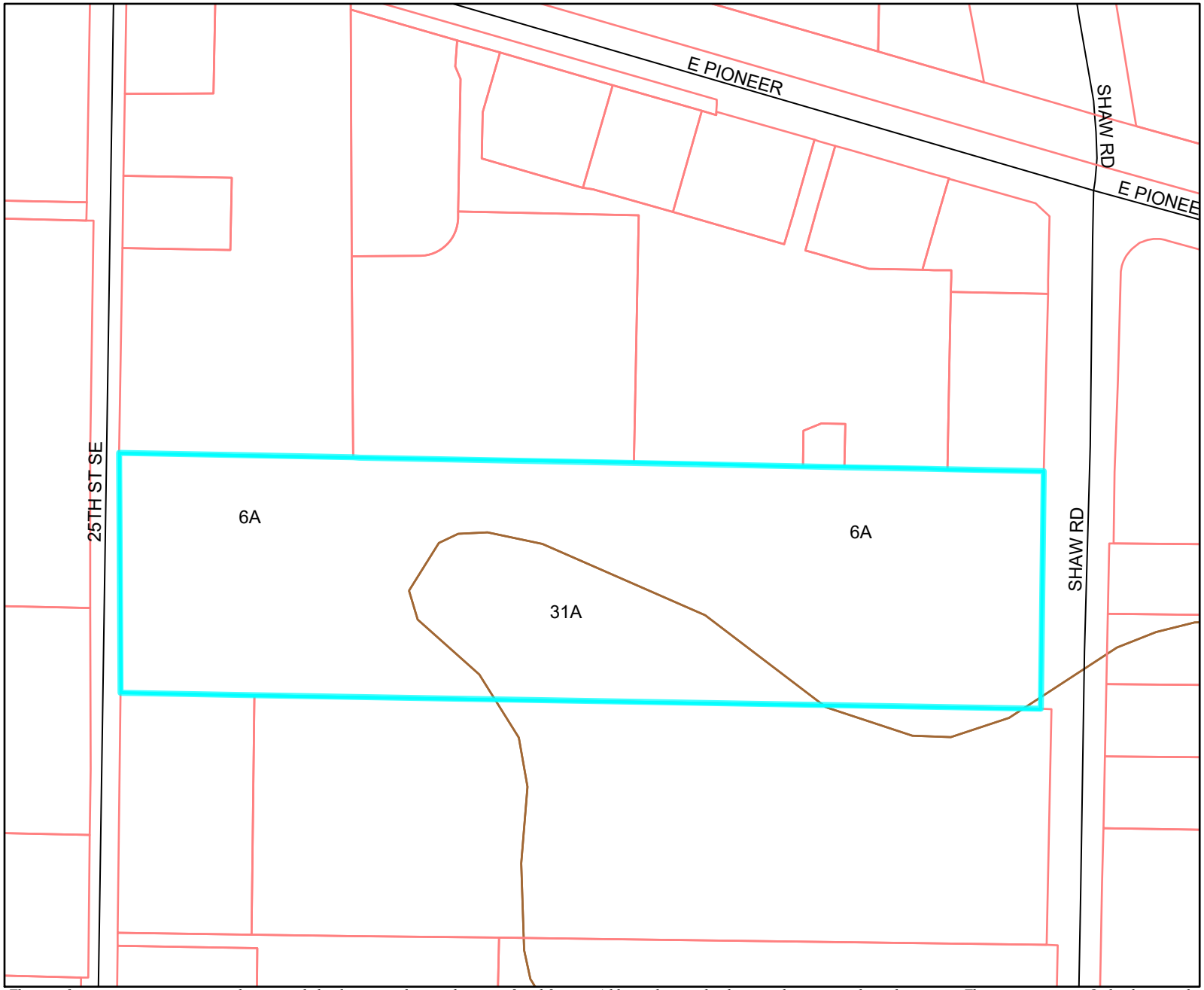
Date: 5/13/2020 03:28 PM

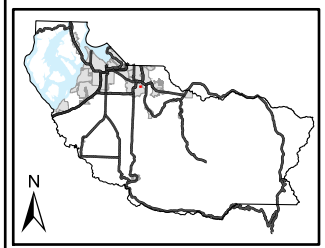
Figure 7 Soils Mapping



Legend

Tax Parcels

- Base Parcel
- Condominium
- Other
- Roads
- Soils



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Date: 5/13/2020 03:21 PM

Figure 8 Site Graphic

Legend

- Streams - Puyallup
- Wetland B
- Wetland A
- Roads

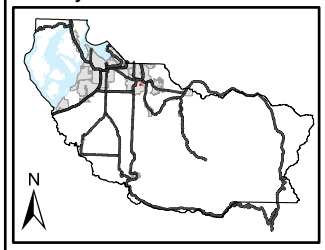
Tax Parcels

- Base Parcel
- Condominium
- Other

Wetlands - Puyallup

- Field-verified Delineated
- Field-verified
- Unverified
- Unverified
- Unverified
- Buffer
- Mitigation Site

County - 2020 Ortho



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Date: 6/15/2022 09:31 AM

CASCADE SHAW DEVELOPMENT

SECTION 35, TOWNSHIP 20 N, RANGE 4 E, W.M.
PIERCE COUNTY, WASHINGTON

MASTER STORM DRAINAGE PLAN

PRIVATE IMPROVEMENTS

DEVELOPMENT ENGINEER _____ DATE _____

PIERCE COUNTY ORDINANCE NUMBER(S) _____

THESE ACTIONS MUST BE COMPLETED PRIOR TO BEGINNING CONSTRUCTION:

1. CONTACT THE APPLICANT'S RETAINED ENGINEER TO COORDINATE REQUIRED INSPECTIONS.

2. APPOINT A TRAINED ESC LEAD WHO SHALL BE PROVIDED A COPY OF THE ESC PLAN & INSPECTION SCHEDULE.

3. CONTACT , LARRY FREMONT, THE AREA INSPECTOR, AT 253-798-7187, TO COORDINATE THE PRECONSTRUCTION MEETING AND COUNTY INSPECTIONS.

FAILURE TO OBTAIN REQUIRED INSPECTIONS MAY ENDANGER OR DELAY PROJECT APPROVAL.

ALL WORK IN THE PUBLIC RIGHT OF WAY REQUIRES A PERMIT FROM THE PIERCE COUNTY PUBLIC WORKS DEPARTMENT.

PERMIT

0 25 50 100

(IN FEET)
1 inch = 50 ft.

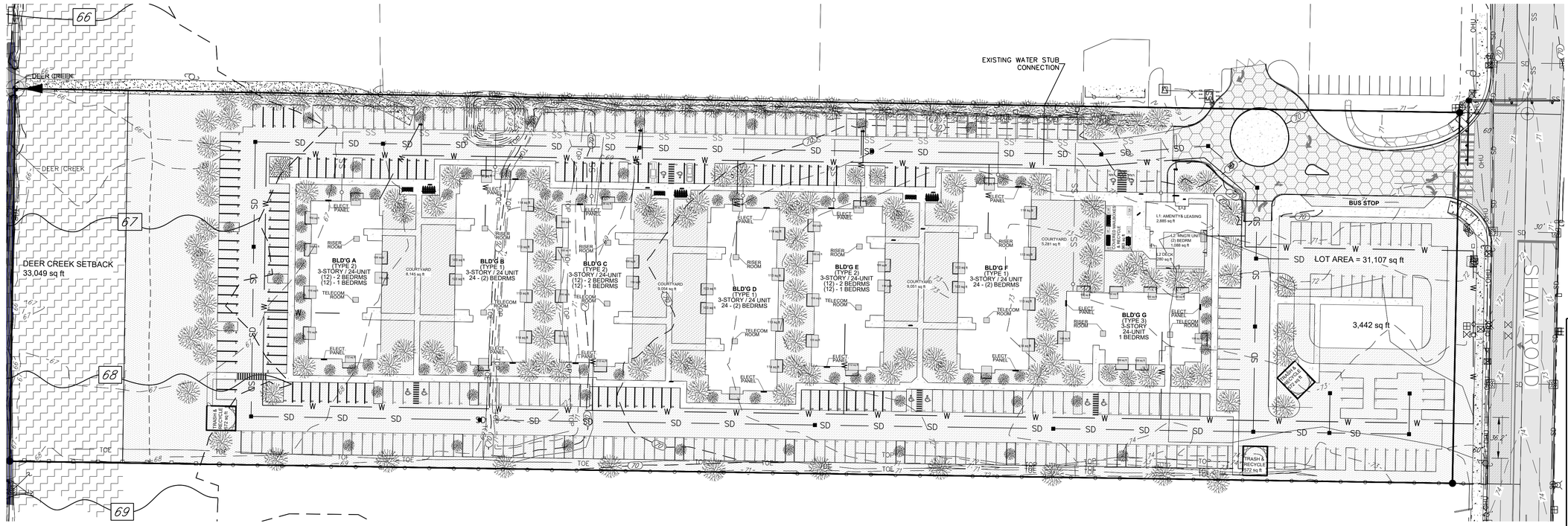

Figure 9

THE CONTRACTOR SHALL VERIFY THE LOCATION OF ALL EXISTING UTILITIES PRIOR TO ANY CONSTRUCTION. AGENCIES INVOLVED SHALL BE NOTIFIED WITHIN A REASONABLE TIME PRIOR TO THE START OF CONSTRUCTION.

CALL BEFORE YOU DIG (811)
WWW.WASHINGTON811.COM

TITLE: CASCADE SHAW DEVELOPMENT — MASTER STORM DRAINAGE PLAN — PUYALLUP, WA

FOR: CASCADE SHAW DEVELOPMENT LLC
P.O. BOX 280
PUYALLUP, WASHINGTON 98371

JEFFREY M. BROWN — STATE OF WASHINGTON — 22792 — REGISTERED PROFESSIONAL ENGINEER
11/08/2021

REVISIONS:

BY:	CHK:	APR:	DATE:	PER:
JMB	PRB	GH	01/25/20	COMMENTS
JMB	PRB	GH	05/18/20	UPDATED PER ARCHITECTURAL PLAN

Abbey Road GROUP

Abbey Road Group
Land Development
Services Company, LLC
2102 EAST MAIN AVE, SUITE 109
PUYALLUP, WA 98372
P.O. Box 1224, Puyallup, WA 98371
(253) 435-3699, Fax (253) 446-3159

JOB #: 03-143-6
DESIGNED BY: JMB
DEVELOPMENT REVIEW: PRB
APPROVED BY: GH
DRAFTED BY: HPJ
DATE: 11/08/2021
SHEET:

File: I:\PROJECTS FILES (Active)\03-143-6, Cascade Christian Shaw Road Property Future Development Planning\DESIGNS\Engineering\03-143-6 Storm Plan.dwg
Plotted: 11/9/2021 8:36 AM — Plotted By: Harrison Jastrzembski

8.0 REFERENCE AND BACKGROUND MATERIALS

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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

9.0 Appendix A – Field Data

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

Project/Site: Western Portion of Parcel 0420351003 City/County: City of Puyallup, Pierce County Sampling Date: 16 APR 2020

Applicant/Owner: Cascade Development State: WA Sampling Point: SP1

Investigator(s): Habitat Technologies Section, Township, Range: Sec 35 T20N R04E QT 12

Landform (hillslope, terrace, etc.): valley Local relief (concave, convex, none): flat Slope (%): <1%

Subregion (LRR): A Lat: Long: Datum: USGS

Soil Map Unit Name: Briscot loam NWI classification: somewhat poorly 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 for annual agricultural crop production and harvest.

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.			
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: _____ (A)

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

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (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 for annual agricultural crop production and harvest. plant community prior to spring plowing a mixture of cover crop, herbs, and grasses.

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
0-24	10YR 3/3	100					SL	mixed 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: NO prominent 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. See spring 2020 monitoring data

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

Project/Site: Western Portion of Parcel 0420351003 City/County: City of Puyallup, Pierce County Sampling Date: 16 APR 2020

Applicant/Owner: Cascade Development State: WA Sampling Point: SP2

Investigator(s): Habitat Technologies Section, Township, Range: Sec 35 T20N R04E QT 12

Landform (hillslope, terrace, etc.): valley Local relief (concave, convex, none): flat Slope (%): <1%

Subregion (LRR): A Lat: Long: Datum: USGS

Soil Map Unit Name: Briscot loam NWI classification: somewhat poorly 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 for annual agricultural crop production and harvest.

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.			
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: _____ (A)

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

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (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 for annual agricultural crop production and harvest. plant community prior to spring plowing a mixture of cover crop, herbs, and grasses.

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
0-12	10YR 3/3	100					SL	mixed sandy loam
12-24	10YR 3/3	100					GSL	mixed sandy loam with gravel fill

[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 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. See spring 2020 monitoring data

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

Project/Site: Western Portion of Parcel 0420351003 City/County: City of Puyallup, Pierce County Sampling Date: 16 APR 2020

Applicant/Owner: Cascade Development State: WA Sampling Point: SP3

Investigator(s): Habitat Technologies Section, Township, Range: Sec 35 T20N R04E QT 12

Landform (hillslope, terrace, etc.): valley Local relief (concave, convex, none): flat Slope (%): <1%

Subregion (LRR): A Lat: Long: Datum: USGS

Soil Map Unit Name: Briscot loam NWI classification: somewhat poorly 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 for annual agricultural crop production and harvest.

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.			
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: _____ (A)

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

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (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 for annual agricultural crop production and harvest. plant community prior to spring plowing a mixture of cover crop, herbs, and grasses.

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
0-9	10YR 3/3	100					SL	mixed sandy loam
9-24	10YR 3/3	90					GSL	mixed sandy loam with gravel fill

[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 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. See spring 2020 monitoring data

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

Project/Site: Western Portion of Parcel 0420351003 City/County: City of Puyallup, Pierce County Sampling Date: 16 APR 2020

Applicant/Owner: Cascade Development State: WA Sampling Point: SP4

Investigator(s): Habitat Technologies Section, Township, Range: Sec 35 T20N R04E QT 12

Landform (hillslope, terrace, etc.): valley Local relief (concave, convex, none): flat Slope (%): <1%

Subregion (LRR): A Lat: Long: Datum: USGS

Soil Map Unit Name: Briscot loam NWI classification: somewhat poorly 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 for annual agricultural crop production and harvest.

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.			
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: _____ (A)

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

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (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 for annual agricultural crop production and harvest. plant community prior to spring plowing a mixture of cover crop, herbs, and grasses.

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
0-13	10YR 3/3	100					SL	mixed sandy loam
13-24	10YR 3/3	90	10YR 4/2	10	D	M	SL	mixed 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: NO prominent 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. See spring 2020 monitoring data

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

Project/Site: Western Portion of Parcel 0420351003 City/County: City of Puyallup, Pierce County Sampling Date: 16 APR 2020

Applicant/Owner: Cascade Development State: WA Sampling Point: SP5

Investigator(s): Habitat Technologies Section, Township, Range: Sec 35 T20N R04E QT 12

Landform (hillslope, terrace, etc.): valley Local relief (concave, convex, none): flat Slope (%): <1%

Subregion (LRR): A Lat: Long: Datum: USGS

Soil Map Unit Name: Briscot loam NWI classification: somewhat poorly 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 for annual agricultural crop production and harvest.

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.			
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: _____ (A)

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

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (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 for annual agricultural crop production and harvest. plant community prior to spring plowing a mixture of cover crop, herbs, and grasses.

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
0-24	10YR 3/3	100					SL	mixed 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: NO prominent 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. See spring 2020 monitoring data

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

Project/Site: Western Portion of Parcel 0420351003 City/County: City of Puyallup, Pierce County Sampling Date: 16 APR 2020

Applicant/Owner: Cascade Development State: WA Sampling Point: SP6

Investigator(s): Habitat Technologies Section, Township, Range: Sec 35 T20N R04E QT 12

Landform (hillslope, terrace, etc.): valley Local relief (concave, convex, none): flat Slope (%): <1%

Subregion (LRR): A Lat: Long: Datum: USGS

Soil Map Unit Name: Briscot loam NWI classification: somewhat poorly 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 for annual agricultural crop production and harvest.

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.			
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: _____ (A)

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

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (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 for annual agricultural crop production and harvest. plant community prior to spring plowing a mixture of cover crop, herbs, and grasses.

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
0-16	10YR 3/3	100					SL	mixed sandy loam
16-24	10YR 4/3	95	10YR 4/6	5	D	M	SL	mixed 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 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. See spring 2020 monitoring data

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

Project/Site: Western Portion of Parcel 0420351003 City/County: City of Puyallup, Pierce County Sampling Date: 16 APR 2020

Applicant/Owner: Cascade Development State: WA Sampling Point: SP7

Investigator(s): Habitat Technologies Section, Township, Range: Sec 35 T20N R04E QT 12

Landform (hillslope, terrace, etc.): valley Local relief (concave, convex, none): flat Slope (%): <1%

Subregion (LRR): A Lat: Long: Datum: USGS

Soil Map Unit Name: Briscot loam NWI classification: somewhat poorly 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 for annual agricultural crop production and harvest.

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.			
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: _____ (A)

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

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (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 for annual agricultural crop production and harvest. plant community prior to spring plowing a mixture of cover crop, herbs, and grasses.

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
0-13	10YR 3/3	100					SL	mixed sandy loam
13-24	10YR 4/2	90	10YR 4/6	10	D	M	SL	mixed 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 indicators of hydric soils located outside of shallow depression

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. See spring 2020 monitoring data

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

Project/Site: Western Portion of Parcel 0420351003 City/County: City of Puyallup, Pierce County Sampling Date: 16 APR 2020

Applicant/Owner: Cascade Development State: WA Sampling Point: SP8

Investigator(s): Habitat Technologies Section, Township, Range: Sec 35 T20N R04E QT 12

Landform (hillslope, terrace, etc.): valley Local relief (concave, convex, none): flat Slope (%): <1%

Subregion (LRR): A Lat: Long: Datum: USGS

Soil Map Unit Name: Briscot loam NWI classification: somewhat poorly 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 for annual agricultural crop production and harvest. shallow depression seasonally saturated

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.			
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: _____ (A)

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

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (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 for annual agricultural crop production and harvest. plant community prior to spring plowing a mixture of cover crop, herbs, and grasses.

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
0-6	10YR 3/2	100					SL	mixed sandy loam
6-13	10YR 3/2	90	10YR 4/6	10	D	M	SL	mixed sandy loam
13-24	10YR 4/2	80	10YR 4/6	20	D	M	SL	mixed 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: prominent indicators of hydric soils located outside of shallow depression

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 documented early growing season. Dry on April 16, 2020. See spring 2020 monitoring data

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

Project/Site: Western Portion of Parcel 0420351003 City/County: City of Puyallup, Pierce County Sampling Date: 16 APR 2020

Applicant/Owner: Cascade Development State: WA Sampling Point: SP9

Investigator(s): Habitat Technologies Section, Township, Range: Sec 35 T20N R04E QT 12

Landform (hillslope, terrace, etc.): valley Local relief (concave, convex, none): flat Slope (%): <1%

Subregion (LRR): A Lat: Long: Datum: USGS

Soil Map Unit Name: Briscot loam NWI classification: somewhat poorly 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 for annual agricultural crop production and harvest.

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.			
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: _____ (A)

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

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (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 for annual agricultural crop production and harvest. plant community prior to spring plowing a mixture of cover crop, herbs, and grasses.

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
0-16	10YR 3/3	100					SL	mixed sandy loam
16-24	10YR 3/3	98	10YR 4/6	2	D	M	SL	mixed 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: NO prominent 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 documented early growing season. See spring 2020 monitoring data

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

Project/Site: Western Portion of Parcel 0420351003 City/County: City of Puyallup, Pierce County Sampling Date: 16 APR 2020

Applicant/Owner: Cascade Development State: WA Sampling Point: SP10

Investigator(s): Habitat Technologies Section, Township, Range: Sec 35 T20N R04E QT 12

Landform (hillslope, terrace, etc.): valley Local relief (concave, convex, none): flat Slope (%): <1%

Subregion (LRR): A Lat: Long: Datum: USGS

Soil Map Unit Name: Briscot loam NWI classification: somewhat poorly 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 for annual agricultural crop production and harvest.

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.			
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: _____ (A)

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

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (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 for annual agricultural crop production and harvest. plant community prior to spring plowing a mixture of cover crop, herbs, and grasses.

SOIL

Sampling Point: SP10

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
0-14	10YR 3/3	100					SL	mixed sandy loam
14-24	10YR 3/3	98	10YR 4/6	2	D	M	SL	mixed 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: NO prominent 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 documented early growing season. See spring 2020 monitoring data

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

Project/Site: Western Portion of Parcel 0420351003 City/County: City of Puyallup, Pierce County Sampling Date: 16 APR 2020

Applicant/Owner: Cascade Development State: WA Sampling Point: SP11

Investigator(s): Habitat Technologies Section, Township, Range: Sec 35 T20N R04E QT 12

Landform (hillslope, terrace, etc.): valley Local relief (concave, convex, none): flat Slope (%): <1%

Subregion (LRR): A Lat: Long: Datum: USGS

Soil Map Unit Name: Briscot loam NWI classification: somewhat poorly 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 for annual agricultural crop production and harvest.

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.			
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: _____ (A)

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

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (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 for annual agricultural crop production and harvest. plant community prior to spring plowing a mixture of cover crop, herbs, and grasses.

SOIL

Sampling Point: SP11

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
0-6	10YR 3/3	100					SL	mixed sandy loam
6-18	10YR 3/3	98	10YR 4/6	2	D	M	SL	mixed sandy loam
18-24	10YR 4/3	95	10YR 4/6	5	D	M	SL	mised 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: NO prominent 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 documented early growing season. See spring 2020 monitoring data

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

Project/Site: Western Portion of Parcel 0420351003 City/County: City of Puyallup, Pierce County Sampling Date: 16 APR 2020

Applicant/Owner: Cascade Development State: WA Sampling Point: SP12

Investigator(s): Habitat Technologies Section, Township, Range: Sec 35 T20N R04E QT 12

Landform (hillslope, terrace, etc.): valley Local relief (concave, convex, none): flat Slope (%): <1%

Subregion (LRR): A Lat: Long: Datum: USGS

Soil Map Unit Name: Briscot loam NWI classification: somewhat poorly 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 for annual agricultural crop production and harvest. shallow depression seasonally saturated

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.			
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: _____ (A)

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

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (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 for annual agricultural crop production and harvest. plant community prior to spring plowing a mixture of cover crop, herbs, and grasses.

SOIL

Sampling Point: SP12

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	mixed sandy loam
4-9	10YR 3/2	90	10YR 4/6	10	D	M	SL	mixed sandy loam
9-24	10YR 4/2	80	10YR 4/6	20	D	M	SL	mixed 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: prominent indicators of hydric soils located outside of shallow depression

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 documented early growing season. Dry on April 16, 2020. See spring 2020 monitoring data

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

Project/Site: Western Portion of Parcel 0420351003 City/County: City of Puyallup, Pierce County Sampling Date: 16 APR 2020

Applicant/Owner: Cascade Development State: WA Sampling Point: SP13

Investigator(s): Habitat Technologies Section, Township, Range: Sec 35 T20N R04E QT 12

Landform (hillslope, terrace, etc.): valley Local relief (concave, convex, none): flat Slope (%): <1%

Subregion (LRR): A Lat: Long: Datum: USGS

Soil Map Unit Name: Briscot loam NWI classification: somewhat poorly 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 for annual agricultural crop production and harvest.

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.			
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: _____ (A)

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

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (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 for annual agricultural crop production and harvest. plant community prior to spring plowing a mixture of cover crop, herbs, and grasses.

SOIL

Sampling Point: SP13

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	mixed sandy loam
11-24	10YR 3/3	98	10YR 4/6	2	D	M	SL	mixed 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: NO prominent 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 documented early growing season. See spring 2020 monitoring data

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

Project/Site: Western Portion of Parcel 0420351003 City/County: City of Puyallup, Pierce County Sampling Date: 16 APR 2020

Applicant/Owner: Cascade Development State: WA Sampling Point: SP14

Investigator(s): Habitat Technologies Section, Township, Range: Sec 35 T20N R04E QT 12

Landform (hillslope, terrace, etc.): valley Local relief (concave, convex, none): flat Slope (%): <1%

Subregion (LRR): A Lat: Long: Datum: USGS

Soil Map Unit Name: Briscot loam NWI classification: somewhat poorly 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 for annual agricultural crop production and harvest.

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.			
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: _____ (A)

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

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (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 for annual agricultural crop production and harvest. plant community prior to spring plowing a mixture of cover crop, herbs, and grasses.

SOIL

Sampling Point: SP14

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

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-9	10YR 3/3	100					SL	mixed sandy loam
9-15	10YR 3/3	90	10YR 4/6	10	D	M	SL	mixed sandy loam
15-24	10YR 4/2	90	10YR 4/6	10	D	M	SL	mixed 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: NO prominent indicators of hydric soils located outside of shallow depression

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. See spring 2020 monitoring data

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

Project/Site: Western Portion of Parcel 0420351003 City/County: City of Puyallup, Pierce County Sampling Date: 16 APR 2020

Applicant/Owner: Cascade Development State: WA Sampling Point: SP15

Investigator(s): Habitat Technologies Section, Township, Range: Sec 35 T20N R04E QT 12

Landform (hillslope, terrace, etc.): valley Local relief (concave, convex, none): flat Slope (%): <1%

Subregion (LRR): A Lat: Long: Datum: USGS

Soil Map Unit Name: Briscot loam NWI classification: somewhat poorly 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 for annual agricultural crop production and harvest. shallow depression seasonally saturated

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.			
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: _____ (A)

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

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (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 for annual agricultural crop production and harvest. plant community prior to spring plowing a mixture of cover crop, herbs, and grasses.

SOIL

Sampling Point: SP15

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
0-7	10YR 3/2	100					SL	mixed sandy loam
7-15	10YR 3/2	90	10YR 4/6	10	D	M	SL	mixed sandy loam
15-24	10YR 4/2	80	10YR 4/6	20	D	M	SL	mixed 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: prominent indicators of hydric soils located outside of shallow depression

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 documented early growing season. Dry on April 16, 2020. See spring 2020 monitoring data

10.0 Appendix B – Spring 2020 Hydrology Data

FIELD DATA AT ESTABLISHED MONITORING PLOTS

DATE	SP1	SP2	SP3	SP4	SP5	SP6	SP7	SP8
2/28/20	Sat at -18 No free	Not Sat No free	Not Sat No free	Sat at -16 No free	Not Sat No free	Not Sat No free	Sat at -14 No free	Sat at -5 Free at -18
3/6/20	Sat at -16 No free	Sat at -16 No free	Sat at -17 No free	Sat at -14 No free	Sat at -14 No free	Sat at -15 No free	Sat at -12 No free	Sat at -2 Free at -14
3/13/20	Sat at -9 No free	Sat at -11 No free	Sat at -14 No free	Sat at -10 No free	Sat at -11 No free	Sat at -14 No free	Sat at -7 No free	Sat at -0 Free at -9
3/20/20	Not Sat No free	Not Sat No free	Not Sat No free	Sat at -16 No free	Not Sat No free	Not Sat No free	Sat at -16 No free	Sat at -8 Free at -20
3/27/20	Not Sat No free	Not Sat No free	Not Sat No free	Not Sat No free	Not Sat No free	Not Sat No free	Sat at -22 No free	Sat at -16 No Free
4/3/20	Sat at -13 No free	Sat at -14 No free	Sat at -13 No free	Sat at -8 No free	Sat at -11 No free	Sat at -12 No free	Sat at -9 No free	Sat at -0 Free at -10
4/10/20	Not Sat No free	Not Sat No free	Not Sat No free	Not Sat No free	Not Sat No free	Not Sat No free	Not Sat No free	Sat at -22 No Free
4/16/20	Not Sat No free	Not Sat No free	Not Sat No free	Not Sat No free	Not Sat No free	Not Sat No free	Not Sat No free	Not Sat No Free

Depth of free water (free) and saturation (sat) in inches from ground level.

FIELD DATA AT ESTABLISHED MONITORING PLOTS

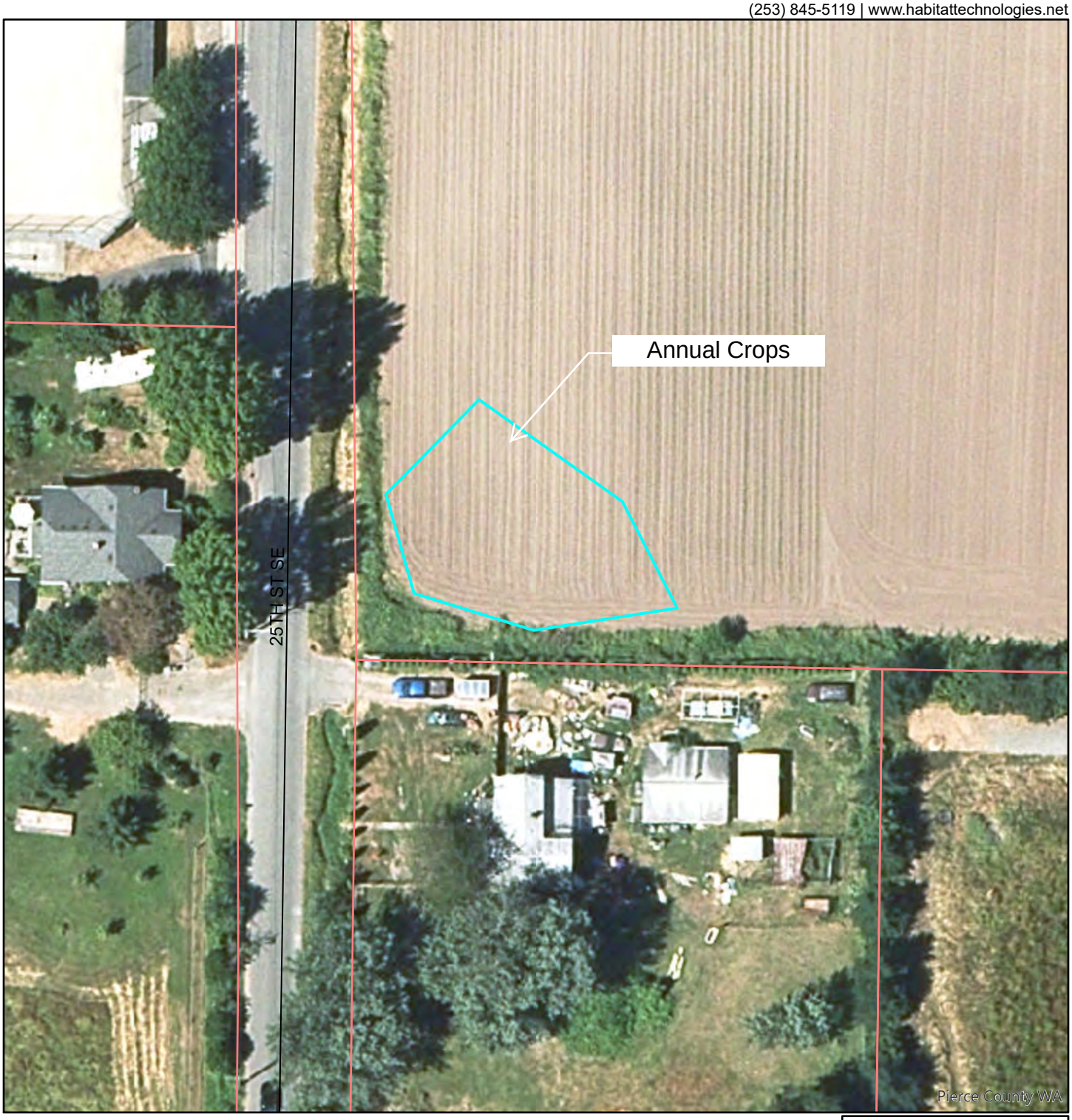
DATE	SP9	SP10	SP11	SP12	SP13	SP14	SP15
2/28/20	Sat at -14 No free	Sat at -18 No free	Sat at -13 No free	Sat at -1 Free at -12	Sat at -15 No free	Sat at -16 No free	Sat at -2 Free at -14
3/6/20	Sat at -16 No free	Not Sat No free	Sat at -17 No free	Sat at -2 Free at -14	Sat at -18 No free	Sat at -16 No free	Sat at -2 Free at -12
3/13/20	Sat at -9 No free	Sat at -12 No free	Sat at -10 No free	Sat at -0 Free at -7	Sat at -9 No free	Sat at -8 No free	Sat at -0 Free at -6
3/20/20	Not Sat No free	Not Sat No free	Sat at -18 No free	Sat at -14 No Free	Sat at -22 No free	Sat at -22 No free	Sat at -11 Free at -20
3/27/20	Not Sat No free	Not Sat No free	Not Sat No free	Sat at -17 No Free	Not Sat No free	Not Sat No free	Sat at -16 No Free
4/3/20	Sat at -8 No free	Sat at -12 No free	Sat at -10 No free	Sat at -1 Free at -11	Sat at -10 No free	Sat at -11 No free	Sat at -0 Free at -10
4/10/20	Not Sat No free	Not Sat No free	Not Sat No free	Sat at -17 No free	Not Sat No free	Not Sat No free	Sat at -16 No free
4/16/20	Not Sat No free	Not Sat No free	Not Sat No free	Not Sat No free	Not Sat No free	Not Sat No free	Not Sat No free

Depth of free water (free) and saturation (sat) in inches from ground level.

11.0 Appendix C – Wetland Rating Worksheet

Figure A1

Habitat Technologies
P.O.Box 1088
Puyallup, WA 98371
(253) 845-5119 | www.habitattechnologies.net



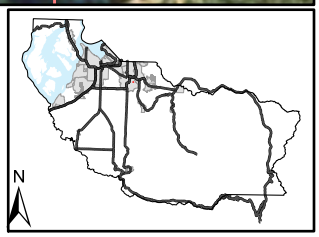
Legend

Wetland A

Tax Parcels
- Base Parcel
- Condominium

Other

Roads



County - 2017 Ortho

1:600

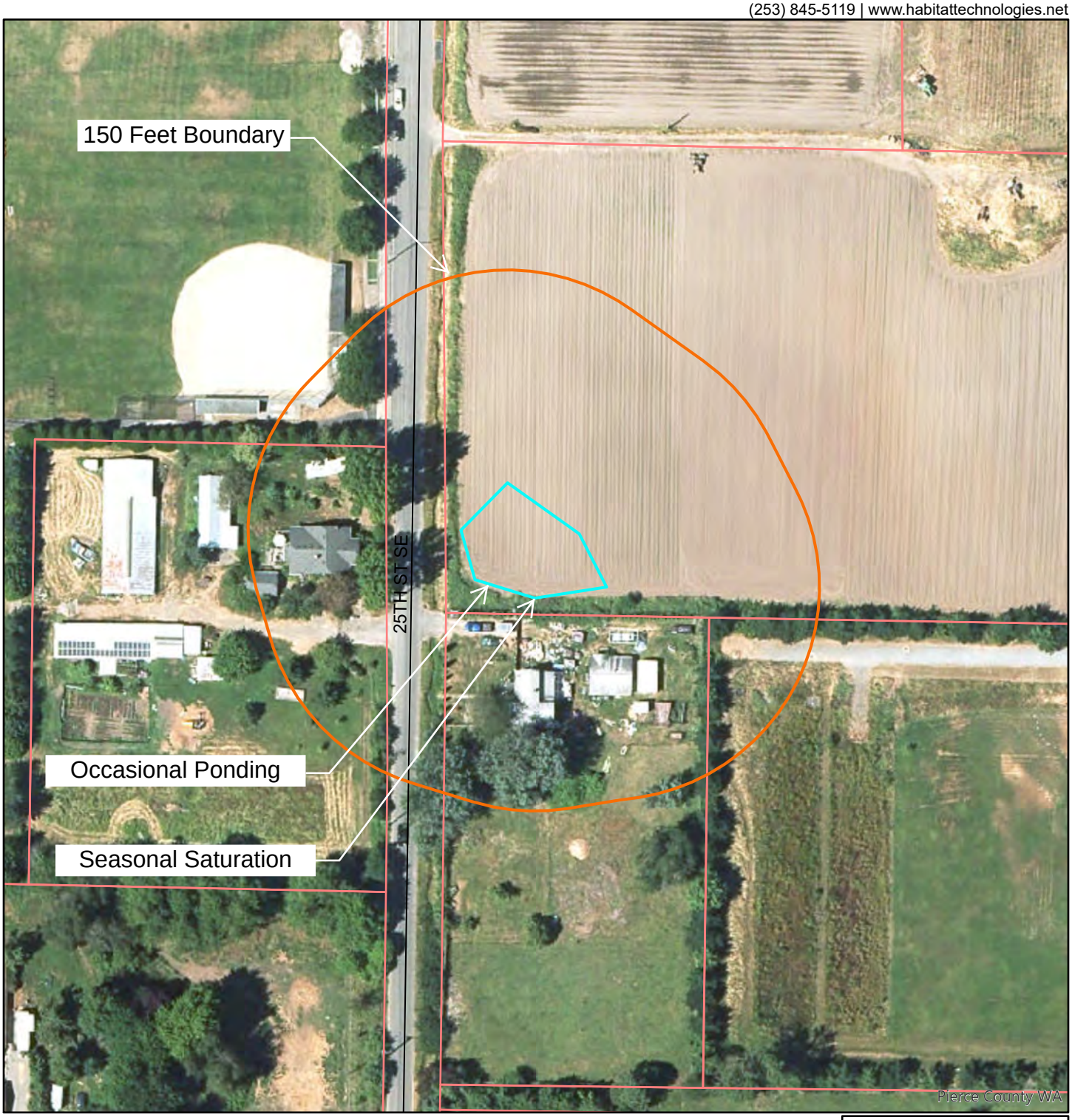
0 12.5 25 50 Feet

The map features are approximate and are intended only to provide an indication of said feature. Additional areas that have not been mapped may be present. This is not a survey. Orthophotos and other data may not align. The County assumes no liability for variations ascertained by actual survey. ALL DATA IS EXPRESSLY PROVIDED 'AS IS' AND 'WITH ALL FAULTS'. The County makes no warranty of fitness for a particular purpose.

Date: 6/16/2020 03:51 PM

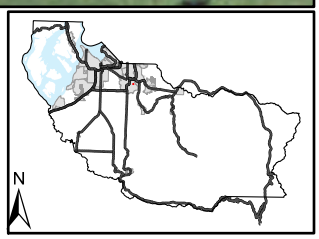
Figure A2

Habitat Technologies
P.O.Box 1088
Puyallup, WA 98371
(253) 845-5119 | www.habitattechnologies.net



Legend

- 150 Feet Boundary
- Wetland A
- Tax Parcels
  - Base Parcel
  - Condominium
- Other
- Roads



County - 2017 Ortho

1:1,200

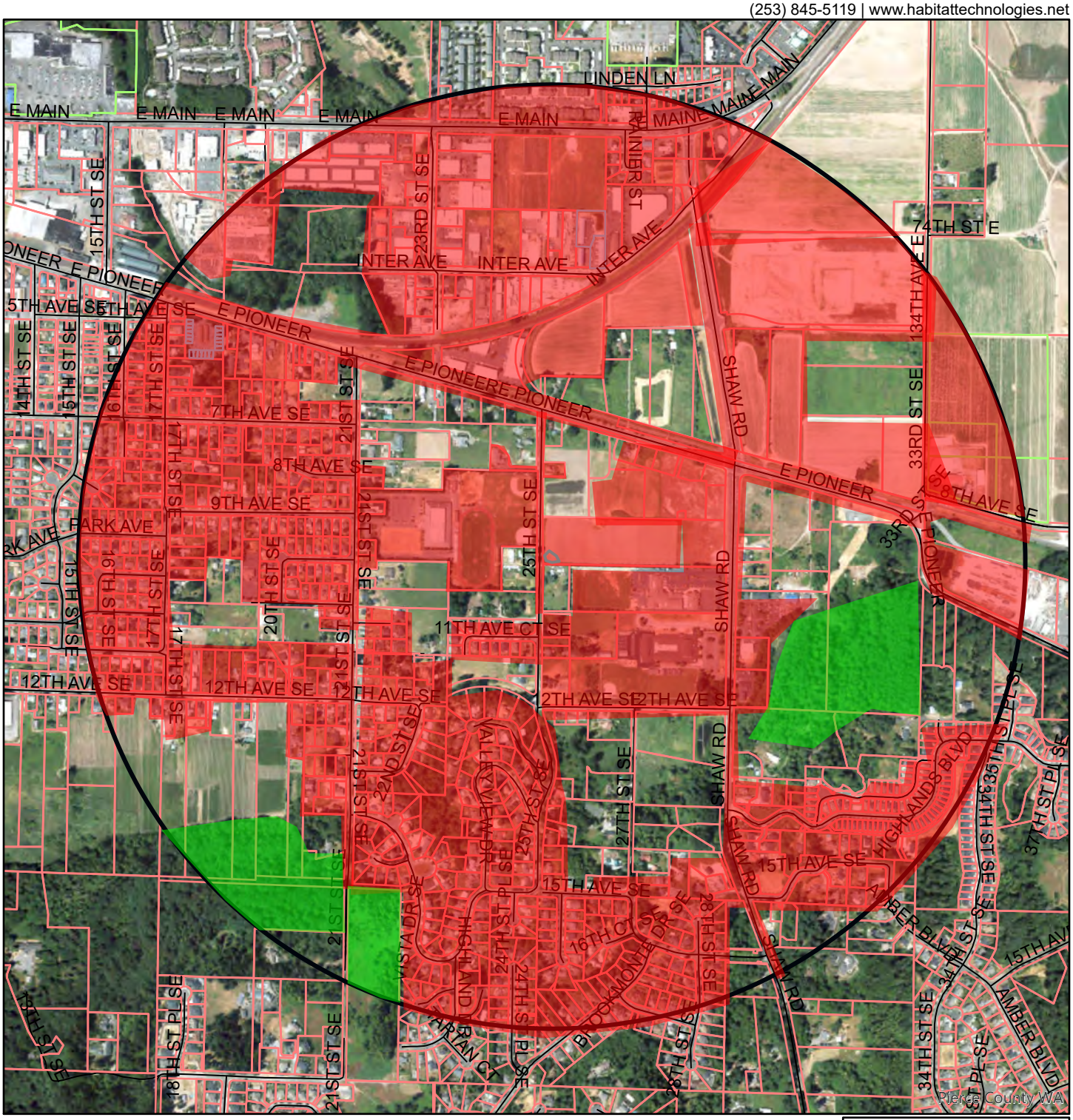
0 25 50 100 Feet

The map features are approximate and are intended only to provide an indication of said feature. Additional areas that have not been mapped may be present. This is not a survey. Orthophotos and other data may not align. The County assumes no liability for variations ascertained by actual survey. ALL DATA IS EXPRESSLY PROVIDED 'AS IS' AND 'WITH ALL FAULTS'. The County makes no warranty of fitness for a particular purpose.

Date: 6/16/2020 03:50 PM

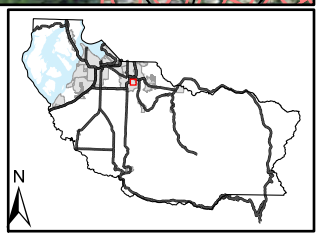
Figure A3

Habitat Technologies
P.O.Box 1088
Puyallup, WA 98371
(253) 845-5119 | www.habitattechnologies.net



Legend

- 1 KM Boundary
- Wetland A
- Tax Parcels
- Base Parcel
- Condominium
- Other
- Roads



County - 2017 Ortho

1:12,000

0 265 530 1,060 Feet

Date: 6/16/2020 03:53 PM

Figure A4

Habitat Technologies
P.O.Box 1088
Puyallup, WA 98371
(253) 845-5119 | www.habitattechnologies.net

Legend

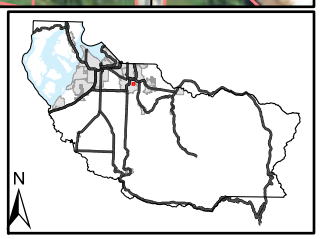
- Wetland A
- Other
- Roads

Tax Parcels

- Base Parcel
- Condominium

CWI Wetlands Delineation

- Delineated
- Verified
- Unverified



0 105 210 420 Feet

County - 2017 Ortho

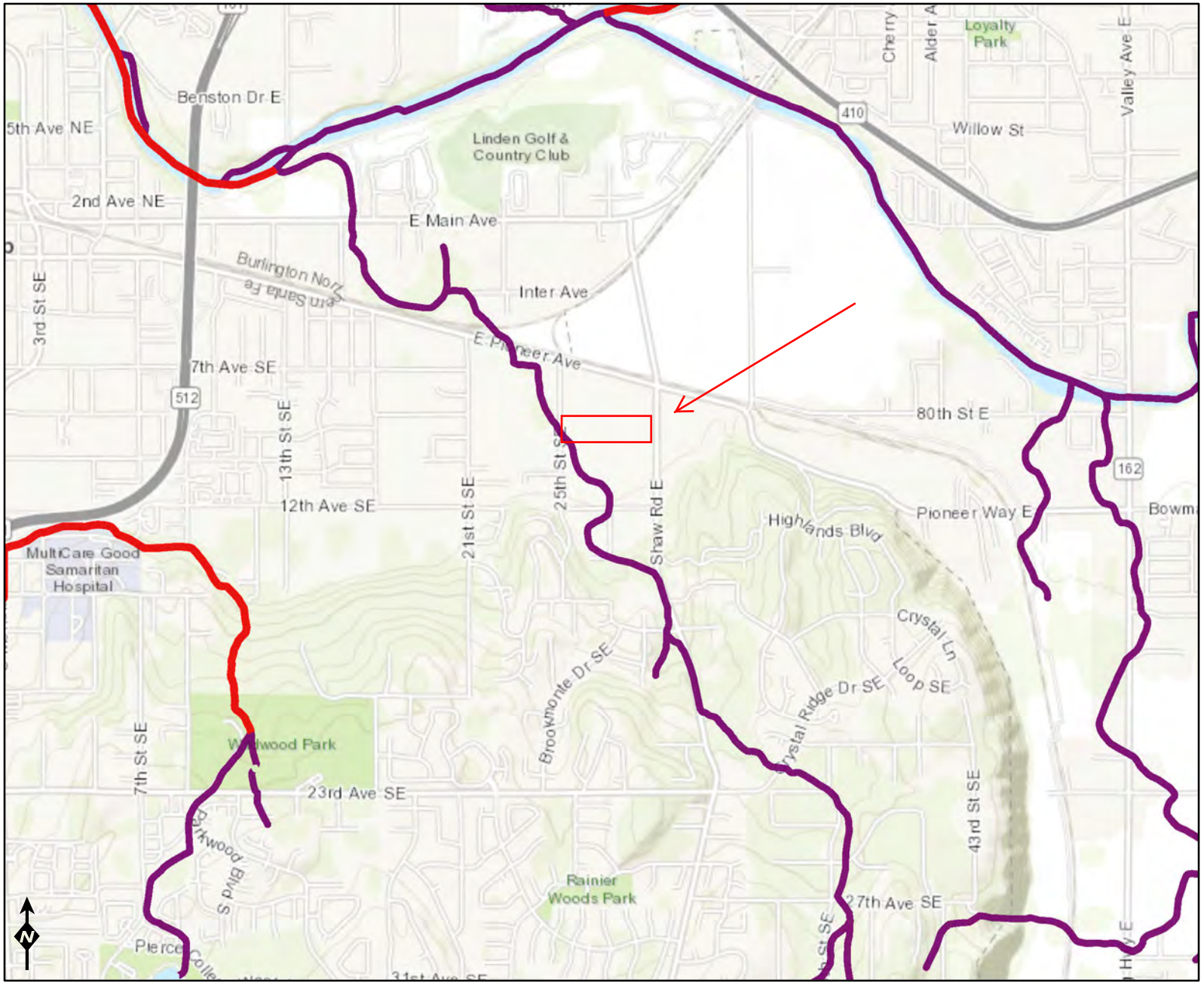
1:4,800

The map features are approximate and are intended only to provide an indication of said feature. Additional areas that have not been mapped may be present. This is not a survey. Orthophotos and other data may not align. The County assumes no liability for variations ascertained by actual survey. ALL DATA IS EXPRESSLY PROVIDED 'AS IS' AND 'WITH ALL FAULTS'. The County makes no warranty of fitness for a particular purpose.

Date: 6/16/2020 05:01 PM

June 16, 2020

Figure W4



Assessed Waters/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 Standards

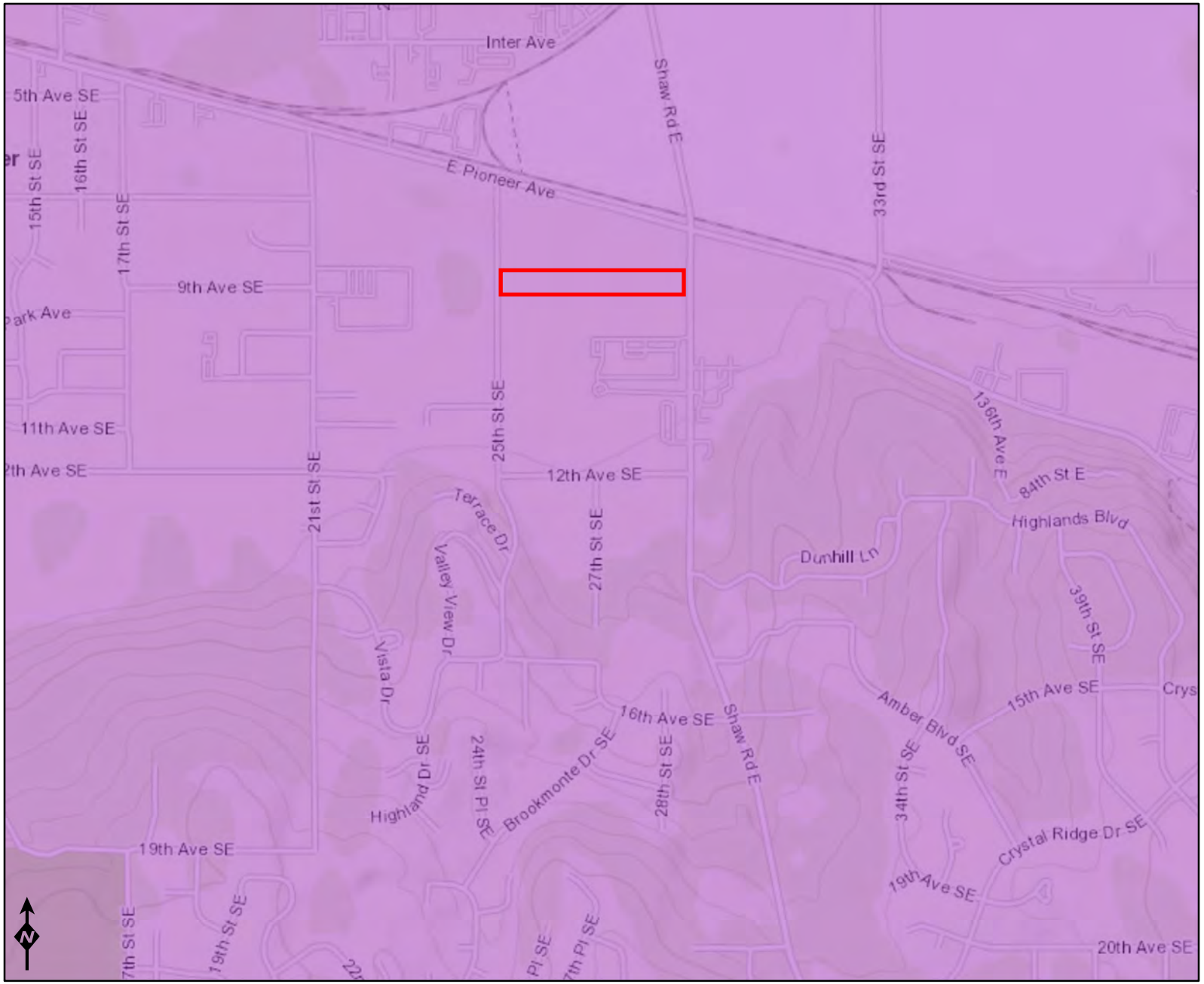
Miles
0 0.25 0.5 1

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and

DEPARTMENT OF ECOLOGY
State of Washington

June 16, 2020

Figure W5



WQ Improvement Projects

- Approved
- In Development

- WQ Standards

Miles
0 0.125 0.25 0.5

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and

DEPARTMENT OF ECOLOGY
State of Washington

Wetland name or number _A__actively managed agricultural production land

RATING SUMMARY – Western Washington

Name of wetland (or ID #): part of Parcel 0420351003 Date of site visit: 16 ARP 2020

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

NOTE: **Form is not complete without the figures requested** *(figures can be combined)*.
Source of base aerial photo/map Pierce County GIS

OVERALL WETLAND CATEGORY ____4____ (based on functions x or special characteristics___)

1. Category of wetland based on FUNCTIONS

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

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

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

__x__**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	6	5	4	15

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

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

2. Category based on SPECIAL CHARACTERISTICS of wetland

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

Wetland name or number A

Maps and figures required to answer questions correctly for Western Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	D 1.3, H 1.1, H 1.4	A1
Hydroperiods	D 1.4, H 1.2	A2
Location of outlet (*can be added to map of hydroperiods)*	D 1.1, D 4.1	A2
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	A2
Map of the contributing basin	D 4.3, D 5.3	A4
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	A3
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	W4
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	D 3.3	W5

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	N/A
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	N/A
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	N/A
Boundary of 150 ft buffer (can be added to another figure)	S 2.1, S 5.1	↓
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	S 3.3	↓

Wetland name or number 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 sheetflow, or in a swale without distinct banks,
___The water leaves the wetland **without being impounded**.

NO – go to 5 **YES –** The wetland class is **Slope**

NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 ft deep).

5. Does the entire wetland unit **meet all** of the following criteria?
___The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river,
___The overbank flooding occurs at least once every 2 years.

Wetland name or number A

NO – go to 6 **YES** – The wetland class is **Riverine**

NOTE: The Riverine unit can contain depressions that are filled with water when the river is not flooding

6. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year? *This means that any outlet, if present, is higher than the interior of the wetland.*

NO – go to 7 **YES** – The wetland class is **Depressional**

7. Is the entire wetland unit located in a very flat area with no obvious depression and no overbank flooding? The unit does not pond surface water more than a few inches. The unit seems to be maintained by high groundwater in the area. The wetland may be ditched, but has no obvious natural outlet.

NO – go to 8 **YES** – The wetland class is **Depressional**

8. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-7 APPLY TO DIFFERENT AREAS IN THE UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

   NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine along stream within boundary of depression	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine
Salt Water Tidal Fringe and any other class of freshwater wetland	Treat as ESTUARINE

*If you are still unable to determine which of the above criteria apply to your wetland, or if you have **more than 2 HGM classes** within a wetland boundary, classify the wetland as Depressional for the rating.*

Wetland name or number A

DEPRESSIONAL AND FLATS WETLANDS

Water Quality Functions - Indicators that the site functions to improve water quality

D 1.0. Does the site have the potential to improve water quality?	
D 1.1. Characteristics of surface water outflows from the wetland: Wetland is a depression or flat depression (QUESTION 7 on key) with no surface water leaving it (no outlet). points = 3 Wetland has an intermittently flowing stream or ditch, OR highly constricted permanently flowing outlet. points = 2 Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing points = 1 Wetland is a flat depression (QUESTION 7 on key), whose outlet is a permanently flowing ditch. points = 1	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	0
D 1.4. Characteristics of seasonal ponding or inundation: *This is the area that is ponded for at least 2 months. See description in manual.* Area seasonally ponded is > 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	0
Total for D 1 Add the points in the boxes above	2

Rating of Site Potential If score is: ___ **12-16 = H** ___ **6-11 = M** X **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	0
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1-D 2.3? Source_____ Yes = 1 No = 0	0
Total for D 2 Add the points in the boxes above	1

Rating of Landscape Potential If score is: ___ **3 or 4 = H** X **1 or 2 = M** ___ **0 = L** *Record the rating on the first page*

D 3.0. Is the water quality improvement provided by the site valuable to society?	
D 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, lake, or marine water that is on the 303(d) list? Yes = 1 No = 0	0
D 3.2. Is the wetland in a basin or sub-basin where an aquatic resource is on the 303(d) list? Yes = 1 No = 0	1
D 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality (*answer YES if there is a TMDL for the basin in which the unit is found*)? Yes = 2 No = 0	2
Total for D 3 Add the points in the boxes above	3

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

Wetland name or number 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 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

0

D 4.3. Contribution of the wetland to storage in the watershed: *Estimate the ratio of the area of upstream basin contributing surface water to the wetland to the area of the wetland unit itself.*
- The area of the basin is less than 10 times the area of the unit points = 5
- The area of the basin is 10 to 100 times the area of the unit points = 3
- The area of the basin is more than 100 times the area of the unit points = 0
- Entire wetland is in the Flats class points = 5

3

Total for D 4 — Add the points in the boxes above: **5**

Rating of Site Potential If score is: ___ **12-16 = H** ___ **6-11 = M** X **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. 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. X 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

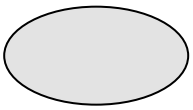
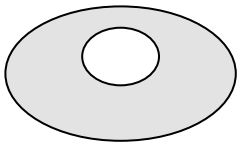
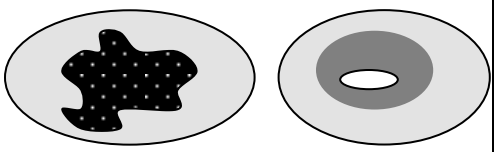
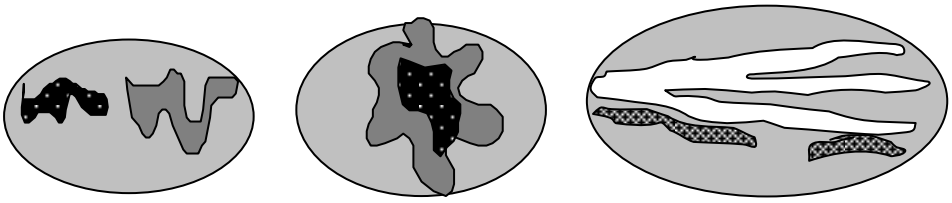
1

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: **1**

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

Wetland name or number A

These questions apply to wetlands of all HGM classes. **HABITAT FUNCTIONS** - Indicators that site functions to provide important habitat	
H 1.0. Does the site have the potential to provide habitat?	
H 1.1. Structure of plant community: *Indicators are Cowardin classes and strata within the Forested class.* Check the Cowardin plant classes in the wetland. *Up to 10 patches may be combined for each class to meet the threshold of ¼ ac or more than 10% of the unit if it is smaller than 2.5 ac. Add the number of structures checked.* ____Aquatic bed — 4 structures or more: points = 4 __X__Emergent — 3 structures: points = 2 ____Scrub-shrub (areas where shrubs have > 30% cover) — 2 structures: points = 1 ____Forested (areas where trees have > 30% cover) — 1 structure: points = 0 *If the unit has a Forested class, check if:* ____The Forested class has 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/ground-cover) that each cover 20% within the Forested polygon	0
H 1.2. Hydroperiods Check the types of water regimes (hydroperiods) present within the wetland. The water regime has to cover more than 10% of the wetland or ¼ ac to count (*see text for descriptions of hydroperiods*). ____Permanently flooded or inundated — 4 or more types present: points = 3 ____Seasonally flooded or inundated — 3 types present: points = 2 __X__Occasionally flooded or inundated — 2 types present: points = 1 __X__Saturated only — 1 type present: points = 0 ____Permanently flowing stream or river in, or adjacent to, the wetland ____Seasonally flowing stream in, or adjacent to, the wetland ____**Lake Fringe wetland** — **2 points** ____**Freshwater tidal wetland** — **2 points**	1
H 1.3. Richness of plant species Count the number of plant species in the wetland that cover at least 10 ft^2. *Different patches of the same species can be combined to meet the size threshold and you do not have to name the species.* ***Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Canadian thistle*** If you counted: > 19 species — points = 2 5 - 19 species — points = 1 < 5 species — points = 0 actively managed crop production area	0
H 1.4. Interspersion of habitats Decide from the diagrams below whether interspersion among Cowardin plants classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, moderate, low, or none. *If you have four or more plant classes or three classes and open water, the rating is always high.*  **None** = 0 points  **Low** = 1 point  **Moderate** = 2 points All three diagrams in this row are **HIGH** = 3points 	0

Wetland name or number A

H 1.5. Special habitat features: Check the habitat features that are present in the wetland. *The number of checks is the number of points.* ____Large, downed, woody debris within the wetland (> 4 in diameter and 6 ft long). ____Standing snags (dbh > 4 in) within the wetland ____Undercut banks are present for at least 6.6 ft (2 m) **and/or** overhanging plants extends at least 3.3 ft (1 m) over a stream (or ditch) in, or contiguous with the wetland, for at least 33 ft (10 m) ____Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 30 degree slope) OR signs of recent beaver activity are present *(cut shrubs or trees that have not yet weathered where wood is exposed)* ____At least ¼ ac of thin-stemmed persistent plants or woody branches are present in areas that are permanently or seasonally inundated *(structures for egg-laying by amphibians)* ____Invasive plants cover less than 25% of the wetland area in every stratum of plants (*see H 1.1 for list of strata*)	0
Total for H 1 Add the points in the boxes above	1

Rating of Site Potential If score is:___**15-18 = H** ___**7-14 = M** X **0-6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support the habitat functions of the site?	
H 2.1. Accessible habitat (include *only habitat that directly abuts wetland unit*). *Calculate:* % undisturbed habitat 0 **+** [(% moderate and low intensity land uses)/2] 0 = 0 % 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:* % undisturbed habitat 10 **+** [(% moderate and low intensity land uses)/2] 11 = 21 % Undisturbed habitat > 50% of Polygon points = 3 Undisturbed habitat 10-50% and in 1-3 patches points = 2 Undisturbed habitat 10-50% and > 3 patches points = 1 Undisturbed habitat < 10% of 1 km Polygon points = 0	1
H 2.3. Land use intensity in 1 km Polygon: If > 50% of 1 km Polygon is high intensity land use points = (- 2) ≤ 50% of 1 km Polygon is high intensity points = 0	-2
Total for H 2 Add the points in the boxes above	-1

Rating of Landscape Potential If score is:___**4-6 = H** ___**1-3 = M** X **< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose only the highest score that applies to the wetland being rated.* Site meets ANY of the following criteria: points = 2 — It has 3 or more priority habitats within 100 m (see next page) — It provides habitat for Threatened or Endangered species (any plant or animal on the state or federal lists) — It is mapped as a location for an individual WDFW priority species — It is a Wetland of High Conservation Value as determined by the Department of Natural Resources — 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 X points = 1 Site does not meet any of the criteria above points = 0	1

Rating of Value If score is:___**2 = H** X **1 = M** ___**0 = L** *Record the rating on the first page*

Wetland name or number A

WDFW Priority Habitats

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp. http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here: http://wdfw.wa.gov/conservation/phs/list/)

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland unit: ***NOTE:*** *This question is independent of the land use between the wetland unit and the priority habitat.*

— **Aspen Stands:** Pure or mixed stands of aspen greater than 1 ac (0.4 ha).

— **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).

— **Herbaceous Balds:** Variable size patches of grass and forbs on shallow soils over bedrock.

— **Old-growth/Mature forests:** Old-growth west of Cascade crest – Stands of at least 2 tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) > 32 in (81 cm) dbh or > 200 years of age. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west of the Cascade crest.

— **Oregon White Oak:** Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).

X **Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

— **Westside Prairies:** Herbaceous, non-forested plant communities that can either take the form of a dry prairie or a wet prairie (*full descriptions in WDFW PHS report p. 161 – see web link above*).

X **Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.

— **Nearshore**: Relatively undisturbed nearshore habitats. These include Coastal Nearshore, Open Coast Nearshore, and Puget Sound Nearshore. (*full descriptions of habitats and the definition of relatively undisturbed are in WDFW report – see web link on previous page).*

— **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

— **Cliffs:** Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.

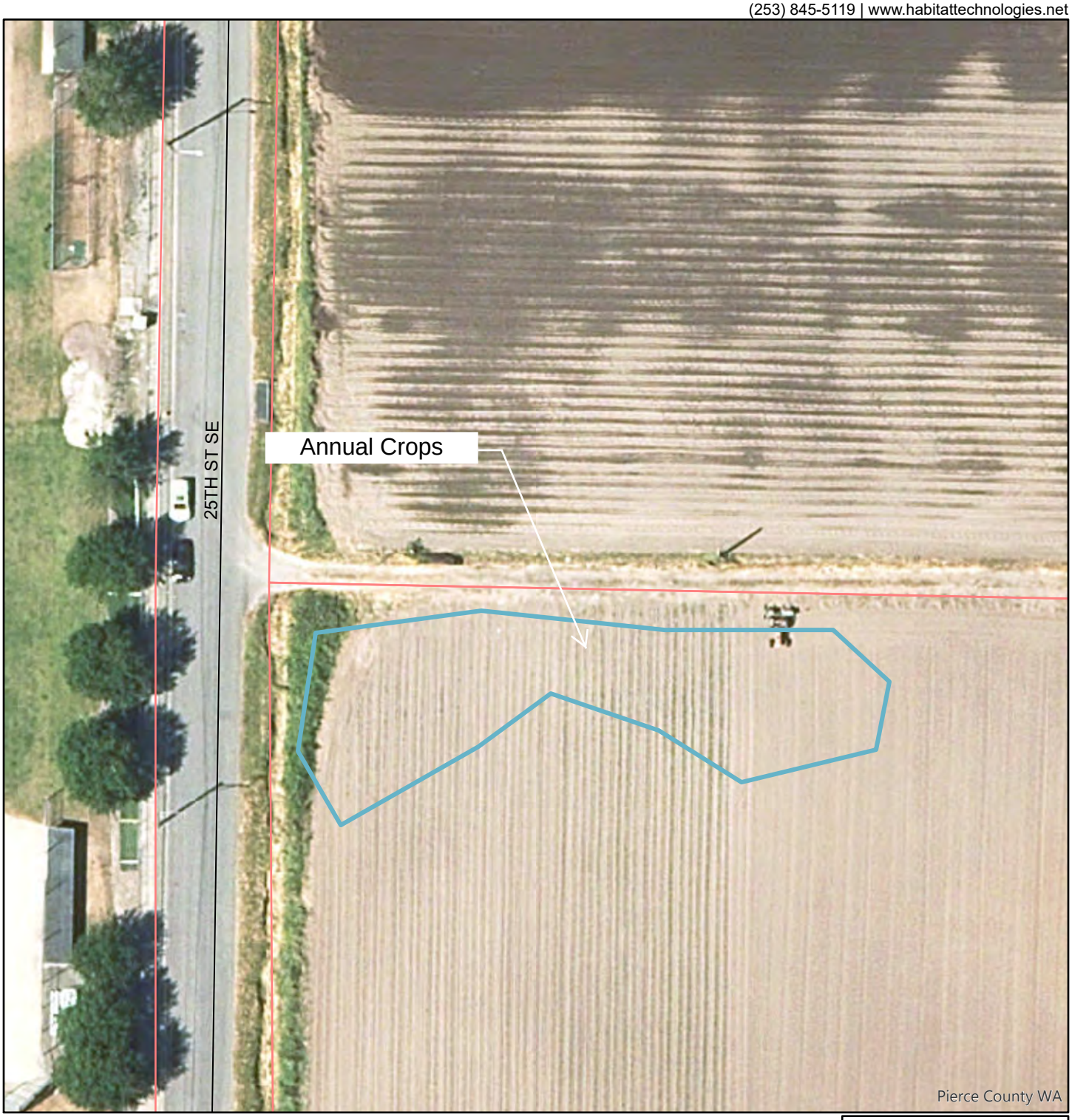
— **Talus:** Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

— **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.

Figure B1

Habitat Technologies
P.O.Box 1088
Puyallup, WA 98371
(253) 845-5119 | www.habitattechnologies.net



Legend

Wetland B

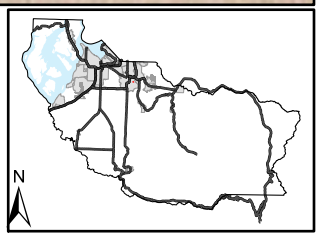
Tax Parcels

Base Parcel

Condominium

Other

Roads



County - 2017 Ortho

1:600

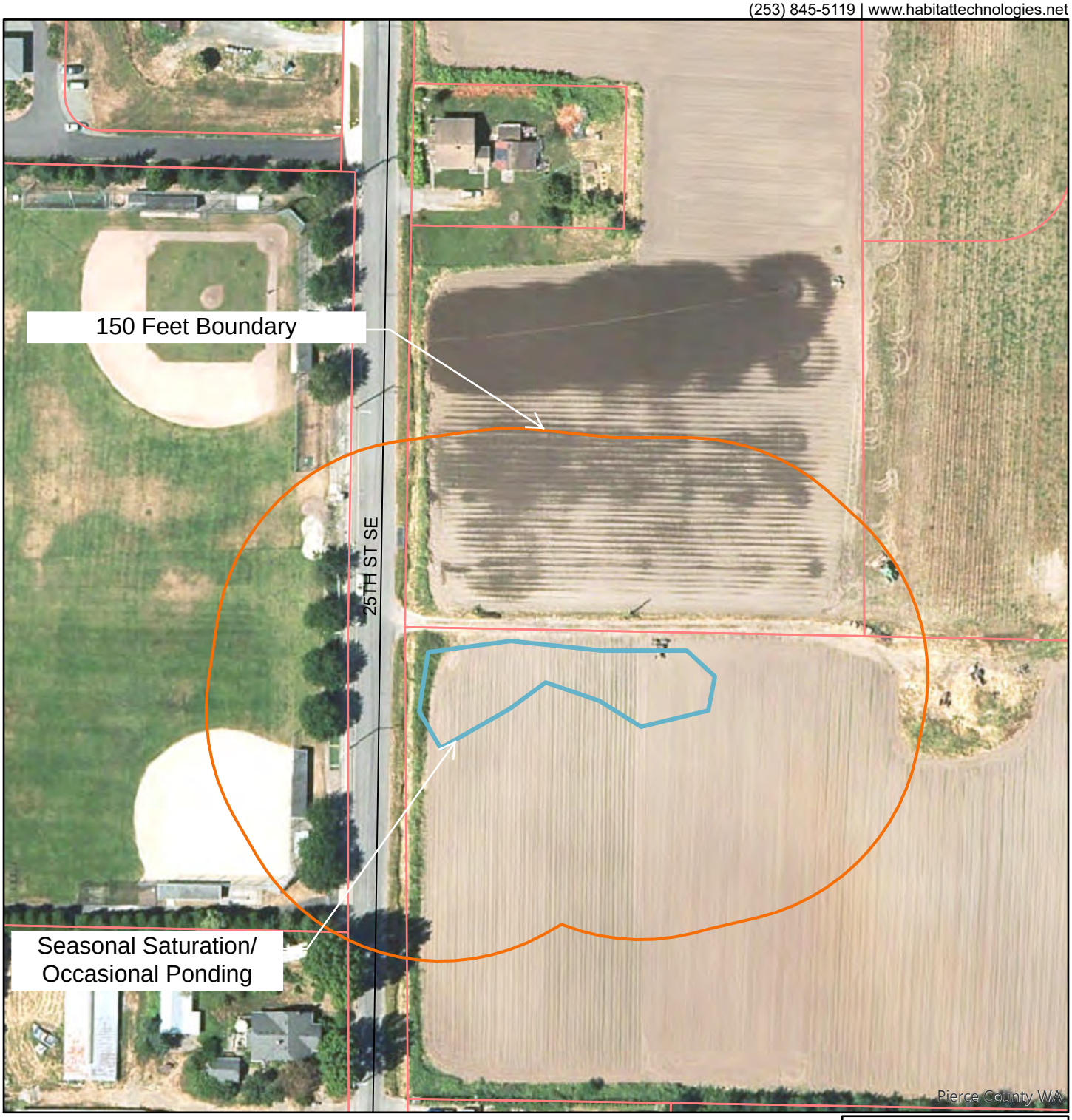
0 12.5 25 50 Feet

The map features are approximate and are intended only to provide an indication of said feature. Additional areas that have not been mapped may be present. This is not a survey. Orthophotos and other data may not align. The County assumes no liability for variations ascertained by actual survey. ALL DATA IS EXPRESSLY PROVIDED 'AS IS' AND 'WITH ALL FAULTS'. The County makes no warranty of fitness for a particular purpose.

Date: 6/16/2020 03:55 PM

Figure B2

Habitat Technologies
P.O.Box 1088
Puyallup, WA 98371
(253) 845-5119 | www.habitattechnologies.net



Legend

150 Feet Boundary

Wetland B

Tax Parcels

Base Parcel

Condominium

Other

Roads

CWI Wetlands Delineation

Delineated

Verified

Unverified

N

0 25 50 100 Feet

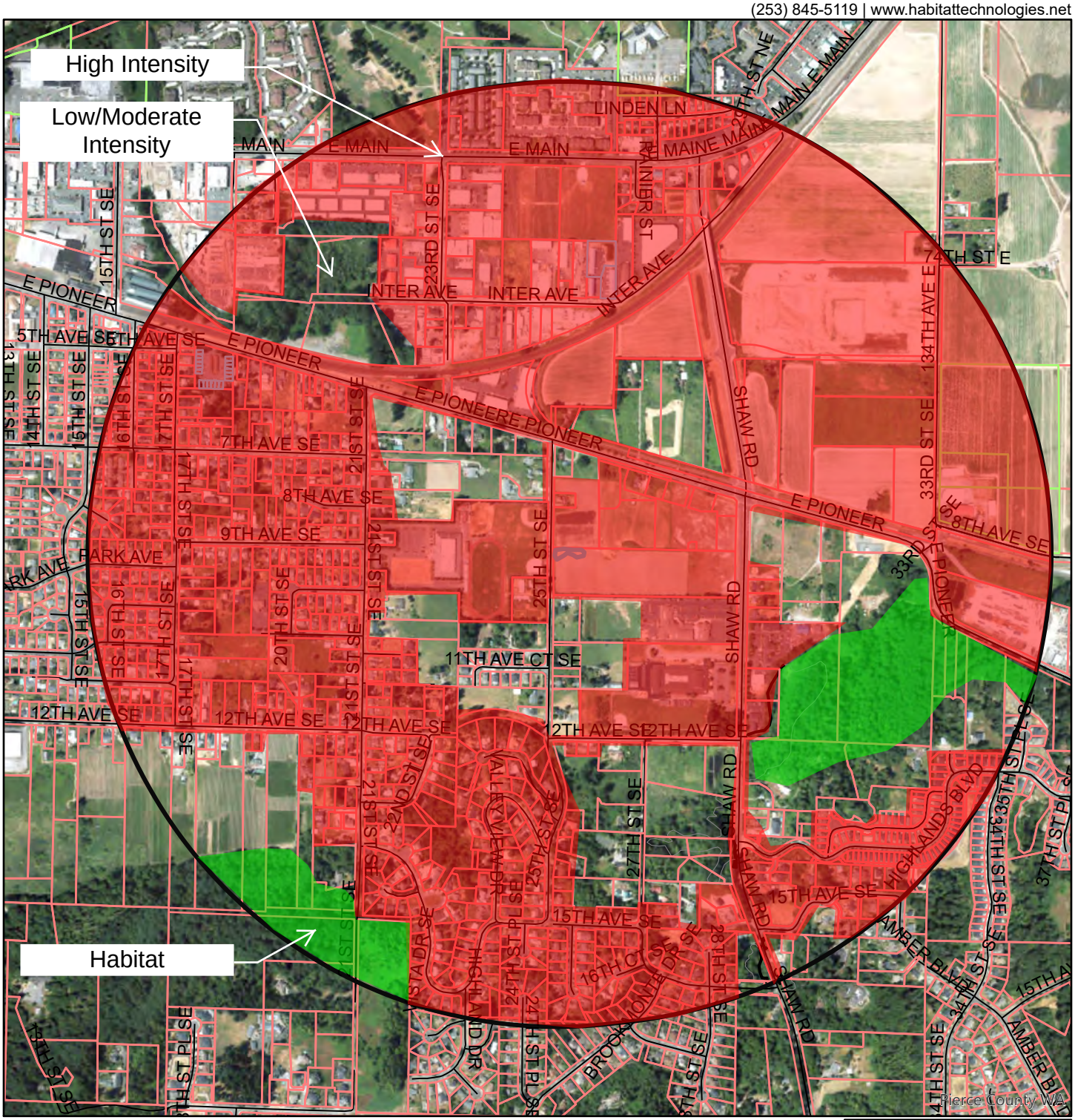
County - 2017 Ortho

1:1,200

Date: 6/16/2020 04:01 PM

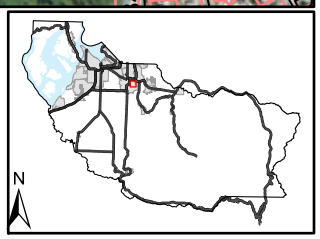
Figure B3

Habitat Technologies
P.O.Box 1088
Puyallup, WA 98371
(253) 845-5119 | www.habitattechnologies.net



Legend

- 1 KM Boundary
- Wetland B
- Tax Parcels
  - Base Parcel
  - Condominium
  - Other
- Roads
  - Verified
  - Unverified
- CWI Wetlands Delineation
  - Delineated



County - 2017 Ortho

1:12,000

0 265 530 1,060 Feet

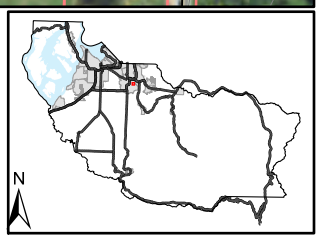
Date: 6/16/2020 04:03 PM

Figure B4

Habitat Technologies
P.O.Box 1088
Puyallup, WA 98371
(253) 845-5119 | www.habitattechnologies.net

Legend

- 1 KM Boundary
- Wetland B
- Tax Parcels
  - Base Parcel
  - Condominium
  - Other
- Roads
- CWI Wetlands Delineation
  - Delineated
  - Verified
  - Unverified



County - 2017 Ortho

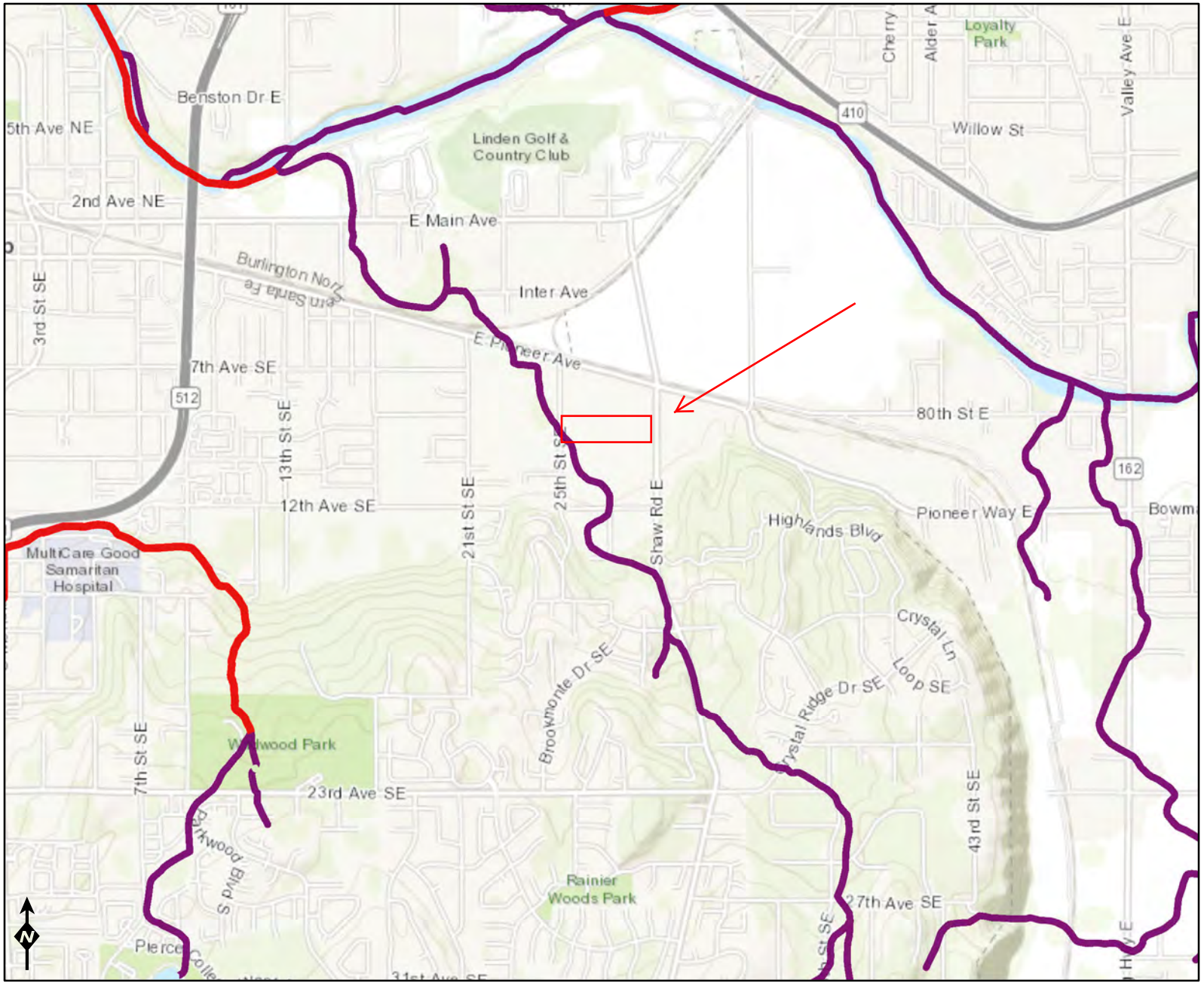
1:4,800

0 105 210 420 Feet

Date: 6/16/2020 04:56 PM

June 16, 2020

Figure W4



Assessed Waters/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 Standards

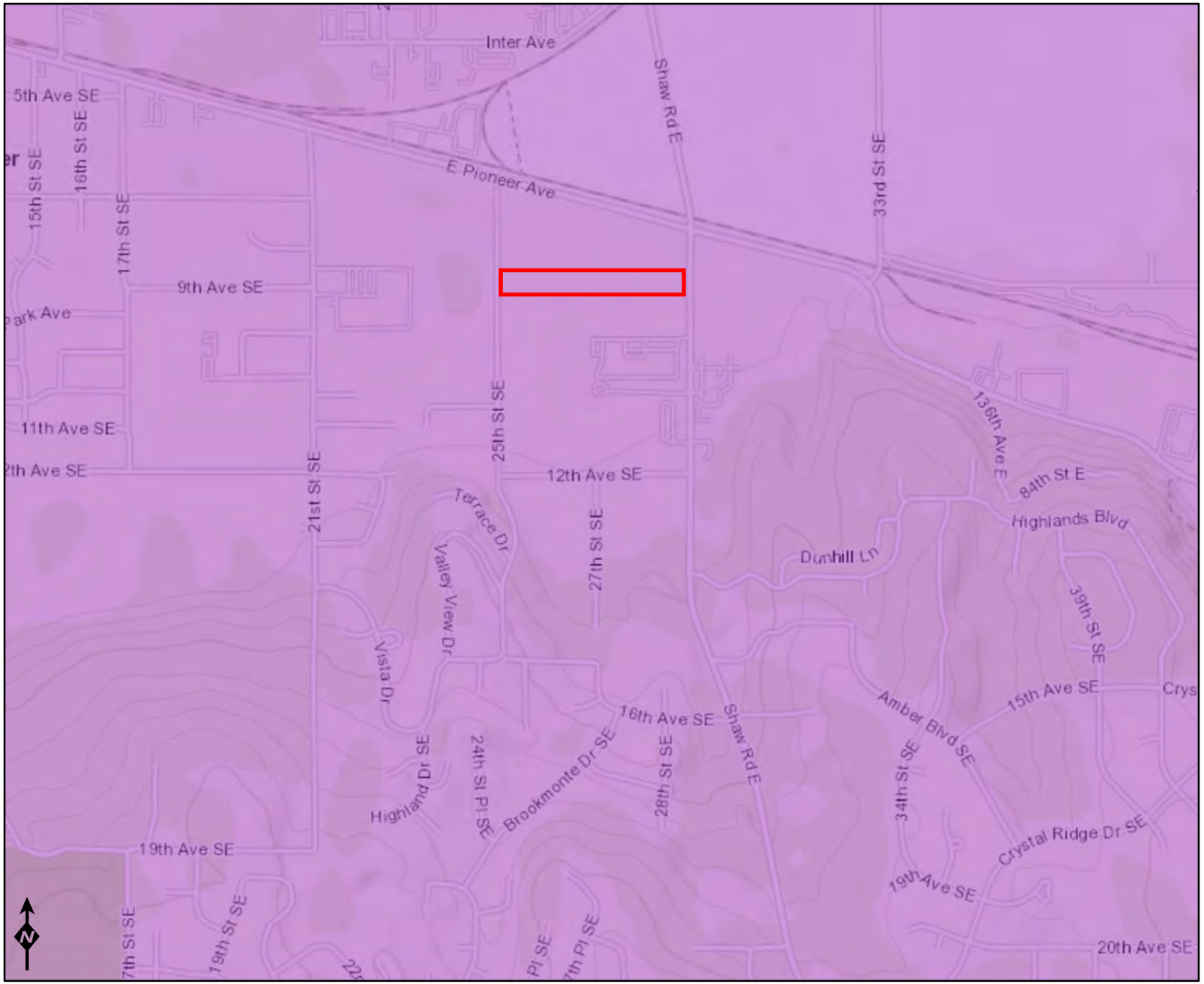
Miles
0 0.25 0.5 1

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and

DEPARTMENT OF ECOLOGY
State of Washington

June 16, 2020

Figure W5



WQ Improvement Projects

- Approved
- In Development

- WQ Standards

Miles
0 0.125 0.25 0.5

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and

DEPARTMENT OF ECOLOGY
State of Washington

Wetland name or number _B__actively managed agricultural production land

RATING SUMMARY – Western Washington

Name of wetland (or ID #): part of Parcel 0420351003 Date of site visit: 16 ARP 2020

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

NOTE: **Form is not complete without the figures requested** *(figures can be combined)*.
Source of base aerial photo/map Pierce County GIS

OVERALL WETLAND CATEGORY ____4____ (based on functions x or special characteristics___)

1. Category of wetland based on FUNCTIONS

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

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

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

__x__**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	6	5	4	15

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

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

2. Category based on SPECIAL CHARACTERISTICS of wetland

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

Wetland name or number B

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	B1
Hydroperiods	D 1.4, H 1.2	B2
Location of outlet (*can be added to map of hydroperiods)*	D 1.1, D 4.1	B2
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	B2
Map of the contributing basin	D 4.3, D 5.3	B4
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	B3
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	W4
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	D 3.3	W5

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	N/A
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	N/A
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	N/A
Boundary of 150 ft buffer (can be added to another figure)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	S 3.3	

Wetland name or number B

HGM Classification of Wetlands in Western Washington

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

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-7 apply, and go to Question 8.

1. Are the water levels in the entire unit usually controlled by tides except during floods?

NO – go to 2 **YES** – the wetland class is **Tidal Fringe** – go to 1.1

1.1 Is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)?

NO – Saltwater Tidal Fringe (Estuarine) **YES – Freshwater Tidal Fringe**

*If your wetland can be classified as a Freshwater Tidal Fringe use the forms for **Riverine** wetlands. If it is Saltwater Tidal Fringe it is an **Estuarine** wetland and is not scored. This method **cannot** be used to score functions for estuarine wetlands.*

2. The entire wetland unit is flat and precipitation is the only source (>90%) of water to it. Groundwater and surface water runoff are NOT sources of water to the unit.

NO – go to 3 **YES** – The wetland class is **Flats**

*If your wetland can be classified as a Flats wetland, use the form for **Depressional** wetlands.*

3. Does the entire wetland unit **meet all** of the following criteria?
   ___The vegetated part of the wetland is on the shores of a body of permanent open water (without any plants on the surface at any time of the year) at least 20 ac (8 ha) in size;
   ___At least 30% of the open water area is deeper than 6.6 ft (2 m).

NO – go to 4 **YES –** The wetland class is **Lake Fringe** (Lacustrine Fringe)

4. Does the entire wetland unit **meet all** of the following criteria?
   ___The wetland is on a slope (*slope can be very gradual*),
   ___The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks,
   ___The water leaves the wetland **without being impounded**.

NO – go to 5 **YES –** The wetland class is **Slope**

NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 ft deep).

5. Does the entire wetland unit **meet all** of the following criteria?
   ___The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river,
   ___The overbank flooding occurs at least once every 2 years.

Wetland name or number B

NO – go to 6 **YES** – The wetland class is **Riverine**

NOTE: The Riverine unit can contain depressions that are filled with water when the river is not flooding

6. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year? *This means that any outlet, if present, is higher than the interior of the wetland.*

NO – go to 7 **YES** – The wetland class is **Depressional**

7. Is the entire wetland unit located in a very flat area with no obvious depression and no overbank flooding? The unit does not pond surface water more than a few inches. The unit seems to be maintained by high groundwater in the area. The wetland may be ditched, but has no obvious natural outlet.

NO – go to 8 **YES** – The wetland class is **Depressional**

8. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-7 APPLY TO DIFFERENT AREAS IN THE UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

   NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine along stream within boundary of depression	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine
Salt Water Tidal Fringe and any other class of freshwater wetland	Treat as ESTUARINE

*If you are still unable to determine which of the above criteria apply to your wetland, or if you have **more than 2 HGM classes** within a wetland boundary, classify the wetland as Depressional for the rating.*

Wetland name or number B

DEPRESSIONAL AND FLATS WETLANDS

Water Quality Functions - Indicators that the site functions to improve water quality

D 1.0. Does the site have the potential to improve water quality?	
D 1.1. Characteristics of surface water outflows from the wetland: Wetland is a depression or flat depression (QUESTION 7 on key) with no surface water leaving it (no outlet). points = 3 Wetland has an intermittently flowing stream or ditch, OR highly constricted permanently flowing outlet. points = 2 Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing points = 1 Wetland is a flat depression (QUESTION 7 on key), whose outlet is a permanently flowing ditch. points = 1	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	0
D 1.4. Characteristics of seasonal ponding or inundation: *This is the area that is ponded for at least 2 months. See description in manual.* Area seasonally ponded is > 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	0
Total for D 1 Add the points in the boxes above	2

Rating of Site Potential If score is: ___ **12-16 = H** ___ **6-11 = M** X **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	0
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1-D 2.3? Source_____ Yes = 1 No = 0	0
Total for D 2 Add the points in the boxes above	2

Rating of Landscape Potential If score is: ___ **3 or 4 = H** X **1 or 2 = M** ___ **0 = L** *Record the rating on the first page*

D 3.0. Is the water quality improvement provided by the site valuable to society?	
D 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, lake, or marine water that is on the 303(d) list? Yes = 1 No = 0	0
D 3.2. Is the wetland in a basin or sub-basin where an aquatic resource is on the 303(d) list? Yes = 1 No = 0	1
D 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality (*answer YES if there is a TMDL for the basin in which the unit is found*)? Yes = 2 No = 0	2
Total for D 3 Add the points in the boxes above	3

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

Wetland name or number B

DEPRESSIONAL AND FLATS WETLANDS

Hydrologic Functions - Indicators that the site functions to reduce flooding and stream degradation

D 4.0. Does the site have the potential to reduce flooding and erosion?	
D 4.1. Characteristics of surface water outflows from the wetland: Wetland is a depression or flat depression with no surface water leaving it (no outlet) points = 4 Wetland has an intermittently flowing stream or ditch, OR highly constricted permanently flowing 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	0
D 4.3. Contribution of the wetland to storage in the watershed: *Estimate the ratio of the area of upstream basin contributing surface water to the wetland to the area of the wetland unit itself.* The area of the basin is less than 10 times the area of the unit points = 5 The area of the basin is 10 to 100 times the area of the unit points = 3 The area of the basin is more than 100 times the area of the unit points = 0 Entire wetland is in the Flats class points = 5	3
Total for D 4 Add the points in the boxes above	5

Rating of Site Potential If score is: ___ **12-16 = H** ___ **6-11 = M** X **0-5 = L** *Record the rating on the first page*

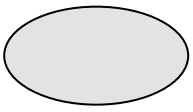
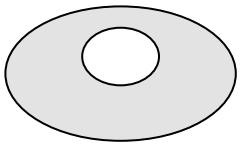
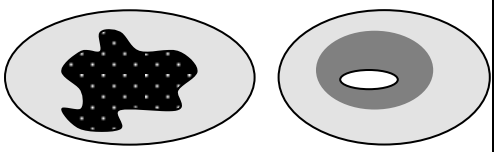
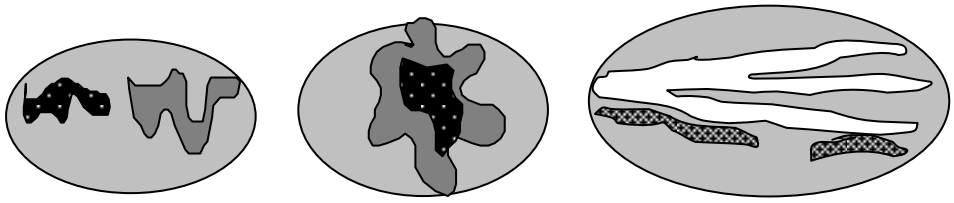
D 5.0. Does the landscape have the potential to support hydrologic functions of the site?	
D 5.1. Does the wetland receive stormwater discharges? Yes = 1 No = 0	0
D 5.2. Is >10% of the area within 150 ft of the wetland in land uses that generate excess runoff? Yes = 1 No = 0	1
D 5.3. Is more than 25% 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. 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	1
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	1

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

Wetland name or number B

These questions apply to wetlands of all HGM classes. **HABITAT FUNCTIONS** - Indicators that site functions to provide important habitat	
H 1.0. Does the site have the potential to provide habitat?	
H 1.1. Structure of plant community: *Indicators are Cowardin classes and strata within the Forested class.* Check the Cowardin plant classes in the wetland. *Up to 10 patches may be combined for each class to meet the threshold of ¼ ac or more than 10% of the unit if it is smaller than 2.5 ac. Add the number of structures checked.* ____Aquatic bed — 4 structures or more: points = 4 _X_Emergent — 3 structures: points = 2 ____Scrub-shrub (areas where shrubs have > 30% cover) — 2 structures: points = 1 ____Forested (areas where trees have > 30% cover) — 1 structure: points = 0 *If the unit has a Forested class, check if:* ____The Forested class has 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/ground-cover) that each cover 20% within the Forested polygon	0
H 1.2. Hydroperiods Check the types of water regimes (hydroperiods) present within the wetland. The water regime has to cover more than 10% of the wetland or ¼ ac to count (*see text for descriptions of hydroperiods*). ____Permanently flooded or inundated — 4 or more types present: points = 3 ____Seasonally flooded or inundated — 3 types present: points = 2 _X_Occasionally flooded or inundated — 2 types present: points = 1 _X_Saturated only — 1 type present: points = 0 ____Permanently flowing stream or river in, or adjacent to, the wetland ____Seasonally flowing stream in, or adjacent to, the wetland ____**Lake Fringe wetland** — **2 points** ____**Freshwater tidal wetland** — **2 points**	1
H 1.3. Richness of plant species Count the number of plant species in the wetland that cover at least 10 ft^2. *Different patches of the same species can be combined to meet the size threshold and you do not have to name the species.* ***Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Canadian thistle*** If you counted: > 19 species — points = 2 5 - 19 species — points = 1 < 5 species — points = 0 actively managed crop production area	0
H 1.4. Interspersion of habitats Decide from the diagrams below whether interspersion among Cowardin plants classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, moderate, low, or none. *If you have four or more plant classes or three classes and open water, the rating is always high.*  **None** = 0 points  **Low** = 1 point  **Moderate** = 2 points All three diagrams in this row are **HIGH** = 3points 	0

Wetland name or number B

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*)	0
Total for H 1 Add the points in the boxes above	1

Rating of Site Potential If score is:___**15-18 = H** ___**7-14 = M** X **0-6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support the habitat functions of the site?	
H 2.1. Accessible habitat (include *only habitat that directly abuts wetland unit*). *Calculate:* % undisturbed habitat 0 **+** [(% moderate and low intensity land uses)/2] 0 **=** 0 % 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:* % undisturbed habitat 10 **+** [(% moderate and low intensity land uses)/2] 11 **=** 21 % Undisturbed habitat > 50% of Polygon points = 3 Undisturbed habitat 10-50% and in 1-3 patches points = 2 Undisturbed habitat 10-50% and > 3 patches points = 1 Undisturbed habitat < 10% of 1 km Polygon points = 0	1
H 2.3. Land use intensity in 1 km Polygon: If > 50% of 1 km Polygon is high intensity land use points = (- 2) ≤ 50% of 1 km Polygon is high intensity points = 0	(-2)
Total for H 2 Add the points in the boxes above	0

Rating of Landscape Potential If score is:___**4-6 = H** ___**1-3 = M** X **< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose only the highest score that applies to the wetland being rated.* Site meets ANY of the following criteria: points = 2 — It has 3 or more priority habitats within 100 m (see next page) — It provides habitat for Threatened or Endangered species (any plant or animal on the state or federal lists) — It is mapped as a location for an individual WDFW priority species — It is a Wetland of High Conservation Value as determined by the Department of Natural Resources — It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan Site has 1 or 2 priority habitats (listed on next page) within 100 m X points = 1 Site does not meet any of the criteria above points = 0	1

Rating of Value If score is:___**2 = H** X **1 = M** ___**0 = L** *Record the rating on the first page*

Wetland name or number B

WDFW Priority Habitats

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp. http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here: http://wdfw.wa.gov/conservation/phs/list/)

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland unit: ***NOTE:*** *This question is independent of the land use between the wetland unit and the priority habitat.*

— **Aspen Stands:** Pure or mixed stands of aspen greater than 1 ac (0.4 ha).

— **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).

— **Herbaceous Balds:** Variable size patches of grass and forbs on shallow soils over bedrock.

— **Old-growth/Mature forests:** Old-growth west of Cascade crest – Stands of at least 2 tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) > 32 in (81 cm) dbh or > 200 years of age. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west of the Cascade crest.

— **Oregon White Oak:** Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).

X **Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

— **Westside Prairies:** Herbaceous, non-forested plant communities that can either take the form of a dry prairie or a wet prairie (*full descriptions in WDFW PHS report p. 161 – see web link above*).

X **Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.

— **Nearshore**: Relatively undisturbed nearshore habitats. These include Coastal Nearshore, Open Coast Nearshore, and Puget Sound Nearshore. (*full descriptions of habitats and the definition of relatively undisturbed are in WDFW report – see web link on previous page).*

— **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

— **Cliffs:** Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.

— **Talus:** Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

— **Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 20 in (51 cm) in western Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

Note: All vegetated wetlands are by definition a priority habitat but are not included in this list because they are addressed elsewhere.

Wetland name or number Potential Offsite Wetland Z to the south of the project site

RATING SUMMARY – Western Washington

Name of wetland (or ID #): South of Parcel 0420351003 Date of site visit: 10 MAY 2022

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

NOTE: **Form is not complete without the figures requested** *(figures can be combined)*.
Source of base aerial photo/map Pierce County GIS

OVERALL WETLAND CATEGORY III (based on functions x or special characteristics___)

1. Category of wetland based on FUNCTIONS

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

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

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

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

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
	Circle the appropriate ratings			
Site Potential	H M [L]	H [M] L	H M [L]	
Landscape Potential	H [M] L	H [M] L	H M [L]	
Value	[H] M L	H [M] L	H [M] L	**TOTAL**
Score Based on Ratings	6	6	4	16

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

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

2. Category based on SPECIAL CHARACTERISTICS of wetland

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

Wetland name or number offsite Z

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	B1
Hydroperiods	D 1.4, H 1.2	B2
Location of outlet (*can be added to map of hydroperiods)*	D 1.1, D 4.1	B2
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	B2
Map of the contributing basin	D 4.3, D 5.3	B4
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	B3
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	W4
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	D 3.3	W5

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	N/A
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	N/A
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	N/A
Boundary of 150 ft buffer (can be added to another figure)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	S 3.3	

Wetland name or number offsite Y

HGM Classification of Wetlands in Western Washington

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

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-7 apply, and go to Question 8.

1. Are the water levels in the entire unit usually controlled by tides except during floods?

NO – go to 2 **YES** – the wetland class is **Tidal Fringe** – go to 1.1

1.1 Is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)?

NO – Saltwater Tidal Fringe (Estuarine) **YES – Freshwater Tidal Fringe**
*If your wetland can be classified as a Freshwater Tidal Fringe use the forms for **Riverine** wetlands. If it is Saltwater Tidal Fringe it is an **Estuarine** wetland and is not scored. This method **cannot** be used to score functions for estuarine wetlands.*

2. The entire wetland unit is flat and precipitation is the only source (>90%) of water to it. Groundwater and surface water runoff are NOT sources of water to the unit.

NO – go to 3 **YES** – The wetland class is **Flats**
*If your wetland can be classified as a Flats wetland, use the form for **Depressional** wetlands.*

3. Does the entire wetland unit **meet all** of the following criteria?
___The vegetated part of the wetland is on the shores of a body of permanent open water (without any plants on the surface at any time of the year) at least 20 ac (8 ha) in size;
___At least 30% of the open water area is deeper than 6.6 ft (2 m).

NO – go to 4 **YES –** The wetland class is **Lake Fringe** (Lacustrine Fringe)

4. Does the entire wetland unit **meet all** of the following criteria?
___The wetland is on a slope (*slope can be very gradual*),
___The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks,
___The water leaves the wetland **without being impounded**.

NO – go to 5 **YES –** The wetland class is **Slope**

NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 ft deep).

5. Does the entire wetland unit **meet all** of the following criteria?
___The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river,
___The overbank flooding occurs at least once every 2 years.

Wetland name or number offsite Z

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 Z

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	0
D 1.4. Characteristics of seasonal ponding or inundation: *This is the area that is ponded for at least 2 months. See description in manual.* Area seasonally ponded is > 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	0
Total for D 1 Add the points in the boxes above	2

Rating of Site Potential If score is: ___ **12-16 = H** ___ **6-11 = M** X **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	0
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1-D 2.3? Source_____ Yes = 1 No = 0	0
Total for D 2 Add the points in the boxes above	1

Rating of Landscape Potential If score is: ___ **3 or 4 = H** X **1 or 2 = M** ___ **0 = L** *Record the rating on the first page*

D 3.0. Is the water quality improvement provided by the site valuable to society?	
D 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, lake, or marine water that is on the 303(d) list? Yes = 1 No = 0	0
D 3.2. Is the wetland in a basin or sub-basin where an aquatic resource is on the 303(d) list? Yes = 1 No = 0	1
D 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality (*answer YES if there is a TMDL for the basin in which the unit is found*)? Yes = 2 No = 0	2
Total for D 3 Add the points in the boxes above	3

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

Wetland name or number offsite Z

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	0
D 4.3. Contribution of the wetland to storage in the watershed: *Estimate the ratio of the area of upstream basin contributing surface water to the wetland to the area of the wetland unit itself.* The area of the basin is less than 10 times the area of the unit points = 5 The area of the basin is 10 to 100 times the area of the unit points = 3 The area of the basin is more than 100 times the area of the unit points = 0 Entire wetland is in the Flats class points = 5	5
Total for D 4 Add the points in the boxes above	7

Rating of Site Potential If score is: ___ **12-16 = H** _X_ **6-11 = M** ___ **0-5 = L** *Record the rating on the first page*

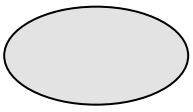
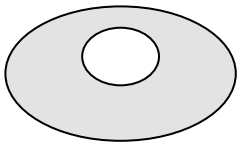
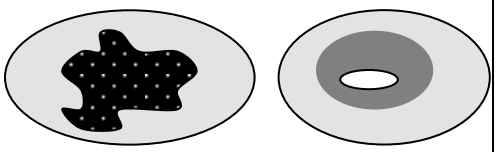
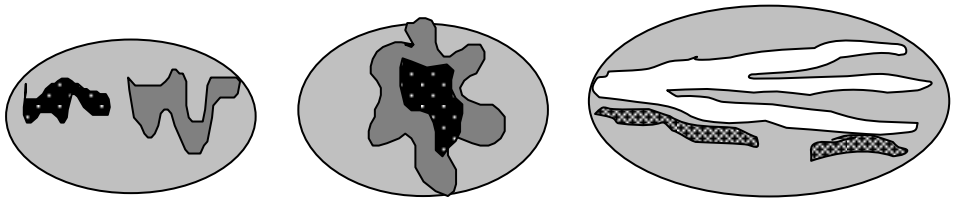
D 5.0. Does the landscape have the potential to support hydrologic functions of the site?	
D 5.1. Does the wetland receive stormwater discharges? Yes = 1 No = 0	0
D 5.2. Is >10% of the area within 150 ft of the wetland in land uses that generate excess runoff? Yes = 1 No = 0	1
D 5.3. Is more than 25% 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. 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	1
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	1

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

Wetland name or number offsite Z

These questions apply to wetlands of all HGM classes. **HABITAT FUNCTIONS** - Indicators that site functions to provide important habitat	
H 1.0. Does the site have the potential to provide habitat?	
H 1.1. Structure of plant community: *Indicators are Cowardin classes and strata within the Forested class.* Check the Cowardin plant classes in the wetland. *Up to 10 patches may be combined for each class to meet the threshold of ¼ ac or more than 10% of the unit if it is smaller than 2.5 ac. Add the number of structures checked.* ____Aquatic bed — 4 structures or more: points = 4 _X_Emergent — 3 structures: points = 2 ____Scrub-shrub (areas where shrubs have > 30% cover) — 2 structures: points = 1 ____Forested (areas where trees have > 30% cover) — 1 structure: points = 0 *If the unit has a Forested class, check if:* ____The Forested class has 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/ground-cover) that each cover 20% within the Forested polygon	0
H 1.2. Hydroperiods Check the types of water regimes (hydroperiods) present within the wetland. The water regime has to cover more than 10% of the wetland or ¼ ac to count (*see text for descriptions of hydroperiods*). ____Permanently flooded or inundated — 4 or more types present: points = 3 ____Seasonally flooded or inundated — 3 types present: points = 2 ____Occasionally flooded or inundated — 2 types present: points = 1 _X_Saturated only — 1 type present: points = 0 ____Permanently flowing stream or river in, or adjacent to, the wetland ____Seasonally flowing stream in, or adjacent to, the wetland ____**Lake Fringe wetland** — **2 points** ____**Freshwater tidal wetland** — **2 points**	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 actively managed lawn area	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** = 3points 	0

Wetland name or number offsite Z

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*)	0
Total for H 1 Add the points in the boxes above	1

Rating of Site Potential If score is:___**15-18 = H** ___**7-14 = M** X **0-6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support the habitat functions of the site?	
H 2.1. Accessible habitat (include *only habitat that directly abuts wetland unit*). *Calculate:* % undisturbed habitat 0 **+** [(% moderate and low intensity land uses)/2] 0 **=** 0 % 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:* % undisturbed habitat 10 **+** [(% moderate and low intensity land uses)/2] 11 **=** 21 % Undisturbed habitat > 50% of Polygon points = 3 Undisturbed habitat 10-50% and in 1-3 patches points = 2 Undisturbed habitat 10-50% and > 3 patches points = 1 Undisturbed habitat < 10% of 1 km Polygon points = 0	1
H 2.3. Land use intensity in 1 km Polygon: If > 50% of 1 km Polygon is high intensity land use points = (- 2) ≤ 50% of 1 km Polygon is high intensity points = 0	(-2)
Total for H 2 Add the points in the boxes above	0

Rating of Landscape Potential If score is:___**4-6 = H** ___**1-3 = M** X **< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose only the highest score that applies to the wetland being rated.* Site meets ANY of the following criteria: points = 2 — It has 3 or more priority habitats within 100 m (see next page) — It provides habitat for Threatened or Endangered species (any plant or animal on the state or federal lists) — It is mapped as a location for an individual WDFW priority species — It is a Wetland of High Conservation Value as determined by the Department of Natural Resources — It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan Site has 1 or 2 priority habitats (listed on next page) within 100 m X points = 1 Site does not meet any of the criteria above points = 0	1

Rating of Value If score is:___**2 = H** X **1 = M** ___**0 = L** *Record the rating on the first page*

Wetland name or number offsite Z

WDFW Priority Habitats

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp. http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here: http://wdfw.wa.gov/conservation/phs/list/)

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland unit: ***NOTE:*** *This question is independent of the land use between the wetland unit and the priority habitat.*

— **Aspen Stands:** Pure or mixed stands of aspen greater than 1 ac (0.4 ha).

— **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).

— **Herbaceous Balds:** Variable size patches of grass and forbs on shallow soils over bedrock.

— **Old-growth/Mature forests:** Old-growth west of Cascade crest – Stands of at least 2 tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) > 32 in (81 cm) dbh or > 200 years of age. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west of the Cascade crest.

— **Oregon White Oak:** Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).

X **Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

— **Westside Prairies:** Herbaceous, non-forested plant communities that can either take the form of a dry prairie or a wet prairie (*full descriptions in WDFW PHS report p. 161 – see web link above*).

X **Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.

— **Nearshore**: Relatively undisturbed nearshore habitats. These include Coastal Nearshore, Open Coast Nearshore, and Puget Sound Nearshore. (*full descriptions of habitats and the definition of relatively undisturbed are in WDFW report – see web link on previous page).*

— **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

— **Cliffs:** Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.

— **Talus:** Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

— **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.

12.0 Photos

View southeasterly across Wetland B from the northwestern corner of the project site.

View easterly across Wetland B from the northwestern corner of the project site.

View westerly from eastern boundary of Wetland A.

View northerly across the eastern portion of the project site.

View northerly along Deer Creek near the southwestern corner of the project site.

View southerly along Deer Creek near the northwestern corner of the project site.

View of Offsite Wetland X immediately to the north of Wetland B and separated by an existing internal roadway.

General view of Offsite Wetland Y to the north of the project site.